Study Scheme & Syllabus of

Bachelor of Technology

Civil Engineering

(3rd -8th Semester, 2018 batch)

DEPARTMENT OF CIVIL ENGINEERING

BHAI GURDAS INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPROVED BY AICTE, NEW DELHI, AFFILIATED TO IKGPTU, JALANDHAR

INDEX
SCHEME: B. TECH 3RD SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-301-18	Surveying & Geomatics	3-1-0	4	4
B	BTCE-302-18	Solid Mechanics	3-0-0	3	3
C	BTCE-303-18	Fluid Mechanics	3-0-0	3	3
D	BTAM-301-18	Mathematics-III (Transform & Discrete Mathematics)	4-0-0	4	4
E	BTEC- 305-18	Basic Electronics & Applications in Civil Engineering	3-0-0	3	3
F	HSMC-132-18	Civil Engineering- Introduction, Societal & Global Impact	3-0-0	3	3
G	BTCE-306-18	Surveying & Geomatics Lab	0-0-2	2	1
H	BTCE-307-18	Fluid Mechanics Lab	0-0-2	2	1
I	BTCE-308-18	Solid Mechanics Lab	0-0-2	2	1
J	BMPD-301-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-301-18: SURVEYING & GEOMATICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS	**SEMESTER:** III
COURSE CODE: BTCE-301-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-306-18	**LAB COURSE NAME:** SURVEYING & GEOMATICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Surveying:** Principles, Survey stations, Survey lines-ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction, Levelling: Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; Contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three-point problem only).	10
II	**Triangulation and Trilateration:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline choices - extension of base lines - corrections - Trigonometric levelling.	12
III	**Curves:** Elements of simple and compound curves – Method of setting out transition curve – length of curve – Elements of transition curve. **Photogrammetry Surveying:** Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping-mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	10
IV	**Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based). **Remote Sensing:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2.	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications
3.	Agor, R., Surveying, Khanna Publishers
4.	Bhavikatti, S.S., Surveying & Levelling Volume I & II

T/R	Book title suggested by faculty
1	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications

E- content used:
https://nptel.ac.in/courses/105107122

Additional topics:

Chain and Tape survey (Corrections), Overview of Indian Topographic Map, Reliability and Quality of Measurement.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team teaching method
Apparatus demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-301- 18.1	Understand the concept, various methods and techniques of surveying.	2
BTCE-301- 18.2	Compute angles, distances and levels for given area.	5
BTCE-301- 18.3	Apply the concept of tachometry survey in difficult and hilly terrain.	3
BTCE-301- 18.4	Select appropriate instruments for data collection and survey purpose.	1

BTCE-301- 18.5	Analyze and retrieve the information from remotely sensed data and interpret the data for survey.	4
BTCE-301- 18.6	Understand the concepts related to GIS and GPS and analyse the geographical data.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	1				2			1	1	1
CO2	3	2	2	2	2				2			1	1	2
CO3	3	2	2	2	2				2			1	1	1
CO4	2	2	3	2	3				1			2	2	2
CO5	1	2	2	3	2				1			2	2	1
CO6	2	1	1	2	3							2	2	1

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BTCE-302-18: SOLID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-302-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-308-18	**LAB COURSE NAME:** SOLID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concept of Equilibrium**: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem. **Stresses and Strains**: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain,	08

	Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.	
II	**Principal Stresses and Strains:** Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress. **Shear Force and Bending Moment Diagrams**: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.	10
III	**Slope and deflection-** Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. **Bending and Shear Stresses:** Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross-sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.	08
IV	**Columns and Struts**: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load. **Torsion of Circular Shafts**: Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending. **Stresses and strains in thin cylinders:** spherical shells subjected to internal pressures; Normal stress, tangential stress.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2.	'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3.	'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4.	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5.	'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.

6.	'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7.	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

T/R	Book title suggested by faculty
1	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.
2	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.

E- content used:
https://nptel.ac.in/courses/112102284

Additional topics:

Mathematical Concepts: Working with Vectors & Tensors, Theories of Failure, Moment of Inertia for different types of bodies/shapes.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-302- 18.1	Understand the concept of static equilibrium, deformations, and material constitutive behaviour.	2
BTCE-302- 18.2	Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyse structural members subjected to tension, compression and torsion.	3
BTCE-302- 18.3	Apply the concept of Mohr's circle in the stress/strain calculations.	3
BTCE-302- 18.4	Develop SFD and BMD for different type of beams subjected to different types of loads.	6
BTCE-302- 18.5	Plot elastic curves for beams undergoing displacements under different loadings.	6

BTCE-302- 18.6	Understand the behaviour of columns and struts under axial loading.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	1	2								2	1	
CO3	3	2	3	3	1								2	2
CO4	3	2	3	3	1								3	2
CO5	2	3	3	2	2								2	3
CO6	2	2		1								1		

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BTCE-303-18: FLUID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-303-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-307-18	**LAB COURSE NAME:** FLUID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Concepts and Definitions** – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics** - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	08

II	**Fluid Kinematics** - Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates. **Fluid Dynamics -** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	10
III	**Laminar Flow & Turbulent Flow** - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel. **Boundary Layer Analysis**- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.	10
IV	**Open Channel Flow** - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2.	Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth
3.	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker
4.	Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman

5.	Fluid Mechanics: Streetes VL & Wylie EB;
6.	Fluid Mechanics by Potter, Cengage Learning

T/R	Book title suggested by faculty
1	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker

E- content used:
https://nptel.ac.in/courses/112104118

Additional topics: Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-303- 18.1	Understand the basic terms used in fluid mechanics and its broad principles	2
BTCE-303- 18.2	Estimate the forces induced on a plane/ submerged bodies.	5
BTCE-303- 18.3	Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.	5
BTCE-303- 18.4	Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.	3
BTCE-303- 18.5	Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.	5
BTCE-303- 18.6	Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	2	2								2	2	
CO3	3	2	2	1								2	2	3
CO4	3	2	3	3	1							2	3	3
CO5	3	3	1	2									2	1
CO6	2	3	3	2	2							2	2	3

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BTAM-301-18: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)	**SEMESTER:** III
COURSE CODE: BTAM-301-18	**CREDITS:** 4
COURSE TYPE: BASIC SCIENCE COURSE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Vector Calculus-I:** Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.	10
II	**Vector Calculus-II:** Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.	11
III	**Transforms Calculus-I:** Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution	10

	theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.	
IV	**Transforms Calculus-II:** Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications	11

Total hours – 42

TEXT /REFERENCE BOOKS

1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3.	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4.	Thomas and Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 2017.
5.	R. K. Jain and S.R.K Iyengar Advanced Engineering Mathematics, 5th Edition, 2017.

T/R	Book title suggested by faculty
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

E- content used:
https://nptel.ac.in/courses/111105121

Additional Topics:

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Small Group Instructions
Problem solving

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTAM-301-18.1	Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.	2

BTAM-301-18.2	Find length, area and volume using integral calculus that is an important application in engineering.	5
BTAM-301-18.3	Solve some real problems in engineering using Gauss Divergence and Stokes' theorem	5
BTAM-301-18.4	Understand the concept of orthogonal curvilinear coordinates and the applications of Green, Gauss and Stokes Theorems.	2
BTAM-301-18.5	Formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.	5
BTAM-301-18.6	Formulate Fourier Series, its properties and its applications to solve problems in engineering.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1									1	
CO2	2		2		1									1
CO3	1	2		2										
CO4	1		2		1								1	
CO5	2	1	1	1										
CO6	2			1									1	1

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BTEC- 305-18: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING	**SEMESTER:** III
COURSE CODE: BTEC- 305-18	**CREDITS:** 3
COURSE TYPE: ENGINEERING SCIENCE COURSE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE	**LAB COURSE NAME:** NA

(IF ANY): NA	

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications.	08
II	**Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.	08
III	**Operational Amplifiers and Applications -** Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.	10
IV	**Digital Electronics** -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K-Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2.	SantiramKal (2002), Basic Electronics- Devices, Circuits and IT undamentals, Prentice Hall, India. 3.Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education.
3.	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
4.	R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson.

T/R	Book title suggested by faculty

1	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH

E- content used:
https://nptel.ac.in/courses/122106025

Additional topics:

Basic laws and theorems in Basic Electronics, Wave Shaping using Diodes

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC- 305-18.1	Identify areas of application of electronics in civil engineering.	2
BTEC- 305-18.2	Understand construction of diodes and their rectifier applications.	1
BTEC- 305-18.3	Appreciate the construction and working bipolar junction transistors and MOSFETs.	6
BTEC- 305-18.4	Design Op-Amp IC based fundamental applications.	1
BTEC- 305-18.5	Appraise the use of integrated circuits in civil engineering applications.	2
BTEC- 305-18.6	Comprehend working of basic elements of digital electronics and circuits.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1		1					2		2	1		
CO2	2				2				1		1			
CO3	2				2				1		1			
CO4	2		2		2						1		1	2
CO5	1	1			2						1		1	
CO6					2						1		1	

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HSMC-132-18: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT	**SEMESTER:** III
COURSE CODE: HSMC-132-18	**CREDITS:** 3
COURSE TYPE: HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Civil Engineering and its historical developments;** Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.	08
II	**Understanding the past to look into the future**; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.	10
III	**Infrastructure development and growth of the Nation**; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals,	08

	Tunnels, bridges.	
IV	**Energy Generation**: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Salvadori, M and Heller, M, Strctures in Architectures, PHI.
2.	Fintel, C, Handbook of Civil Engineering, CBS Publications.
3.	*Žiga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
4.	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
5.	NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004

T/R	Book title suggested by faculty
1	Fintel, C, Handbook of Civil Engineering, CBS Publications.
2	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition.

E- content used:
https://www.dce-darbhanga.org/wp-content/uploads/2020/04/file_5e8ca9c9a4968.pdf

Additional topics: Present and future scenario of energy generation methods.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team Teaching Method
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
HSMC-132-18.1	Introduction to what constitutes Civil Engineering	1
HSMC-132-18.2	Understanding the vast interfaces this field has with the society at large	2
HSMC-132-18.3	Providing inspiration for doing creative and innovative work for the benefit of the society	1
HSMC-132-18.4	Need to think innovatively to ensure Sustainability	1
HSMC-132-18.5	Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field	2
HSMC-132-18.6	Illustrate the Futuristic engineering systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1											1		
CO2						2	1	1						
CO3					2	3	2	2					2	
CO4						2	3						2	
CO5												2		
CO6	2				2							2		

Prepared by **Approved By**

HOD

BTCE-306-18: SURVEYING & GEOMATICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-306-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
II	Different methods of leveling, height of instrument, rise & fall methods.
III	Measurement of horizontal and vertical angle by theodolite.
IV	Determination of tachometric constants and determination of reduced levels by tachometric observations.
V	Plane table survey, different methods of plotting, three-point problem.
VI	Determination of height of an inaccessible object.
VII	Setting out of circular curves in the field using different methods.
VIII	Plotting of traverse using the Total Station and GPS.

Total hours – 20

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-306- 18.1	Assess horizontal & vertical angles by Theodolite.	5
BTCE-306- 18.2	Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.	1
BTCE-306- 18.3	Compute the reduce levels using various methods of levelling.	5
BTCE-306- 18.4	Predict the location of any point horizontally and vertically using Tachometry.	3
BTCE-306- 18.5	Setting out curves in the field.	3
BTCE-306- 18.6	Use electronic survey instruments.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2

CO1	2	2		2	1				2			1	2	
CO2	2	2	1	2	1				2			1	1	1
CO3	2	2	2	1	2				2			1	2	1
CO4	2	2			1				2					
CO5	2	2			1				2					
CO6	2	2		1	2				1				2	

BTCE-307-18: FLUID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-307-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges.
II	To verify Bernoulli's Theorem
III	To determine the Meta centric height of a Floating Body under different condition.
IV	To determine the coefficient of discharge of a Venturimeter.
V	To determine the coefficient of discharge of a Orifice Meter
VI	To determine the coefficient of friction of different diameter pipes.
VII	To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
VIII	To determine the coefficient of discharge on rectangular and V-notches.
IX	To determine the various element of a hydraulic jump.

Total hours – 18

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2.	Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3.	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4.	Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-307- 18.1	Select appropriate pressure measuring device under different condition of flow.	1
BTCE-307- 18.2	Determine the stability of a floating body.	5
BTCE-307- 18.3	Understand and apply Bernoulli's theorem practically.	2
BTCE-307- 18.4	Find discharge of fluid through pipe, orifices and in open channel.	5
BTCE-307- 18.5	Estimate the major and minor losses in pipe.	5
BTCE-307- 18.6	Estimate the various elements and energy losses in hydraulic jump.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				2							1		
CO2	2	2		1	1							2	1	
CO3	2	2		2					1			1	2	
CO4	2	2		1	2				2			2	2	
CO5	2	2		1	2				1			2	2	
CO6	2	2		1	2				1			2	2	

BTCE-308-18: SOLID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS LAB	**SEMESTER:** III

COURSE CODE: BTCE-308-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of physical properties of steel including strength and ductility.
II	Study of tensile and compressive stress-strain behaviour of steel.
III	Compression test on brick.
IV	Development of shear stress-strain curve for steel in torsion.
V	Determination of hardness of a material by Rockwell and Brinell hardness testing machine.
VI	Determination of impact strength of a material by Izod and Charpy tests.
VII	Determination of bending strength of a wooden beam specimen.
VIII	Determination of fatigue strength of a material.
IX	Study of behavior of columns and struts with different end conditions.
X	To verify the moment area theorem for slope and deflection of a given beam.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-308- 18.1	Understand the importance of physical properties of steel.	2
BTCE-308- 18.2	Identify and comprehend code provisions for testing different properties of steel.	1
BTCE-308- 18.3	Develop stress-strain curve for axial compression, axial tension and shear.	1

BTCE-308- 18.4	Assess hardness and impact strength of steel.	5
BTCE-308- 18.5	Assess flexural strength of a given material.	5
BTCE-308- 18.6	Evaluate fatigue and impact strength of steel.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		1
CO2	2	1		1								2		2
CO3	2	3	3	1	1				2			2	3	1
CO4	2	1			2							1	1	
CO5	2	1			2				2			1	1	
CO6	2	1			2				2			1	1	

BTCE-308-18: TRAINING -I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRAINING -I	**SEMESTER:** III
COURSE CODE: BTCE-308-18	**CREDITS:** --
COURSE TYPE: Professional Skill Enhancement	**CONTACT HOURS:** --

SYLLABUS:

EXPERIMENT	DETAILS
I	**Institutional Training (3 weeks)** 1. Hands-on-training on MS Office/ Office suite (Word processor, Spreadsheet, Math tools, presentation/ ppt, etc.) 2. Introduction to Civil Engineering software's and basic overview of drafting tools such as AutoCAD, etc.
II	**Field and Market Study** 1. Student shall visit construction site of significantly scale and make an inventory construction and finishing materials being used. 2. Student shall do Market Survey for availability and rates of materials in the already prepared inventory.

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-332- 18.1	Visualize things/ concepts and express the thoughts in the form of sketches, models, etc	1
BTCE-332- 18.2	Create a well-organized document using computers	6
BTCE-332- 18.3	Work in teams	1
BTCE-332- 18.4	Acknowledge the work of other in a consistent manner	1
BTCE-332- 18.5	Understanding of ethical and professional issues	2
BTCE-332- 18.6	Demonstrate effective oral communication and presentation skills	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1			2				1	2			1	
CO2					2				1	2			2	
CO3									3	2				
CO4									3	1				
CO5							2	3	1	1				
CO6									1	3				

INDEX
SCHEME: B. TECH 4TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-401- 18	Concrete Technology	3-0-0	3	3
B	BTCE-402- 18	Materials, Testing & Evaluation	4-0-0	4	4
C	BTCE-403- 18	Hydrology & Water Resources Engineering	3-1-0	4	4
D	BTCE-404- 18	Transportation Engineering	3-1-0	4	4
E	BTCE-405- 18	Disaster Preparedness & Planning	3-0-0	3	3
F	EVS-101-18	Environmental Science	2-0-0	2	0
G	BTCE-406- 18	Concrete Testing Lab	0-0-2	2	1
H	BTCE-407- 18	Transportation Lab	0-0-2	2	1
I	BMPD-401-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 20 **Hours: 26**

BTCE-401- 18: CONCRETE TECHNOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TECHNOLOGY	**SEMESTER:** IV
COURSE CODE: BTCE-401- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 406-18	**LAB COURSE NAME:** CONCRETE TESTING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concrete and its ingredients**: Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines. **Concrete behaviour in fresh and hardened states**: Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.	08
II	**Production of concrete**: Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions. **Concrete mix design:** Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.	10
III	**Inspection and testing of concrete**: Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pull-out etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.	09
IV	**Special concretes:** Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self-Healing Concrete.	09

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Properties of Concrete', A. M. Neville, Prentice Hall
2.	'Concrete Technology', M. S. Shetty, S.Chand & Co.
3.	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4.	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi
5.	P Kumar Mehta, Monteiro; Concrete Technology, Indian Concrete Institute

T/R	Book title suggested by faculty
1	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
2	'Concrete Technology', M. S. Shetty, S. Chand & Co.
3	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

E- content used:
https://nptel.ac.in/courses/105102012

Additional topics:

Mix Design of concrete: Packing Density, Rheology, testing of mixing water, Abram's Law.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-401- 18.1	Understand the relevance of different properties of constituent materials on properties of concrete.	2
BTCE-401- 18.2	Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.	2
BTCE-401- 18.3	Understand the issues involved in production and use of concrete.	2
BTCE-401- 18.4	Design of concrete mixes as per BIS specifications.	6
BTCE-401- 18.5	Understand various testing methods for concrete and their applicability.	2

BTCE-401- 18.6	Knowledge of special type of non-conventional concretes.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2													
CO4	3		3		2								2	3
CO5	3	2			2							1	2	1
CO6					3							1	2	

Prepared by **Approved By**

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BTCE-402- 18: MATERIALS, TESTING & EVALUATION

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATERIALS, TESTING & EVALUATION	**SEMESTER:** IV
COURSE CODE: BTCE-402- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes; Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's Bricks; Concrete hollow blocks & Interlocking tiles. Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,	10

II	Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behaviour (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep –fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.	12
III	Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	10
IV	Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regard for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2.	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3.	Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. correspondingto materials used for Civil Engineering applications
4.	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5.	E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6.	American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

T/R	**Book title suggested by faculty**
1	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
2	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition

E- content used:
https://nptel.ac.in/courses/105102088

Additional topics:

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Class discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-402- 18.1	Appraisal about the role of materials in civil engineering	5
BTCE-402- 18.2	Introduce common measurement instruments, equipment and devices to capture the material response under loading	2
BTCE-402- 18.3	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice	2
BTCE-402- 18.4	Ability to write a technical laboratory report.	1
BTCE-402- 18.5	Interpret the observations/ test reports for selection of suitable material.	2
BTCE-402- 18.6	Utilize the relevant information from the standards and guidelines.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		1	2								2	
CO3	2	2		2	1								2	
CO4									2	2				
CO5	1	2		1					1					
CO6	2													

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BTCE-403- 18: HYDROLOGY & WATER RESOURCES ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: HYDROLOGY & WATER RESOURCES ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-403- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction -** Hydrologic Cycle, History of Hydrology, Water-Budget Equation, World Water Balance, Applications in Engineering, Sources of Data. **Precipitation -** Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.	12
II	**Abstractions from precipitation** - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices. **Runoff -** Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.	12
III	**Unit III: Water withdrawals and uses –** Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation. **Distribution systems** - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime	10

	Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets.	
IV	**Water Logging**: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods. **Dams and spillways** - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2.	K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3.	K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4.	G L Asawa, Irrigation Engineering, Wiley Eastern
5.	L W Mays, Water Resources Engineering, Wiley.
6.	J. D Zimmerman, Irrigation, John Wiley & Sons
7.	C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

T/R	Book title suggested by faculty
1	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2	L W Mays, Water Resources Engineering, Wiley.

E- content used:
https://archive.nptel.ac.in/courses/105/103/105103213/

Additional topics:

Water vapour dynamics, Gumbel's method, Thunderstorm Cell Model, Infiltration: Green Amp Equation.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-403- 18.1	Understand the interaction among various processes in the hydrologic cycle.	2
BTCE-403- 18.2	Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc.	5
BTCE-403- 18.3	Understand the various component of hydro graphs and able to estimate the run off.	2
BTCE-403- 18.4	Find the water requirement for different crops and able to proposed appropriate method of applying water.	5
BTCE-403- 18.5	Understand the distribution system of canal and various components of irrigation system.	1
BTCE-403- 18.6	Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	1	2	1				1				1	
CO3	3	2	2	2										
CO4	2	1	3	2	2								1	2
CO5	2				1							1		
CO6	3	2		1										

Prepared by **Approved By**

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BTCE-404- 18: TRANSPORTATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-404- 18	**CREDITS:** 4

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 407-18	**LAB COURSE NAME:** TRANSPORTATION LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction:*** Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport. ***Transportation Systems****:* Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.	10
II	***Highway Development & Planning****:* Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements	12
III	***Railway Engineering****:* History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge. ***Railway Track****:* Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.	12
IV	***Airport Engineering*****:** Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration. ***Aircraft Parking System & Visual Aids****:* Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers,

	Roorkee,1998.
2.	Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3.	Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4.	Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5.	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
6.	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

T/R	Book title suggested by faculty
1	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee,1998.
2	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
3	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

E- content used:
https://nptel.ac.in/courses/105105107

https://archive.nptel.ac.in/courses/105/107/105107123/

Additional topics:

Overview to geometric design of highways, Overview to Mix design methods for construction of flexible pavement, Introduction to superelevation, transition curve in railways, Introduction to railway equipment and junctions.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Student led classrooms
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom’s Level (B.L)
BTCE-404- 18.1	Appreciate the importance of different modes of transportation and characterize the road transportation.	2

BTCE-404- 18.2	Alignment and geometry of pavement as per Indian Standards according to topography.	1
BTCE-404- 18.3	Assess the properties of highway materials in laboratory	5
BTCE-404- 18.4	Understand the importance of railway infrastructure planning and design.	2
BTCE-404- 18.5	Identify the functions of different component of railway track.	2
BTCE-404- 18.6	Outline the importance of Airport Infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2	2			2									
CO4	2		1		1									
CO5	2	1			1									
CO6	2				1									

Prepared by **Approved By**

HOD

BTCE-405- 18: DISASTER PREPAREDNESS & PLANNING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: DISASTER PREPAREDNESS & PLANNING	**SEMESTER:** IV
COURSE CODE: BTCE-405- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction to Disaster Management:*** Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation. ***Disasters****:* Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender, age, special needs), Lessons and experiences from important disasters with specific reference to civil engineering.	10
II	***Disaster Mitigation and Preparedness:*** Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; Preparedness for natural disasters in urban areas. ***Risk Assessment****:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.	08
III	***Post disaster response****:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.	10
IV	***Integration of public policy****:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	www.http//ndma.gov.in
2.	http://www.ndmindia.nic.in
3.	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4.	Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5.	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

6.	Disaster Management, R.B. Singh (Ed), Rawat Publications

T/R	Book title suggested by faculty
1	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
2	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

E- content used:
https://nptel.ac.in/courses/124107010

Additional topics:

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-405- 18.1	Identify various types of disasters, their causes, effects & mitigation measures.	2
BTCE-405- 18.2	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.	2
BTCE-405- 18.3	Understand the use of emergency management system to tackle the problems.	2
BTCE-405- 18.4	Discuss the role of media, various agencies and organisations for effective disaster management.	6
BTCE-405- 18.5	Design early warning system and understand the utilization of advanced technologies in disaster management.	6
BTCE-405- 18.6	Compare different models for disaster management and plan & design of infrastructure for effective disaster management.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	2	1										1		
CO2	1	1	2									1	1	1
CO3	1											1		
CO4						3	2		2	2				
CO5	2		2		3				2	2		1	2	3
CO6		2	3						2	2			1	3

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EVS-101-18: ENVIRONMENTAL SCIENCE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL SCIENCE	**SEMESTER:** IV
COURSE CODE: EVS-101-18	**CREDITS:** 0
COURSE TYPE: BASIC SCIENCES (MANDATORY COURSES)	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Natural Resources: Renewable and non-renewable resources** Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resource: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.	06

II	**Ecosystems** Concept of an ecosystem, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	06
III	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India	06
IV	**Social Issues and the Environment** From Unsustainable to Sustainable development, Resettlement and rehabilitation of people; its problems and concerns., Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies, Public awareness.	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	Textbook of Environmental studies, Erach Bharucha, UGC Weblink: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2.	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
3.	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
4.	Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
5.	Principle of Environment Science by Cunninghan, W.P.
6.	Elements of Environment Science & Engineering by Meenakshi.
7.	Elements of Environment Engineering by Duggal.

T/R	**Book title suggested by faculty**
1	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
2	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

E- content used:
https://evspgdavevening.blogspot.com/p/e-content.html

Additional topics:

Biomedical Waste Management, Environmental Acts and Rules.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Student led classrooms

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
EVS-101-18.1	Understand environmental problems at local and national level through literature and general awareness.	2
EVS-101-18.2	Acquire practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.	2
EVS-101-18.3	Apply interdisciplinary approach to understand key environmental issues and critically analyse them to explore the possibilities to mitigate these problems.	4
EVS-101-18.4	Create awareness among people about protection of wild life & forests.	2
EVS-101-18.5	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.	2
EVS-101-18.6	Understand the need of conservation of natural resources, ecological balance and biodiversity to achieve sustainable development.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1							3			2				
CO2							3			2				
CO3	1	1				2	3		1			1		
CO4						2	3		1	2				
CO5						2	2	2	1	2				
CO6						2	3	1	1	2				

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BTCE-406- 18: CONCRETE TESTING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TESTING LAB	**SEMESTER:** IV
COURSE CODE: BTCE-406- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on cement • Fineness • Consistency • Setting time • Soundness • Specific gravity • Strength
II	Tests on aggregates (fine and coarse) • Specific gravity • Bulk Density • Fineness Modulus • Moisture content • Water Absorption • Bulking of sand
III	Design mix of concrete as per BIS method.
IV	Workability tests on concrete • Slump test • Compaction Factor test • Vee-Bee test
V	Strength tests on concrete • Compressive strength (Cube and Cylinder) • Split Tensile strength • Flexural strength • Abrasion resistance
VI	Non-Destructive Techniques • Rebound hammer test • Ultra-sonic pulse velocity test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	'Concrete Lab Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2.	'Concrete Lab Manual', TTTI Chandigarh.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-406- 18.1	Evaluate properties of building materials, such as cement and aggregates.	5
BTCE-406- 18.2	Conduct experiments and check the acceptance criteria (if any).	4
BTCE-406- 18.3	Design concrete mixes as per BIS provisions.	6
BTCE-406- 18.4	Analyze the properties of concrete in fresh and hardened state.	4
BTCE-406- 18.5	Create a well-organized document and present the results appropriately.	6
BTCE-406- 18.6	Understand and apply non-destructive testing (NDT) for evaluating concrete quality.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				2			1	1	
CO2	2	1		2	1				1			1		
CO3	2	1	3		2				1			1	2	3
CO4	2	2		1	2				1			1	2	
CO5	1								2	3	1	1		
CO6	2	1		1	3				1			1	2	

BTCE-407- 18: TRANSPORTATION LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION LAB	**SEMESTER:** IV
COURSE CODE: BTCE-407- 18	**CREDITS:** 1

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on Sub-grade Soil 1. California Bearing Ratio Test
II	Tests on Road Aggregates 2. Crushing Value Test 3. Los Angles Abrasion Value Test 4. Impact Value Test 5. Shape Test (Flakiness and Elongation Index)
III	Tests on Bituminous Materials and Mixes 6. Penetration Test 7. Ductility Test 8. Softening Point Test 9. Flash & Fire Point Test 10. Bitumen Extraction Test
IV	Field Tests 11. Study of Roughometer/Bump Indicator 12. Study of Benkelman Beam Method

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", NemChand and Brothers, Roorkee.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-407- 18.1	Characterize the pavement materials as per the Indian Standard guidelines.	4
BTCE-407- 18.2	Evaluate the strength of subgrade soil by CBR test.	5
BTCE-407- 18.3	Conduct experiments to evaluate aggregate properties.	5
BTCE-407- 18.4	Determine properties of bitumen material and mixes	5
BTCE-407- 18.5	Evaluate the pavement condition by rough meter and	5

	Benkelman beam test.	
BTCE-407- 18.6	Create a well-organized report and present the results appropriately	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		
CO2	2				1				1			1	1	
CO3	2			1	1				1			1	1	
CO4	2				1				1			1	1	
CO5	2			2	2				1			1	2	
CO6	1								2	3	1	1		

INDEX
SCHEME: B. TECH 5TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-501-18	Engineering Geology	3-0-0	3	3
B	BTCE-502-18	Elements of Earthquake Engineering	3-0-0	3	3
C	BTCE-503-18	Construction Engineering & Management	3-0-0	3	3
D	BTCE-504- 18	Environmental Engineering	4-0-0	4	4
E	BTCE-505-18	Structural Engineering	3-1-0	4	4
F	BTCE-506-18	Geotechnical Engineering	3-0-0	3	3
G	BTCE-507- 18	Geotechnical Lab	0-0-2	2	1
H	BTCE-508- 18	Environmental Engineering Lab	0-0-2	2	1
I	BTCE-509- 18	Structural Lab	0-0-2	2	1
J	BMPD-501-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-501-18: ENGINEERING GEOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING GEOLOGY	**SEMESTER:** V
COURSE CODE: BTCE-501-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**General Geology:** Scope of geology in Civil Engineering - the earth, its structure and environment - Standard geological time scale, unit & fossils. physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes –weathering – types, weathered products, assessment of degree of weathering, Fluvial processes, glaciation, wind action, and their significance in Civil Engineering.	04
II	**Mineralogy and Petrology:** Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Horn blend, Mica family, calcite, Iron oxide minerals, Augite, Horn blend, and Clay minerals and their behaviour and significance in the field of Civil Engineering. Classification of rock - mode of formation -distinction between igneous, sedimentary and metamorphic rocks. Formation, textures, structure, Classification, and Engineering, Characteristic of rocks. Study of imp rocks granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia, conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate	07
III	**Strength Behaviour of Rocks:** Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold-Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.	07
IV	**Geological Hazards:** Rock Instability and Slope movement: Concept of	08

	sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslides. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence.	
V	**Rock masses as construction material:** Definition of Rock masses. Main features constituting rock mass. Main features that affect the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging. Rock Quality Designation. Rock mass description.	06
VI	**Geology of dam and reservoir site:** Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2.	Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3.	Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
4.	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995
5.	Leggot, R.F.," Geology and Engineers ", McGraw Hill, New York.2002 2.
6.	Blyth, F.G.M., "A Geology for Engineers", Arnold, Londo, (2003.
7.	Bell.F.G, " Fundamentals of Engineering Geology" Butterworth, 1983

T/R	Book title suggested by faculty
1	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995

E- content used:
https://nptel.ac.in/courses/105105106

Additional topics:

Classification of rocks for engineering purposes. Rock quality designation (RQD).

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Topic delivery by students
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-501- 18.1	Understanding geological processes and their importance in civil Engineering	2
BTCE-501- 18.2	Identification of rocks and minerals and their characteristics	2
BTCE-501- 18.3	Significance of geological structures and processes in civil engineering projects	2
BTCE-501- 18.4	Identify the geological hazards associated with civil engineering structures and suggest remedies.	2
BTCE-501- 18.5	Site characterization and geologic considerations in construction	4
BTCE-501- 18.6	Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	1												
CO3	2													
CO4	2	2	2						1				2	
CO5	2	2	2						1					
CO6	2	2	1	2					1				2	

Prepared by **Approved By**

HOD

BTCE-502-18: ELEMENTS OF EARTHQUAKE ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ELEMENTS OF EARTHQUAKE ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-502-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.	04
II	Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.	04
III	Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.	08
IV	Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.	06
V	Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.	06
VI	Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.	04
VII	Introduction to provisions of IS 4326. Unit 8: Introduction to provision of IS 13920.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2.	Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra,

	Prentice Hall
3.	Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4.	Structural Dynamics by Mario & Paz, Springer.
5.	Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6.	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7.	IS 1893-2016Indian Standard Criteria for Earthquake Resistant Design of Structures.
8.	IS 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9.	IS 13920:2016- Ductile design and detailing of Reinforced Concrete Structures subjected to Seismic Forces-code of practice

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Seismic Soil-Structure Interaction: soil effect on the ground motion characteristics, Effect of Surface Topography.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-502- 18.1	Appreciate the role of earthquake forces in structural design of building.	2
BTCE-502- 18.2	Develop an understanding of structural defects due to earthquakes by studying past earthquakes	3

BTCE-502- 18.3	Acquire basic knowledge of concept of vibrations in earthquake engineering	2
BTCE-502- 18.4	Analyse the behaviour of structures under dynamic loads	4
BTCE-502- 18.5	Understand engineering seismology, ductility requirement & structural configurations.	2
BTCE-502- 18.6	Apply various codal provisions related to seismic design of buildings.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		2									1	
CO3	3													
CO4	3	3		2					1				2	
CO5	3													
CO6	2	2											2	2

Prepared by **Approved By**

HOD

BTCE-503-18: CONSTRUCTION ENGINEERING & MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONSTRUCTION ENGINEERING & MANAGEMENT	**SEMESTER:** V
COURSE CODE: BTCE-503-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS

I	Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.	03
II	Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.	06
III	Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.	04
IV	Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.	04
V	Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow,sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling-Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction.	05
VI	Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project	06

	sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.	
VII	Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.	05
VIII	Construction Costs: Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.	03

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Varghese, P.C., "*Building Construction"*, Prentice Hall India, 2007.
2.	*National Building Code,* Bureau of Indian Standards, New Delhi, 2017.
3.	Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
4.	Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5.	Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6.	Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7.	Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Cost Analysis: Determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Projects study

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-503- 18.1	An understanding of modern construction practices	2
BTCE-503- 18.2	A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics	2
BTCE-503- 18.3	A basic ability to plan, control and monitor construction projects with respect to time and cost	6
BTCE-503- 18.4	An idea of how to optimise construction projects based on costs	2
BTCE-503- 18.5	An idea how construction projects are administered with respect to contract structures and issues.	2
BTCE-503- 18.6	An ability to put forward ideas and understandings to others with effective communication processes	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				3									
CO2	2				2				2		3			
CO3	2		1						2		3			3
CO4	2	2	2	1					2		3		1	2
CO5	2		1	1					2		3		1	2
CO6	2									3				1

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BTCE-504-18: ENVIRONMENTAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-504-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 508-18	**LAB COURSE NAME:** ENVIRONMENTAL ENGINEERING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	*Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. *Water Treatment:* aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes	08
II	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage-Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water-Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.	10
III	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution.	06
IV	*Noise*- Basic concept, measurement and various control methods.	04
V	*Solid waste management*-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management.	10

VI	*Building Plumbing*-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Storage tanks, building drainage for high rise buildings, various kinds of fixtures and fittings used.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2.	Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3.	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
4.	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
5.	Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6.	Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7.	Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8.	Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development

T/R	Book title suggested by faculty
1	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
2	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low-cost treatment techniques.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations
Inquiry guided instructions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-504- 18.1	Understanding the principles of water treatment processes, their design and distribution systems.	2
BTCE-504- 18.2	Be able to apply the knowledge for selecting the most appropriate technique for the treatment of wastewater.	3
BTCE-504- 18.3	Identify the major sources, effects and monitoring of air pollutants.	2
BTCE-504- 18.4	Impart knowledge on the sources, effects and control techniques of noise pollution.	2
BTCE-504- 18.5	Understand the fundamental principles of existing and emerging technologies for the solid waste management	2
BTCE-504- 18.6	Identify various plumbing systems provided in the buildings.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		1											2
CO2	2	2			2								2	
CO3	2	2					2							
CO4	2	2			1		2							
CO5	2				2		1							
CO6	2	2												

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BTCE-505-18: STRUCTURAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: STRUCTURAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-505-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 509-18	**LAB COURSE NAME:** STRUCTURAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction** Structural Engineering, role of structural engineer, engineer, architect, builder; Objectives of designing a structure, safety, sustainable development in performance.	08
II	**Structural Analysis** Concept of determinacy and indeterminacy, Analyses of indeterminate beams, frames and trusses using Slope deflection method, Moment distribution method, unit load method and castiglano's theorem.	12
III	**Design of concrete Elements** Design Philosophies of Working Stress Method and Limit State Method, Design of Reinforced Concrete Beams for Flexure, Shear; Bond, Anchorage, development length and torsion; Reinforced Concrete Axially Loaded Columns, Reinforced Concrete Slabs: One Way and Two Way.	12
IV	**Design of Steel Elements** Properties of structural steel, I.S. rolled sections, I.S. specifications; Connections- Bolted and welded connections for axial loads; Tension members: Design of members subjected to axial tension; Compression members: Design of axially loaded members, built-up columns, laced and battened columns; Flexural members: Design of laterally restrained and un-restrained rolled section beams.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
2.	McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
3.	Intermediate Structural Analysis - C K Wang, McGraw hill publications.
4.	Limit state design of steel structures: S K Duggal, Mc Graw Hill.

5.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.
6.	Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
7.	NBC, National Building Code, BIS (2017).
8.	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
9.	Theory of structures - B.C. Punima, Laxmi Publications.
10.	Reinforced concrete design - Pillai & Menon, Tata McGrawHill publications

BIS Codes of practice and Design Handbooks:

1.	*IS 456-2000- Indian Standard. Plain and Reinforced concrete -Code of practice
2.	*Design Aid SP 16
3.	*IS 800: 2007 (General construction in steel-Code of practice)*
4.	*SP: 6(1) (Handbook for structural engineers-Structural steel sections
5.	Explanatory hand book SP24.
6.	Detailing of Reinforcement SP 34

T/R	Book title suggested by faculty
1	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
2	Limit state design of steel structures: S K Duggal, Mc Graw Hill.
3.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Introduction to Moving Loads and Influence Line Diagrams, Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-505- 18.1	Apply their knowledge of structural mechanics in addressing design problems of structural engineering	3
BTCE-505- 18.2	Possess the skills to analyse and design concrete and steel structures	4
BTCE-505- 18.3	Knowledge of structural engineering	2
BTCE-505- 18.4	Understand the various design philosophies related to reinforced concrete structures	2
BTCE-505- 18.5	Analyse and design the safe RCC structural members	6
BTCE-505- 18.6	Design various steel structure members i.e., connections, tension members, compression members and flexural members	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									1	2
CO2	3	3	3	2	2				2				2	3
CO3	3													
CO4	3	2	2											2
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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BTCE-506-18: GEOTECHNICAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-506-18	**CREDITS:** 3

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 507-18	**LAB COURSE NAME:** GEOTECHNICAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Basic Concepts***- Definition of soil, Comparison between soil mechanics, rock mechanics and geotechnical engineering, Scope of soil mechanics problems in Civil Engineering. Principal types of soils in India. Characteristics of main Clay mineral groups. Soil as three phase system: weight volume relationship and determination of moisture content from nuclear method, alcohol method and sensors. Determination of Specific gravity by density bottle method, pycnometer method. Field density from sand replacement method and other methods. ***Index Properties***: Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse- and fine-grained soils as per Indian Standard.	08
II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis-Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. ***Effective Stress Principle***- Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.	10
III	***Compaction of Soil***-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. ***Consolidation of Soil*** - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, Concept of various consolidation characteristics i.e., av, mv and cv, primary and secondary consolidation concept of cv, tv& U. Consolidation test: determination of cv from curve fitting methods, Pre consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect disturbance on e-Log σ curves of normally consolidated clays, importance of consolidation settlement in the design of structures. final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.	10

IV	***Shear Strength***- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test ***Stability of Slopes***- Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S. Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M. Das Cengage Publisher
7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers.

T/R	**Book title suggested by faculty**
1	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
2	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons

E- content used:
https://nptel.ac.in/courses/105101201

Additional topics:

Soil particle structures, Derivation of skempton's pore pressure parameters, sliding block analysis, Earth pressures under applied load.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-506- 18.1	Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	2
BTCE-506- 18.2	Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of permeability, total and effective stress approaches in soil strength determination	4
BTCE-506- 18.3	Apply the various specifications of compaction of soils in the construction of highways and earthen dams.	3
BTCE-506- 18.4	Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.	3
BTCE-506- 18.5	Evaluate shear strength and permeability parameters of different soils	5
BTCE-506- 18.6	Design the embankment slopes and check the stability of finite slopes.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3	2	2	2						2			2	2
CO3	3	2	2										2	
CO4	3	2	2	1									2	
CO5	3	2	2	1									2	
CO6	3	2	3	1	2				2				2	3

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BTCE-507- 18: GEOTECHNICAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-507- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of in-situ density by core cutter method and Sand replacement method.
II	Determination of Liquid Limit & Plastic Limit.
III	Determination of specific gravity of soil solids by pyconometer method.
IV	Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
V	Compaction test of soil.
VI	Determination of Relative Density of soil.
VII	Determination of permeability by Constant Head Method.
VIII	Determination of permeability by Variable Head method.
IX	Unconfined Compression Test for fine grained soil.
X	Direct Shear Test
XI	Triaxial Test
XII	Swell Pressure Test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain. Nem Chand & Brothers.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-507- 18.1	Comprehend the procedure for classifying coarse grained and fine-grained soils	2
BTCE-507- 18.2	Evaluate the index properties of soil	5
BTCE-507- 18.3	Determine the engineering properties of soil	5
BTCE-507- 18.4	Interpret the results of compaction test for relative compaction in the field	4
BTCE-507- 18.5	Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis	3
BTCE-507- 18.6	Conduct experiments, analyse and interpret results for geotechnical engineering design	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							2					
CO2	3	2	1						2				1	
CO3	3	2	1						2				1	
CO4	3	2							2				1	
CO5	3	2		1	3				2			2	2	
CO6	3	2	2						2				1	2

BTCE-508- 18: ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING LAB	**SEMESTER:** V
COURSE CODE: BTCE-508- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To measure the pH value of a water/waste water sample.

II	To determine optimum Alum dose for Coagulation.
III	To find MPN for the bacteriological examination of water.
IV	To find the turbidity of a given waste water/water sample
V	To find B.O.D. of a given waste water sample.
VI	To measure D.O. of a given sample of water.
VII	Determination of Hardness of a given water sample
VIII	Determination of total solids, dissolved solids, suspended solids of a given water sample.
IX	To determine the concentration of sulphates in water/wastewater sample.
X	To find chlorides in a given sample of water/waste water.
XI	To find acidity/alkalinity of a given water sample
XII	To determine the COD of a wastewater sample.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2.	Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-508-18.1	Conduct experiments as per standard methods of sampling and analysis.	2
BTCE-508-18.2	Demonstrate the expertise to characterize water and wastewater samples.	5
BTCE-508-18.3	Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.	5
BTCE-508-18.4	Record the experimental observations and interpret the analysis results.	4
BTCE-508-18.5	Use the analysis results for making informed decision about the potability of water and disposal of wastewater.	3

BTCE-508-18.6	Recognize the working of air pollution monitoring equipment and noise meter.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2			1				2					
CO2	3	2			1				2					
CO3	3	1			1				2					
CO4	2	2	1		2				2				2	
CO5	2	2	2	1	2				2				1	
CO6	2	2			2				2				2	

BTCE-509-18: STRUCTURAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-509- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
II	To determine the Flexural Rigidity of a given beam.
III	Deflection of a fixed beam and influence line for reactions.
IV	Deflection studies for a overhang beam and influence line for reactions.
V	Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
VI	Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams,

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Dally J W, and Riley W F, "Experimental Stress Analysis", McGraw-Hill Inc. New York, 1991.
2.	Harrison H.B., "Structural Analysis and Design Vol.I and II", Pergamon Press, 1991

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-509-18.1	Verify theoretical formulas by conducting experiments.	4
BTCE-509-18.2	Predict the behaviour of statically determinate beams and trusses.	6
BTCE-509-18.3	Depict the behaviour of two hinged arch and three hinged arch structures.	4
BTCE-509-18.4	Demonstrate the influence lines for statically determinate and indeterminate beams.	2
BTCE-509-18.5	Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.	5
BTCE-509-18.6	Outline the deflected shapes of columns and struts with different end conditions.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							1					
CO2	3	2	2						1					
CO3	3	2	2						1					
CO4	3	2	2	1					1					
CO5	3	2	1	2					1					
CO6	3	2	1	2					1					

INDEX
SCHEME: B. TECH 6TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-601-18	Engineering Economics, Estimation & Costing	3-1-0	4	4
B	PECE-602A-18	Foundation Engineering	3-1-0	4	4
C	PECE-603D-18	Structural Analysis and Design	3-1-0	4	4
D	PECE-604B-18	Sustainable Construction Methods	3-1-0	4	4
E	BTEC-401-18	Analog Circuits	3-0-0	3	3
F	BTEE-603D-18	Wind And Solar Energy Systems	3-0-0	3	3
G	BTMC101-18	Constitution of India	3-0-0	3	0
H	BMPD-601-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 22 Hours = 27

BTCE-601-18: ENGINEERING ECONOMICS, ESTIMATION & COSTING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING ECONOMICS, ESTIMATION & COSTING	**SEMESTER:** VI
COURSE CODE: BTCE-601-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Principles of Economics** Demand/Supply – elasticity – Basic Macroeconomic Concepts (including GDP/GNP/NI/ Disposable Income), Aggregate demand and Supply (IS/LM), Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.	04
II	**Elements of Business/Managerial Economics** Cost & Cost Control -Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money.	06
III	**Estimation / Measurements for various items** Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.	08
IV	**Specifications** Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.	06
V	**Rate analysis**: Purpose, importance and necessity of the same, factors affecting, task work,	06

	daily output from different equipment/ productivity.	
VI	**Tender:** Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price build-up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.	08
VII	**Introduction to Acts:** Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2.	V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3.	Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
4.	M Chakravarty, Estimating, Costing Specifications & Valuation
5.	Joy P K, Handbook of Construction Management, Macmillan
6.	B.S. Patil, Building & Engineering Contracts
7.	Relevant Indian Standard Specifications.
8.	World Bank Approved Contract Documents.
9.	FIDIC Contract Conditions.
10.	Acts Related to Minimum Wages, Workmen’s Compensation, Contract, and Arbitration
11.	Typical PWD Rate Analysis documents.
12.	UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
13.	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

T/R	Book title suggested by faculty
1	M Chakravarty, Estimating, Costing Specifications & Valuation
2	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

E- content used:
https://nptel.ac.in/courses/105103093

Additional topics:

Schedule of Rates- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-601- 18.1	Have an idea of basic principles and elements of economics in general.	2
BTCE-601- 18.2	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.	5
BTCE-601- 18.3	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.	2
BTCE-601- 18.4	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	5
BTCE-601- 18.5	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	2
BTCE-601- 18.6	Demonstrate the knowledge related to various rules and regulations applicable to construction industry.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2								

CO2		2				2					3			
CO3	2	2				2					2			
CO4	2	2				2					3			
CO5	2					2				2	3	1		
CO6	2					2				2	2	1		

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PECE-602A-18: FOUNDATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FOUNDATION ENGINEERING	**SEMESTER:** VI
COURSE CODE: PECE-602A-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Soil Exploration** Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, - standard penetration test -static and dynamic cone penetration test, Bore Hole log for S.P.T. Geophysical exploration by seismic and resistivity methods **Stresses Distribution:** Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, Newmark's chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Pressure Bulb and Isobar. Related Numerical Problems	10
II	**Earth Pressure** Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and K_p for horizontal backfills. Rankine's theory both for active and passive	12

	earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfills. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).	
III	**Shallow Foundation** Type of shallow foundations, Depth and factors affecting it. Definitionof ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of Shear failures. Factors affecting bearing capacity. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration test. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by Plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code.	11
IV	**Pile Foundations** Types and function of pile - factors influencing the selection of pile - carrying capacity of single pile in cohesionless and cohesive soil by static formula. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile- dynamic formulae (Engineering News and Hileys) Types of pile driving hammers & their comparison. Limitations of pile driving formulae. Negative skin friction - Carrying capacity of Pile group - Pile load test Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Settlement of pile groups in sand, Negative skin friction. Related Numerical problems **Well foundations-**shapes, depth of well foundations, components, factors affecting well foundation design, Scour Depth, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.	11

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M.Das Cengage Publisher

7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

T/R	Book title suggested by faculty
1	Soil Mech. & Foundation Engg, by K.R. Arora Standard *Publishers* Distributors
2	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers

E- content used:
https://archive.nptel.ac.in/courses/105/105/105105176/

Additional topics:

Danish method of analysis of pile foundation, Equivalent point load method of load distribution.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-602A-18.1	Understand the methods of surface and subsoil exploration and to prepare investigation report.	2
PECE-602A-18.2	Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations.	5
PECE-602A-18.3	Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations	6
PECE-602A-18.4	Estimate the stresses in soils and bearing capacity of soil for shallow foundation.	3
PECE-602A-18.5	Design various types of shallow foundation and to estimate settlement.	6
PECE-602A-	Apply the concepts of deep foundation and solve problems	3

18.6	related with pile foundation.	

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2		2	2				1					
CO2	3	2	2	2	2				1				1	2
CO3	3	2		2	2				1					
CO4	3	2	2	1					1				1	
CO5	3	2	2	2	2				1				2	3
CO6	3	2	2	2	2				1				2	3

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PECE-603D-18: STRUCTURAL ANALYSIS AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL ANALYSIS AND DESIGN	**SEMESTER:** VI
COURSE CODE: PECE-603D-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Review of indeterminacy:** Static and kinematic indeterminacies of beams, rigid-jointed and pin-jointed plane frames.	04
II	**Analysis of indeterminate structures**: Analysis indeterminate beams and frames by Kani's method, Theorem of three moments and other approximate methods- Portal, Cantilever and Substitute frame method.	12

III	**Moving loads and influence lines:** Analysis of moving Loads for determinate beams, Influence lines for indeterminate beams, trusses and frames. Muller Breslau principle.	08
IV	**Design of Concrete structures:** **Columns with moments**: Design of short columns with uni-axial and bi-axial bending; Design of Long columns, use of design charts; **Foundations**: Isolated and combined footing for columns; **Staircases**, Introduction, types and design; **Retaining walls** - Cantilever and Counter-forte type retaining wall.	10
V	**Design of Steel Structures:** **Column bases:** Slab base, Gusseted base; **Beam-column connections:** bracket connections, seated and framed connections.; **Plate girders:** Elements of a plate girder, design of plate girder section, intermediate and bearing stiffeners, **Roof trusses:** Types, Design loads, design of members and joints.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2.	Intermediate structural analysis - C . K. Wang. McGraw Hill
3.	Structural analysis - S Ramamurtham
4.	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
5.	Limit state Design of Reinforced Concrete; Varghese P C; PHI Pvt. Ltd.
6.	Design of concrete structures, B C Punmia
7.	Limit state design of steel structures: S K Duggal, TMH
8.	Design of steel structures: N Subramanian, Oxford publications
9.	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

T/R	**Book title suggested by faculty**
1	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2	Structural analysis - S Ramamurtham
3	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

E- content used:
https://nptel.ac.in/courses/105105166

Additional topics:

Connections: Riveted, bolted and welded connections for axial and eccentric loads, Comparison of working stress method, limit state method and ultimate load method.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems as per codes

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-603D-18.1	To recognize the concept of structural systems, loads, supports and displacements.	2
PECE-603D-18.2	To understand and determine the indeterminacy of different types of structures.	2
PECE-603D-18.3	To calculate forces and moments in indeterminate structures due to static as well as moving loads.	5
PECE-603D-18.4	To develop and use the concept of influence line diagram for calculating different structural quantities in a statically determinate structure.	4
PECE-603D-18.5	To analyse and design concrete structures i.e., column subjected to moments, foundations, retaining walls, etc.	6
PECE-603D-18.6	To analyse and design the steel structures i.e., column bases, beam-column joints, plate girders and roof trusses.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO2	3	2	1	2										
CO3	3	2	1	2										
CO4	3	2	3	2									2	1
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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PECE-604B-18: SUSTAINABLE CONSTRUCTION METHODS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SUSTAINABLE CONSTRUCTION METHODS	**SEMESTER:** VI
COURSE CODE: PECE-604B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION** Definitions- Various types - Pillars of Sustainability - Circle of Sustainability - Need - systems and their sustainability - Green Buildings -Difference between Green and Sustainability - Climate Change, Global warming - National and International policies and Regulations. Identification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.	06
II	**BUILDING CONSTRUCTION METHODS** Conventional vs modular construction methods, development, Engineering principles, benefits**,** Modular construction methods for repetitive works, Green Roofs, Cool Roofs, Passive House, Rammed Earth Brick**,** Passive Solar, Greywater Plumbing Systems, Solar Thermal Cladding, Solar Power, Water Efficiency Technologies, Sustainable Indoor Environment Technologies.	10
III	**PRECAST CONSTRUCTION METHODS** Modular construction methods for repetitive works; Precast concrete construction methods; Benefits , Sustainability in Concrete Mix Design, Greener, Faster and Sustainable Construction Practices Through Precast Solutions, Use of secondary cementitious material (SCM's) like GGBS, fly ash, ultra-fine GGBS in the production of the concrete, Basics of Slip forming for tall structures, Structural 3D Printing, Self-healing Concrete**,** Green Insulation, Sustainable Resource Sourcing, Environmental Sustainability Benefits From Precast Concrete.	10
IV	**CONSTRUCTION METHODS OF BRIDGES** Types of foundations and construction methods; Basics of Formwork and Staging; Proactive Maintenance**,** Prefabrication/Modular Construction, balance between environment and construction activities, reducing problems at site with minimal staging, increasing safety etc, Constructions are sustainable with reduced use of natural resources, Costs of	10

	Construction/Assembly and Transportation, Lifespan, Environmental Impact, harmful emissions during bridge construction, Reducing waste, solar panels to power LED lights to illuminate its deck, water-powered light system powered by the currents of the river, development that meets the needs of the present.	
V	**NEW CONSTRUCTION MATERIALS TECHNOLOGIES** Introduction to new construction materials & technologies, Synthetic Roof Underlayment, Electro chromic Glass, Biodegradable Materials, Reduction of water consumption, Impact on environment, Concepts of climate responsive building, Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process.	08

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Margaret Robertson, Sustainability Principles and Practice, Routledge, 2014
2.	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
3.	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
4.	Stephen M. Stephen, Stephen M. Wheeler, Climate Change and Social Ecology: A New Perspective on the Climate Challenge, Routledge, 2012.
5.	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

T/R	Book title suggested by faculty
1	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
2	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
3	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

E- content used:
https://nptel.ac.in/courses/105102195

Additional topics:

Case studies: Shanghai Tower, China; Bank of America, New York; The Crystal, London, United Kingdom; Council House 2, Melbourne.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-604B-18.1	Create new engineering materials to improve the performance of infrastructure	6
PECE-604B-18.2	Characterize and mitigate natural and man-made hazards	4
PECE-604B-18.3	Understanding various sustainable building construction methods and precast construction methods	2
PECE-604B-18.4	Improve fundamental knowledge of the inter-relationships between the built environment and natural systems.	6
PECE-604B-18.5	Understanding sustainable construction methods for bridges and analysing their economic viability.	4
PECE-604B-18.6	Develop the technological innovations needed to safeguard, improve, and economize infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	2				2				3	
CO2	3	2	2										2	
CO3	2	2					3							
CO4	2	2	2				3		2				2	1
CO5	2	2					3							
CO6	2	2	3	2	3		2		2			2	3	2

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BTEC-401-18: ANALOG CIRCUITS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ANALOG CIRCUITS	**SEMESTER:** VI

COURSE CODE: BTEC-401-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Diode and Transistor Amplifier Circuits -** Diode Circuits, Amplifiers types: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier; biasing schemes for BJT and FET amplifiers; bias stability; transistor configurations: CE/CS, CB/CG, CC/CD and their features; small-signal analysis; low frequency transistor models; amplifier analysis: current gain, voltage gain, input resistance and output resistance; amplifier design procedure; low frequency analysis of multistage amplifiers. High frequency transistor models.	12
II	**Feedback Amplifiers -** Feedback topologies: Voltage series, current series, voltage shunt and current shunt feedback; effect of feedback on gain, bandwidth, input & output impedances; concept of stability, gain margin and phase margin	10
III	**Oscillators -** Introduction, Types of Oscillators, Barkhausen criterion, RC-phase shift, Wien bridge, Hartley, Colpitt, Clapp oscillators and non-sinusoidal oscillators.	12
IV	**Power Amplifiers -** Class A, B, AB and C power amplifiers, their efficiency and distortions; frequency response: single stage, multistage amplifiers and cascade amplifier	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	J Millman & A Grabel, Microelectronics, McGraw Hill
2.	J Millman & C Halkias, Integrated Electronics, Tata McGraw Hill
3.	A Ramakant, Gayakwad, Op-Amps And Linear Integrated Circuits, PHI
4.	P Horowitz & W Hill, The Art of Electronics, Cambridge University Press
5.	A S Sedra & K C Smith, Microelectronic Circuits, Saunder's College Publishing

T/R	Book title suggested by faculty
1	J Millman & C Halkias, Integrated Electronics, Tata McGraw Hill

2	A S Sedra & K C Smith, Microelectronic Circuits, Saunder's College Publishing

E- content used:
https://nptel.ac.in/courses/108102112

Additional topics:

Small signal operation and Models: Collector current and transconductance, Base current and input resistance, Emitter current and input resistance, voltage gain, Separating the signal and the DC quantities, The hybrid Π model.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC-401-18.1	Understand Analog Circuits voltage gain and current studies	2
BTEC-401-18.2	Understand Feedback amplifiers	2
BTEC-401-18.3	Understand the biasing of transistors and analyze BJT/FET amplifiers	2
BTEC-401-18.4	Analyze various rectifier and amplifier circuits	2
BTEC-401-18.5	Analyze sinusoidal and non-sinusoidal oscillators	2
BTEC-401-18.6	Understand various types of Power Amplifiers	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		2	2								2		
CO2									2	2		2		
CO3	3	3		2	2		2	2	2	3		2		
CO4			3		3				2			2	1	1
CO5				3	2					2	2	2	1	1
CO6			2							2		2		

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BTEE-603D-18: WIND AND SOLAR ENERGY SYSTEMS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: WIND AND SOLAR ENERGY SYSTEMS	**SEMESTER:** VI
COURSE CODE: BTEE-603D-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power cumulative distribution functions.	08
II	**Wind generator topologies:** Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.	08
III	**The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.	08
IV	**Solar energy Technologies** - Solar photovoltaic Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.	10
V	**Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2.	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3.	S. P. Sukhatme, Solar Energy: Principles of Thermal Collection & Storage, McGraw Hill, 1984.
4.	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.
5.	G. N. Tiwari and M. K. Ghosal, Renewable Energy Applications, Narosa Publications, 2004.
6.	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley & Sons, 1991.

T/R	Book title suggested by faculty
1	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.

E- content used:
https://nptel.ac.in/courses/103103206

Additional topics:

Non-concentrating solar collectors, Parabolic solar collectors, Turbulence in Wakes and Wind Farms, Turbulence in Complex Terrain.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEE-603D-18.1	Understand the global energy scenario and the consequent growth of the power generation from renewable energy sources.	2
BTEE-603D-18.2	Understand the basic physics of wind and solar power	2

	generation.	
BTEE-603D-18.3	Apply the knowledge of electrical machines to generate electrical power from wind	3
BTEE-603D-18.4	Understand and analyse the solar photo-voltaic technology for energy generation	4
BTEE-603D-18.5	Understand the power electronic interfaces for wind and solar generation.	2
BTEE-603D-18.6	Understand the issues related to the grid-integration of solar and wind energy systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1		2		1		1	2							
CO2	2				1		2							
CO3	3		2		2		2						2	2
CO4	3	2	2	2	2		2						2	
CO5	3				2		2							
CO6	2					1	2						1	

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INDEX
SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	PECE -701B-18	Airport Planning and Design	3-1-0	4	4
B	OECE-701-18	Metro Systems and Engineering	3-0-0	3	3
C	PECE -701B-18	Solid And Hazardous Waste Management	3-1-0	4	4
D	PECE-703F-18	Urban Hydrology and Hydraulics	3-1-0	4	4
E	HSMC -255	Professional Practice, Law & Ethics	2-0-0	2	2
F		Project	0-0-8	8	7
G	BTMC701-18	Management- I (Organizational Behavior)	2-0-0	2	0

Total Credits = 24 Hours: 27

SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE801-18	Training (one semester)	-	-	16

PECE -701B-18: AIRPORT PLANNING AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: AIRPORT PLANNING AND DESIGN	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Airport Engineering:** Components of airport: Classifications of obstructions, Imaginary surfaces, Approach zone and turning zone. Runway orientation, basic runway length, corrections for elevation, temperature & gradient, airport classification.	10
II	**Runway & Taxiway Design:** Wind-rose diagram, Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons,	12
III	**Structural design** of runway pavements LCN/PCN method of rigid pavement design, different LCN/PCN of aircrafts using runway. Pavement Evaluation for runway & taxiway, design of overlay, Terminal area, building area, parking area, apron, hanger typical airport layouts.	12
IV	**Design of flexible and rigid runways** as per FAA procedure, Specifications for the different layers of runway and taxiway pavements, Pavement management systems for runway pavements. Benkelman Beam method for maintenance.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2.	Rangwala, Airport Engineering, Charotar Publishing House (2019).
3.	Horenjeff Robert, Airport Engineering, McGraw Hill International Publisher (2010).

T/R	Book title suggested by faculty
1	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2	Rangwala, Airport Engineering, Charotar Publishing House (2019).

E- content used:
http://128.173.204.63/courses/cee4674/ce_4674.html

Additional topics:

Visual and navigation aids, Instrument and Visual Flight Rules, Aircraft characteristics.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understand the detail concepts of the airport engineering.	2
PECE -701B-18.2	Estimate the geometric design characteristics of taxiways and runway	5
PECE -701B-18.3	Suggest the runway orientation and the runway length as per FAA & ICAO guidelines.	5
PECE -701B-18.4	Understanding the pavement evaluation techniques and design the overlay for runways and taxiways.	2
PECE -701B-18.5	Specify the guidelines and procedure for the design of flexible and rigid pavement for runways.	6
PECE -701B-18.6	Conceptualise Pavement management system for maintenance	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3		2	1					1					2
CO3	3		3	2					1					3
CO4	3	2	2	2					1					2
CO5	3	2	2	2					1					2

CO6	3		2	`								1	

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OECE-701-18: METRO SYSTEMS AND ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: METRO SYSTEMS AND ENGINEERING	**SEMESTER:** VII/VIII
COURSE CODE: OECE-701-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Metro systems** Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.	04
II	**Planning and Development** Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;	06
III	**Traffic Management Systems** Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems- permanent way. Facilities Management Module	08
IV	**Signalling Systems** Introduction to Signalling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	06
V	**Electrical Systems** OHE, Traction Power; Substations-TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air	06

	mechanics.	
VI	**Mechanical Systems** Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators	06

Total hours – 36

TEXT /REFERENCE BOOKS

1.	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2.	"Metropolitan Railways: Rapid Transit in America (Railroads Past and Present)",Middleton, Indiana University Press 2013.
3.	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

T/R	Book title suggested by faculty
1	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

E- content used:
https://coursecontent.indusuni.ac.in/wp-content/uploads/sites/8/2020/05/METRO-SYSTEMS-AND-ENGINEERING_CV0425_OE-5_UNIT-1.pdf

Additional topics:

Case studies: Baltimore Metro Subway Link, Moscow Metro, Kyoto Municipal Subway, Delhi Metro Rapid Metro Express.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects study
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
OECE-701-18.1	Understand overview of metro systems.	2
OECE-701-18.2	Analyse vehicle dynamics and structure; tunnel ventilation	4

	systems; electrical systems.	
OECE-701-18.3	Understanding electronic signalling systems and automatic fare collection.	2
OECE-701-18.4	Understand the basics of construction planning & management.	2
OECE-701-18.5	Evaluate the construction quality & safety systems	5
OECE-701-18.6	Acquiring the knowledge of mechanical systems in context of metro systems engineering.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3	3		2	3								1	
CO3	3													
CO4	2										3			
CO5	2	2		1										
CO6	3													

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PECE -701B-18: SOLID AND HAZARDOUS WASTE MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID AND HAZARDOUS WASTE MANAGEMENT	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction:** Definition of solid wastes and hazardous wastes, Nuisance potential and extent of solid waste problems, Objectives and scope of integrated solid waste management. **Collection, Storage and Transportation of Wastes:** Types of collection systems and their components, Concept of waste segregation at source and recycling and reuse of wastes.	08
II	**Solid Waste Processing and Treatment:** Waste processing – processing technologies –biological and chemical conversion technologies–Composting-thermal conversion technologies-energy recovery.	12
III	**Hazardous Waste Treatment and Disposal:** Biological and chemical treatment of hazardous wastes; Solidification and stabilization of wastes; Incineration for the treatment and disposal of hazardous wastes; Land farming; Landfill disposal of hazardous waste; Bioremediation of hazardous waste disposal sites.	12
IV	**Sanitary Landfills:** Design, development, operation and closure of landfills, Management of leachate and landfill gases, environmental monitoring of landfill sites.	06
V	**Legal Requirements:** Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, fly ash, etc.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press
2.	Vesilind, P.A., Solid Waste Engineering, Thomson Learning Inc.
3.	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill
4.	Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engg.", McGraw Hill
5.	CPHEEO, *Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization*, Government of India

T/R	Book title suggested by faculty
1	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill

2	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press

E- content used:
https://nptel.ac.in/courses/120108005

Additional topics:

Resource Conservation and Recovery Act, Health and Safety at Work Act, Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments and Reauthorization Act.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Case studies

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.	2
PECE -701B-18.2	Knowledge of waste processing technologies and various waste treatment methods	2
PECE -701B-18.3	Become aware of Environment and health impacts solid waste mismanagement.	2
PECE -701B-18.4	Understand engineering, financial and technical options for waste management.	2
PECE -701B-18.5	Plan, design, manage and operate sanitary landfills for effective waste management.	6
PECE -701B-18.6	Knowledge of legal, institutional and financial aspects of management of solid wastes	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2				2									
CO3							2							
CO4	2						2				3			
CO5	3	2	3	1	2		2				2		2	3
CO6						2	2				2			

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PECE-703F-18: URBAN HYDROLOGY AND HYDRAULICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: URBAN HYDROLOGY AND HYDRAULICS	**SEMESTER:** VII/VIII
COURSE CODE: PECE-703F-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction-** Trends of Urbanization and Industrialization, Urban water supply demand forecast, urban hydrological cycle.	08
II	**Urban water Management-** Rain water harvesting, managed aquifer recharge, effect of water management practices on urban water infrastructure, hydrology and ground water regime, mapping of water supply and sewage networks. **Urban water Infrastructure-** water supply, sanitation, sewerage and wastewater conveyance infrastructures, Water supply and sewerage network hydraulics, Structural safety and mitigating plans against natural and human caused threats.	14
III	**Urban Storm water-** Master drainage plans, Estimation of urban stormwater quantity, Wastewater collection systems, Design of storm sewer network systems, Storage facilities. Interaction between urban drainage and solid waste management, Stormwater Management, Operation and maintenance of urban drainage system.	12
IV	**Sustainable Design-** Sustainable urban designs, Methodologies for assessing sustainability of urban water infrastructures, Emerging sustainable materials and design procedures for water supply and sewerage pipelines, determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2.	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.
3.	Hall, M.J., (1984), *"Urban Hydrology*", Elsevier Applied Science Publishers.
4.	Mays, L.W., Hydraulic Design Handbook, McGraw-Hill, 1999

T/R	Book title suggested by faculty
1	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.

E- content used:
https://nptel.ac.in/courses/105104029

Additional topics:

Urban Runoff hydrology, Urban Runoff pollution, Stormwater best management practices.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instruction
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-703F-18.1	Build understanding of hydrological aspects of water resources.	2
PECE-703F-18.2	Develop competence to propose effective convergence and design features of water supply projects.	6
PECE-703F-18.3	Outline the principles of engineered systems for aeration in wastewater treatment.	6
PECE-703F-18.4	Recommend principles of need-based activities such as pumps, mixers related to water.	6

PECE-703F-18.5	Illustrate the application of pipe flow and open channel flow in water distribution networks and sewers.	2
PECE-703F-18.6	Formulate the effective use of surface and ground water sources.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	3	2	2								2	3
CO3	2													
CO4	3	2	3	2	2							2	2	3
CO5	3	2		2	1									
CO6	2		2										2	

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HSMC -255: PROFESSIONAL PRACTICE, LAW & ETHICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: PROFESSIONAL PRACTICE, LAW & ETHICS	**SEMESTER:** VII/VIII
COURSE CODE: HSMC -255	**CREDITS:** 2
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Professional Ethics** – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.	04

II	***General Principles of Contracts Management: Indian Contract Act, 1972 and amendments*** covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms.	05
III	***Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:*** Arbitration –meaning, scope and types – distinction between laws of 1940 and 1996;UNCITRAL model law –Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat.	05
IV	**Engagement *of Labour and Labour & other construction-related Laws:*** Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	04
V	***Law relating to Intellectual property:*** Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2.	The National Building Code, BIS, 2017
3.	RERA Act, 2017
4.	Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5.	Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6.	Anson W.R. (1979), Law of Contract, Oxford University Press
7.	Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
8.	Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
9.	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
10.	O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

T/R	Book title suggested by faculty
1	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974
2	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

E- content used:
https://nptel.ac.in/courses/110105097

Additional topics:

Accounts-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects
Class room discussions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)

HSMC -255.1	Understanding basic purpose of profession, professional ethics and various moral and social issues.	2
HSMC -255.2	Awareness of professional rights and responsibilities of an Engineer, safety and risk benefit analysis of an Engineer	2
HSMC -255.3	Understanding professional ethical values and contemporary issues	6
HSMC -255.4	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels	2
HSMC -255.5	Awareness of Law relating to Intellectual property	2
HSMC -255.6	Excelling in competitive and challenging environment to contribute to industrial growth.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2		3		1				
CO2						2		3		1				
CO3						2		3						
CO4						2		3						
CO5						2		3						
CO6						2	2	3	2	3	2			

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Study Scheme & Syllabus of

Bachelor of Technology

Civil Engineering

(3rd -8th Semester, 2019 batch)

DEPARTMENT OF CIVIL ENGINEERING

BHAI GURDAS INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPROVED BY AICTE, NEW DELHI, AFFILIATED TO IKGPTU, JALANDHAR

INDEX
SCHEME: B. TECH 3RD SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2019

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-301-18	Surveying & Geomatics	3-1-0	4	4
B	BTCE-302-18	Solid Mechanics	3-0-0	3	3
C	BTCE-303-18	Fluid Mechanics	3-0-0	3	3
D	BTAM-301-18	Mathematics-III (Transform & Discrete Mathematics)	4-0-0	4	4
E	BTEC- 305-18	Basic Electronics & Applications in Civil Engineering	3-0-0	3	3
F	HSMC-132-18	Civil Engineering- Introduction, Societal & Global Impact	3-0-0	3	3
G	BTCE-306-18	Surveying & Geomatics Lab	0-0-2	2	1
H	BTCE-307-18	Fluid Mechanics Lab	0-0-2	2	1
I	BTCE-308-18	Solid Mechanics Lab	0-0-2	2	1
J	BMPD-301-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-301-18: SURVEYING & GEOMATICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS	**SEMESTER:** III
COURSE CODE: BTCE-301-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-306-18	**LAB COURSE NAME:** SURVEYING & GEOMATICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Surveying:** Principles, Survey stations, Survey lines-ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction, Levelling: Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; Contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three-point problem only).	10
II	**Triangulation and Trilateration:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline choices - extension of base lines - corrections - Trigonometric levelling.	12
III	**Curves:** Elements of simple and compound curves – Method of setting out transition curve – length of curve – Elements of transition curve. **Photogrammetry Surveying:** Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping-mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	10
IV	**Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based). **Remote Sensing:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2.	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications
3.	Agor, R., Surveying, Khanna Publishers
4.	Bhavikatti, S.S., Surveying & Levelling Volume I & II

T/R	Book title suggested by faculty
1	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications

E- content used:
https://nptel.ac.in/courses/105107122

Additional topics:

Chain and Tape survey (Corrections), Overview of Indian Topographic Map, Reliability and Quality of Measurement.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team teaching method
Apparatus demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-301- 18.1	Understand the concept, various methods and techniques of surveying.	2
BTCE-301- 18.2	Compute angles, distances and levels for given area.	5
BTCE-301- 18.3	Apply the concept of tachometry survey in difficult and hilly terrain.	3
BTCE-301- 18.4	Select appropriate instruments for data collection and survey purpose.	1

BTCE-301- 18.5	Analyze and retrieve the information from remotely sensed data and interpret the data for survey.	4
BTCE-301- 18.6	Understand the concepts related to GIS and GPS and analyse the geographical data.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	1				2			1	1	1
CO2	3	2	2	2	2				2			1	1	2
CO3	3	2	2	2	2				2			1	1	1
CO4	2	2	3	2	3				1			2	2	2
CO5	1	2	2	3	2				1			2	2	1
CO6	2	1	1	2	3							2	2	1

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BTCE-302-18: SOLID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-302-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-308-18	**LAB COURSE NAME:** SOLID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concept of Equilibrium**: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem. **Stresses and Strains**: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain,	08

	Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.	
II	**Principal Stresses and Strains:** Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress. **Shear Force and Bending Moment Diagrams**: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.	10
III	**Slope and deflection-** Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. **Bending and Shear Stresses:** Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross-sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.	08
IV	**Columns and Struts**: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load. **Torsion of Circular Shafts**: Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending. **Stresses and strains in thin cylinders:** spherical shells subjected to internal pressures; Normal stress, tangential stress.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2.	'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3.	'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4.	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5.	'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.

6.	'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7.	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

T/R	Book title suggested by faculty
1	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.
2	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.

E- content used:
https://nptel.ac.in/courses/112102284

Additional topics:

Mathematical Concepts: Working with Vectors & Tensors, Theories of Failure, Moment of Inertia for different types of bodies/shapes.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-302- 18.1	Understand the concept of static equilibrium, deformations, and material constitutive behaviour.	2
BTCE-302- 18.2	Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyse structural members subjected to tension, compression and torsion.	3
BTCE-302- 18.3	Apply the concept of Mohr's circle in the stress/strain calculations.	3
BTCE-302- 18.4	Develop SFD and BMD for different type of beams subjected to different types of loads.	6
BTCE-302- 18.5	Plot elastic curves for beams undergoing displacements under different loadings.	6

BTCE-302- 18.6	Understand the behaviour of columns and struts under axial loading.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	1	2								2	1	
CO3	3	2	3	3	1								2	2
CO4	3	2	3	3	1								3	2
CO5	2	3	3	2	2								2	3
CO6	2	2		1								1		

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BTCE-303-18: FLUID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-303-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-307-18	**LAB COURSE NAME:** FLUID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Concepts and Definitions** – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics** - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	08

II	**Fluid Kinematics** - Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates. **Fluid Dynamics -** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	10
III	**Laminar Flow & Turbulent Flow** - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel. **Boundary Layer Analysis**- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.	10
IV	**Open Channel Flow** - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2.	Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth
3.	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker
4.	Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman

5.	Fluid Mechanics: Streetes VL & Wylie EB;
6.	Fluid Mechanics by Potter, Cengage Learning

T/R	Book title suggested by faculty
1	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker

E- content used:
https://nptel.ac.in/courses/112104118

Additional topics: Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-303- 18.1	Understand the basic terms used in fluid mechanics and its broad principles	2
BTCE-303- 18.2	Estimate the forces induced on a plane/ submerged bodies.	5
BTCE-303- 18.3	Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.	5
BTCE-303- 18.4	Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.	3
BTCE-303- 18.5	Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.	5
BTCE-303- 18.6	Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	2	2								2	2	
CO3	3	2	2	1								2	2	3
CO4	3	2	3	3	1							2	3	3
CO5	3	3	1	2									2	1
CO6	2	3	3	2	2							2	2	3

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BTAM-301-18: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)	**SEMESTER:** III
COURSE CODE: BTAM-301-18	**CREDITS:** 4
COURSE TYPE: BASIC SCIENCE COURSE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Vector Calculus-I:** Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.	10
II	**Vector Calculus-II:** Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.	11
III	**Transforms Calculus-I:** Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution	10

	theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.	
IV	**Transforms Calculus-II:** Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications	11

Total hours – 42

TEXT /REFERENCE BOOKS

1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3.	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4.	Thomas and Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 2017.
5.	R. K. Jain and S.R.K Iyengar Advanced Engineering Mathematics, 5th Edition, 2017.

T/R	Book title suggested by faculty
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

E- content used:
https://nptel.ac.in/courses/111105121

Additional Topics:

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Small Group Instructions
Problem solving

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTAM-301-18.1	Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.	2

BTAM-301-18.2	Find length, area and volume using integral calculus that is an important application in engineering.	5
BTAM-301-18.3	Solve some real problems in engineering using Gauss Divergence and Stokes' theorem	5
BTAM-301-18.4	Understand the concept of orthogonal curvilinear coordinates and the applications of Green, Gauss and Stokes Theorems.	2
BTAM-301-18.5	Formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.	5
BTAM-301-18.6	Formulate Fourier Series, its properties and its applications to solve problems in engineering.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1									1	
CO2	2		2		1									1
CO3	1	2		2										
CO4	1		2		1								1	
CO5	2	1	1	1										
CO6	2			1									1	1

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BTEC- 305-18: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING	**SEMESTER:** III
COURSE CODE: BTEC- 305-18	**CREDITS:** 3
COURSE TYPE: ENGINEERING SCIENCE COURSE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE	**LAB COURSE NAME:** NA

(IF ANY): NA	

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications.	08
II	**Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.	08
III	**Operational Amplifiers and Applications -** Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.	10
IV	**Digital Electronics** -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K-Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2.	SantiramKal (2002), Basic Electronics- Devices, Circuits and IT undamentals, Prentice Hall, India. 3.Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education.
3.	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
4.	R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson.

T/R	Book title suggested by faculty

1	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH

E- content used:
https://nptel.ac.in/courses/122106025

Additional topics:

Basic laws and theorems in Basic Electronics, Wave Shaping using Diodes

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC- 305-18.1	Identify areas of application of electronics in civil engineering.	2
BTEC- 305-18.2	Understand construction of diodes and their rectifier applications.	1
BTEC- 305-18.3	Appreciate the construction and working bipolar junction transistors and MOSFETs.	6
BTEC- 305-18.4	Design Op-Amp IC based fundamental applications.	1
BTEC- 305-18.5	Appraise the use of integrated circuits in civil engineering applications.	2
BTEC- 305-18.6	Comprehend working of basic elements of digital electronics and circuits.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1		1					2		2	1		
CO2	2				2				1		1			
CO3	2				2				1		1			
CO4	2		2		2						1		1	
CO5	1	1			2						1		1	
CO6					2						1		1	

Prepared by **Approved By**

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HSMC-132-18: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT	**SEMESTER:** III
COURSE CODE: HSMC-132-18	**CREDITS:** 3
COURSE TYPE: HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Civil Engineering and its historical developments;** Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.	08
II	**Understanding the past to look into the future**; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.	10
III	**Infrastructure development and growth of the Nation**; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals,	08

	Tunnels, bridges.	
IV	**Energy Generation**: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Salvadori, M and Heller, M, Strctures in Architectures, PHI.
2.	Fintel, C, Handbook of Civil Engineering, CBS Publications.
3.	*Žiga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
4.	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
5.	NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004

T/R	Book title suggested by faculty
1	Fintel, C, Handbook of Civil Engineering, CBS Publications.
2	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition.

E- content used:
https://www.dce-darbhanga.org/wp-content/uploads/2020/04/file_5e8ca9c9a4968.pdf

Additional topics: Present and future scenario of energy generation methods.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team Teaching Method
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
HSMC-132-18.1	Introduction to what constitutes Civil Engineering	1
HSMC-132-18.2	Understanding the vast interfaces this field has with the society at large	2
HSMC-132-18.3	Providing inspiration for doing creative and innovative work for the benefit of the society	1
HSMC-132-18.4	Need to think innovatively to ensure Sustainability	1
HSMC-132-18.5	Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field	2
HSMC-132-18.6	Illustrate the Futuristic engineering systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1											1		
CO2						2	1	1						
CO3					2	3	2	2					2	
CO4						2	3						2	
CO5												2		
CO6	2				2							2		

Prepared by **Approved By**

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BTCE-306-18: SURVEYING & GEOMATICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-306-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
II	Different methods of leveling, height of instrument, rise & fall methods.
III	Measurement of horizontal and vertical angle by theodolite.
IV	Determination of tachometric constants and determination of reduced levels by tachometric observations.
V	Plane table survey, different methods of plotting, three-point problem.
VI	Determination of height of an inaccessible object.
VII	Setting out of circular curves in the field using different methods.
VIII	Plotting of traverse using the Total Station and GPS.

Total hours – 20

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-306- 18.1	Assess horizontal & vertical angles by Theodolite.	5
BTCE-306- 18.2	Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.	1
BTCE-306- 18.3	Compute the reduce levels using various methods of levelling.	5
BTCE-306- 18.4	Predict the location of any point horizontally and vertically using Tachometry.	3
BTCE-306- 18.5	Setting out curves in the field.	3
BTCE-306- 18.6	Use electronic survey instruments.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2

CO1	2	2		2	1				2			1	2	
CO2	2	2	1	2	1				2			1	1	1
CO3	2	2	2	1	2				2			1	2	1
CO4	2	2			1				2					
CO5	2	2			1				2					
CO6	2	2		1	2				1				2	

BTCE-307-18: FLUID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-307-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges.
II	To verify Bernoulli's Theorem
III	To determine the Meta centric height of a Floating Body under different condition.
IV	To determine the coefficient of discharge of a Venturimeter.
V	To determine the coefficient of discharge of a Orifice Meter
VI	To determine the coefficient of friction of different diameter pipes.
VII	To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
VIII	To determine the coefficient of discharge on rectangular and V-notches.
IX	To determine the various element of a hydraulic jump.

Total hours – 18

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2.	Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3.	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4.	Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-307- 18.1	Select appropriate pressure measuring device under different condition of flow.	1
BTCE-307- 18.2	Determine the stability of a floating body.	5
BTCE-307- 18.3	Understand and apply Bernoulli's theorem practically.	2
BTCE-307- 18.4	Find discharge of fluid through pipe, orifices and in open channel.	5
BTCE-307- 18.5	Estimate the major and minor losses in pipe.	5
BTCE-307- 18.6	Estimate the various elements and energy losses in hydraulic jump.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				2							1		
CO2	2	2		1	1							2	1	
CO3	2	2		2					1			1	2	
CO4	2	2		1	2				2			2	2	
CO5	2	2		1	2				1			2	2	
CO6	2	2		1	2				1			2	2	

BTCE-308-18: SOLID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS LAB	**SEMESTER:** III

COURSE CODE: BTCE-308-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of physical properties of steel including strength and ductility.
II	Study of tensile and compressive stress-strain behaviour of steel.
III	Compression test on brick.
IV	Development of shear stress-strain curve for steel in torsion.
V	Determination of hardness of a material by Rockwell and Brinell hardness testing machine.
VI	Determination of impact strength of a material by Izod and Charpy tests.
VII	Determination of bending strength of a wooden beam specimen.
VIII	Determination of fatigue strength of a material.
IX	Study of behavior of columns and struts with different end conditions.
X	To verify the moment area theorem for slope and deflection of a given beam.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-308- 18.1	Understand the importance of physical properties of steel.	2
BTCE-308- 18.2	Identify and comprehend code provisions for testing different properties of steel.	1
BTCE-308- 18.3	Develop stress-strain curve for axial compression, axial tension and shear.	1

BTCE-308- 18.4	Assess hardness and impact strength of steel.	5
BTCE-308- 18.5	Assess flexural strength of a given material.	5
BTCE-308- 18.6	Evaluate fatigue and impact strength of steel.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		1
CO2	2	1		1								2		2
CO3	2	3	3	1	1				2			2	3	1
CO4	2	1			2							1	1	
CO5	2	1			2				2			1	1	
CO6	2	1			2				2			1	1	

BTCE-308-18: TRAINING -I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRAINING -I	**SEMESTER:** III
COURSE CODE: BTCE-308-18	**CREDITS:** --
COURSE TYPE: Professional Skill Enhancement	**CONTACT HOURS:** --

SYLLABUS:

EXPERIMENT	DETAILS
I	**Institutional Training (3 weeks)** 3. Hands-on-training on MS Office/ Office suite (Word processor, Spreadsheet, Math tools, presentation/ ppt, etc.) 4. Introduction to Civil Engineering software's and basic overview of drafting tools such as AutoCAD, etc.
II	**Field and Market Study** 3. Student shall visit construction site of significantly scale and make an inventory construction and finishing materials being used. 4. Student shall do Market Survey for availability and rates of materials in the already prepared inventory.

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-332- 18.1	Visualize things/ concepts and express the thoughts in the form of sketches, models, etc	1
BTCE-332- 18.2	Create a well-organized document using computers	6
BTCE-332- 18.3	Work in teams	1
BTCE-332- 18.4	Acknowledge the work of other in a consistent manner	1
BTCE-332- 18.5	Understanding of ethical and professional issues	2
BTCE-332- 18.6	Demonstrate effective oral communication and presentation skills	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1			2				1	2			1	
CO2					2				1	2			2	
CO3									3	2				
CO4									3	1				
CO5							2	3	1	1				
CO6									1	3				

INDEX
SCHEME: B. TECH 4TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2019

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-401- 18	Concrete Technology	3-0-0	3	3
B	BTCE-402- 18	Materials, Testing & Evaluation	4-0-0	4	4
C	BTCE-403- 18	Hydrology & Water Resources Engineering	3-1-0	4	4
D	BTCE-404- 18	Transportation Engineering	3-1-0	4	4
E	BTCE-405- 18	Disaster Preparedness & Planning	3-0-0	3	3
F	EVS-101-18	Environmental Science	2-0-0	2	0
G	BTCE-406- 18	Concrete Testing Lab	0-0-2	2	1
H	BTCE-407- 18	Transportation Lab	0-0-2	2	1
I	BMPD-401-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 20 **Hours: 26**

BTCE-401- 18: CONCRETE TECHNOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TECHNOLOGY	**SEMESTER:** IV
COURSE CODE: BTCE-401- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 406-18	**LAB COURSE NAME:** CONCRETE TESTING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concrete and its ingredients**: Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines. **Concrete behaviour in fresh and hardened states**: Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.	08
II	**Production of concrete**: Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions. **Concrete mix design:** Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.	10
III	**Inspection and testing of concrete**: Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pull-out etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.	09
IV	**Special concretes:** Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self-Healing Concrete.	09

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Properties of Concrete', A. M. Neville, Prentice Hall
2.	'Concrete Technology', M. S. Shetty, S.Chand & Co.
3.	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4.	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi
5.	P Kumar Mehta, Monteiro; Concrete Technology, Indian Concrete Institute

T/R	Book title suggested by faculty
1	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
2	'Concrete Technology', M. S. Shetty, S. Chand & Co.
3	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

E- content used:
https://nptel.ac.in/courses/105102012

Additional topics:

Mix Design of concrete: Packing Density, Rheology, testing of mixing water, Abram's Law.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-401- 18.1	Understand the relevance of different properties of constituent materials on properties of concrete.	2
BTCE-401- 18.2	Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.	2
BTCE-401- 18.3	Understand the issues involved in production and use of concrete.	2
BTCE-401- 18.4	Design of concrete mixes as per BIS specifications.	6
BTCE-401- 18.5	Understand various testing methods for concrete and their applicability.	2

BTCE-401- 18.6	Knowledge of special type of non-conventional concretes.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2													
CO4	3		3		2								2	3
CO5	3	2			2							1	2	1
CO6					3							1	2	

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BTCE-402- 18: MATERIALS, TESTING & EVALUATION

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATERIALS, TESTING & EVALUATION	**SEMESTER:** IV
COURSE CODE: BTCE-402- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes; Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's Bricks; Concrete hollow blocks & Interlocking tiles. Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,	10

II	Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behaviour (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep –fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.	12
III	Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	10
IV	Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regard for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2.	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3.	Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. correspondingto materials used for Civil Engineering applications
4.	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5.	E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6.	American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

T/R	**Book title suggested by faculty**
1	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
2	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition

E- content used:
https://nptel.ac.in/courses/105102088

Additional topics:

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Class discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-402- 18.1	Appraisal about the role of materials in civil engineering	5
BTCE-402- 18.2	Introduce common measurement instruments, equipment and devices to capture the material response under loading	2
BTCE-402- 18.3	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice	2
BTCE-402- 18.4	Ability to write a technical laboratory report.	1
BTCE-402- 18.5	Interpret the observations/ test reports for selection of suitable material.	2
BTCE-402- 18.6	Utilize the relevant information from the standards and guidelines.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		1	2								2	
CO3	2	2		2	1								2	
CO4									2	2				
CO5	1	2		1					1					
CO6	2													

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BTCE-403- 18: HYDROLOGY & WATER RESOURCES ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: HYDROLOGY & WATER RESOURCES ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-403- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction -** Hydrologic Cycle, History of Hydrology, Water-Budget Equation, World Water Balance, Applications in Engineering, Sources of Data. **Precipitation -** Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.	12
II	**Abstractions from precipitation** - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices. **Runoff -** Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.	12
III	**Unit III: Water withdrawals and uses –** Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation. **Distribution systems** - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime	10

	Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets.	
IV	**Water Logging**: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods. **Dams and spillways** - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2.	K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3.	K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4.	G L Asawa, Irrigation Engineering, Wiley Eastern
5.	L W Mays, Water Resources Engineering, Wiley.
6.	J. D Zimmerman, Irrigation, John Wiley & Sons
7.	C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

T/R	Book title suggested by faculty
1	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2	L W Mays, Water Resources Engineering, Wiley.

E- content used:
https://archive.nptel.ac.in/courses/105/103/105103213/

Additional topics:

Water vapour dynamics, Gumbel's method, Thunderstorm Cell Model, Infiltration: Green Amp Equation.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-403- 18.1	Understand the interaction among various processes in the hydrologic cycle.	2
BTCE-403- 18.2	Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc.	5
BTCE-403- 18.3	Understand the various component of hydro graphs and able to estimate the run off.	2
BTCE-403- 18.4	Find the water requirement for different crops and able to proposed appropriate method of applying water.	5
BTCE-403- 18.5	Understand the distribution system of canal and various components of irrigation system.	1
BTCE-403- 18.6	Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	1	2	1				1				1	
CO3	3	2	2	2										
CO4	2	1	3	2	2								1	2
CO5	2				1							1		
CO6	3	2		1										

Prepared by **Approved By**

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BTCE-404- 18: TRANSPORTATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-404- 18	**CREDITS:** 4

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 407-18	**LAB COURSE NAME:** TRANSPORTATION LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction:*** Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport. ***Transportation Systems****:* Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.	10
II	***Highway Development & Planning****:* Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements	12
III	***Railway Engineering****:* History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge. ***Railway Track****:* Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.	12
IV	***Airport Engineering*****:** Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration. ***Aircraft Parking System & Visual Aids****:* Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers,

	Roorkee,1998.
2.	Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3.	Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4.	Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5.	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
6.	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

T/R	Book title suggested by faculty
1	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee,1998.
2	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
3	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

E- content used:
https://nptel.ac.in/courses/105105107

https://archive.nptel.ac.in/courses/105/107/105107123/

Additional topics:

Overview to geometric design of highways, Overview to Mix design methods for construction of flexible pavement, Introduction to superelevation, transition curve in railways, Introduction to railway equipment and junctions.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Student led classrooms
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom’s Level (B.L)
BTCE-404- 18.1	Appreciate the importance of different modes of transportation and characterize the road transportation.	2

BTCE-404- 18.2	Alignment and geometry of pavement as per Indian Standards according to topography.	1
BTCE-404- 18.3	Assess the properties of highway materials in laboratory	5
BTCE-404- 18.4	Understand the importance of railway infrastructure planning and design.	2
BTCE-404- 18.5	Identify the functions of different component of railway track.	2
BTCE-404- 18.6	Outline the importance of Airport Infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2	2			2									
CO4	2		1		1									
CO5	2	1			1									
CO6	2				1									

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BTCE-405- 18: DISASTER PREPAREDNESS & PLANNING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: DISASTER PREPAREDNESS & PLANNING	**SEMESTER:** IV
COURSE CODE: BTCE-405- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction to Disaster Management:*** Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation. ***Disasters****:* Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender, age, special needs), Lessons and experiences from important disasters with specific reference to civil engineering.	10
II	***Disaster Mitigation and Preparedness:*** Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; Preparedness for natural disasters in urban areas. ***Risk Assessment****:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.	08
III	***Post disaster response****:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.	10
IV	***Integration of public policy****:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	www.http//ndma.gov.in
2.	http://www.ndmindia.nic.in
3.	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4.	Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5.	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

6.	Disaster Management, R.B. Singh (Ed), Rawat Publications

T/R	Book title suggested by faculty
1	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
2	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

E- content used:
https://nptel.ac.in/courses/124107010

Additional topics:

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-405- 18.1	Identify various types of disasters, their causes, effects & mitigation measures.	2
BTCE-405- 18.2	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.	2
BTCE-405- 18.3	Understand the use of emergency management system to tackle the problems.	2
BTCE-405- 18.4	Discuss the role of media, various agencies and organisations for effective disaster management.	6
BTCE-405- 18.5	Design early warning system and understand the utilization of advanced technologies in disaster management.	6
BTCE-405- 18.6	Compare different models for disaster management and plan & design of infrastructure for effective disaster management.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	2	1										1		
CO2	1	1	2									1	1	1
CO3	1											1		
CO4						3	2		2	2				
CO5	2		2		3				2	2		1	2	3
CO6		2	3						2	2			1	3

Prepared by **Approved By**

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EVS-101-18: ENVIRONMENTAL SCIENCE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL SCIENCE	**SEMESTER:** IV
COURSE CODE: EVS-101-18	**CREDITS:** 0
COURSE TYPE: BASIC SCIENCES (MANDATORY COURSES)	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Natural Resources: Renewable and non-renewable resources** Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resource: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.	06

II	**Ecosystems** Concept of an ecosystem, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	06
III	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India	06
IV	**Social Issues and the Environment** From Unsustainable to Sustainable development, Resettlement and rehabilitation of people; its problems and concerns., Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies, Public awareness.	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	Textbook of Environmental studies, Erach Bharucha, UGC Weblink: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2.	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
3.	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
4.	Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
5.	Principle of Environment Science by Cunninghan, W.P.
6.	Elements of Environment Science & Engineering by Meenakshi.
7.	Elements of Environment Engineering by Duggal.

T/R	**Book title suggested by faculty**
1	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
2	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

E- content used:
https://evspgdavevening.blogspot.com/p/e-content.html

Additional topics:

Biomedical Waste Management, Environmental Acts and Rules.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Student led classrooms

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
EVS-101-18.1	Understand environmental problems at local and national level through literature and general awareness.	2
EVS-101-18.2	Acquire practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.	2
EVS-101-18.3	Apply interdisciplinary approach to understand key environmental issues and critically analyse them to explore the possibilities to mitigate these problems.	4
EVS-101-18.4	Create awareness among people about protection of wild life & forests.	2
EVS-101-18.5	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.	2
EVS-101-18.6	Understand the need of conservation of natural resources, ecological balance and biodiversity to achieve sustainable development.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1							3			2				
CO2							3			2				
CO3	1	1				2	3		1			1		
CO4						2	3		1	2				
CO5						2	2	2	1	2				
CO6						2	3	1	1	2				

Prepared by **Approved By**

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BTCE-406- 18: CONCRETE TESTING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TESTING LAB	**SEMESTER:** IV
COURSE CODE: BTCE-406- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on cement • Fineness • Consistency • Setting time • Soundness • Specific gravity • Strength
II	Tests on aggregates (fine and coarse) • Specific gravity • Bulk Density • Fineness Modulus • Moisture content • Water Absorption • Bulking of sand
III	Design mix of concrete as per BIS method.
IV	Workability tests on concrete • Slump test • Compaction Factor test • Vee-Bee test
V	Strength tests on concrete • Compressive strength (Cube and Cylinder) • Split Tensile strength • Flexural strength • Abrasion resistance
VI	Non-Destructive Techniques • Rebound hammer test • Ultra-sonic pulse velocity test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	'Concrete Lab Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2.	'Concrete Lab Manual', TTTI Chandigarh.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-406- 18.1	Evaluate properties of building materials, such as cement and aggregates.	5
BTCE-406- 18.2	Conduct experiments and check the acceptance criteria (if any).	4
BTCE-406- 18.3	Design concrete mixes as per BIS provisions.	6
BTCE-406- 18.4	Analyze the properties of concrete in fresh and hardened state.	4
BTCE-406- 18.5	Create a well-organized document and present the results appropriately.	6
BTCE-406- 18.6	Understand and apply non-destructive testing (NDT) for evaluating concrete quality.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				2			1	1	
CO2	2	1		2	1				1			1		
CO3	2	1	3		2				1			1	2	3
CO4	2	2		1	2				1			1	2	
CO5	1								2	3	1	1		
CO6	2	1		1	3				1			1	2	

BTCE-407- 18: TRANSPORTATION LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION LAB	**SEMESTER:** IV
COURSE CODE: BTCE-407- 18	**CREDITS:** 1

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on Sub-grade Soil 1. California Bearing Ratio Test
II	Tests on Road Aggregates 6. Crushing Value Test 7. Los Angles Abrasion Value Test 8. Impact Value Test 9. Shape Test (Flakiness and Elongation Index)
III	Tests on Bituminous Materials and Mixes 13. Penetration Test 14. Ductility Test 15. Softening Point Test 16. Flash & Fire Point Test 17. Bitumen Extraction Test
IV	Field Tests 18. Study of Roughometer/Bump Indicator 19. Study of Benkelman Beam Method

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", NemChand and Brothers, Roorkee.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-407- 18.1	Characterize the pavement materials as per the Indian Standard guidelines.	4
BTCE-407- 18.2	Evaluate the strength of subgrade soil by CBR test.	5
BTCE-407- 18.3	Conduct experiments to evaluate aggregate properties.	5
BTCE-407- 18.4	Determine properties of bitumen material and mixes	5
BTCE-407- 18.5	Evaluate the pavement condition by rough meter and	5

	Benkelman beam test.	
BTCE-407- 18.6	Create a well-organized report and present the results appropriately	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		
CO2	2				1				1			1	1	
CO3	2			1	1				1			1	1	
CO4	2				1				1			1	1	
CO5	2			2	2				1			1	2	
CO6	1								2	3	1	1		

INDEX
SCHEME: B. TECH 5TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2019

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-501-18	Engineering Geology	3-0-0	3	3
B	BTCE-502-18	Elements of Earthquake Engineering	3-0-0	3	3
C	BTCE-503-18	Construction Engineering & Management	3-0-0	3	3
D	BTCE-504- 18	Environmental Engineering	4-0-0	4	4
E	BTCE-505-18	Structural Engineering	3-1-0	4	4
F	BTCE-506-18	Geotechnical Engineering	3-0-0	3	3
G	BTCE-507- 18	Geotechnical Lab	0-0-2	2	1
H	BTCE-508- 18	Environmental Engineering Lab	0-0-2	2	1
I	BTCE-509- 18	Structural Lab	0-0-2	2	1
J	BMPD-501-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 Hours: 28

BTCE-501-18: ENGINEERING GEOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING GEOLOGY	**SEMESTER:** V
COURSE CODE: BTCE-501-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**General Geology:** Scope of geology in Civil Engineering - the earth, its structure and environment - Standard geological time scale, unit & fossils. physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes –weathering – types, weathered products, assessment of degree of weathering, Fluvial processes, glaciation, wind action, and their significance in Civil Engineering.	04
II	**Mineralogy and Petrology:** Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Horn blend, Mica family, calcite, Iron oxide minerals, Augite, Horn blend, and Clay minerals and their behaviour and significance in the field of Civil Engineering. Classification of rock - mode of formation -distinction between igneous, sedimentary and metamorphic rocks. Formation, textures, structure, Classification, and Engineering, Characteristic of rocks. Study of imp rocks granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia, conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate	07
III	**Strength Behaviour of Rocks:** Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold-Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.	07
IV	**Geological Hazards:** Rock Instability and Slope movement: Concept of	08

	sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslides. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence.	
V	**Rock masses as construction material:** Definition of Rock masses. Main features constituting rock mass. Main features that affect the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging. Rock Quality Designation. Rock mass description.	06
VI	**Geology of dam and reservoir site:** Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2.	Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3.	Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
4.	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995
5.	Leggot, R.F.," Geology and Engineers ", McGraw Hill, New York.2002 2.
6.	Blyth, F.G.M., "A Geology for Engineers", Arnold, Londo, (2003.
7.	Bell.F.G, " Fundamentals of Engineering Geology" Butterworth, 1983

T/R	Book title suggested by faculty
1	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995

E- content used:
https://nptel.ac.in/courses/105105106

Additional topics:

Classification of rocks for engineering purposes. Rock quality designation (RQD).

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Topic delivery by students
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-501- 18.1	Understanding geological processes and their importance in civil Engineering	2
BTCE-501- 18.2	Identification of rocks and minerals and their characteristics	2
BTCE-501- 18.3	Significance of geological structures and processes in civil engineering projects	2
BTCE-501- 18.4	Identify the geological hazards associated with civil engineering structures and suggest remedies.	2
BTCE-501- 18.5	Site characterization and geologic considerations in construction	4
BTCE-501- 18.6	Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	1												
CO3	2													
CO4	2	2	2						1				2	
CO5	2	2	2						1					
CO6	2	2	1	2					1				2	

Prepared by **Approved By**

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BTCE-502-18: ELEMENTS OF EARTHQUAKE ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ELEMENTS OF EARTHQUAKE ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-502-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.	04
II	Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.	04
III	Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.	08
IV	Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.	06
V	Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.	06
VI	Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.	04
VII	Introduction to provisions of IS 4326. Unit 8: Introduction to provision of IS 13920.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2.	Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra,

	Prentice Hall
3.	Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4.	Structural Dynamics by Mario & Paz, Springer.
5.	Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6.	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7.	IS 1893-2016Indian Standard Criteria for Earthquake Resistant Design of Structures.
8.	IS 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9.	IS 13920:2016- Ductile design and detailing of Reinforced Concrete Structures subjected to Seismic Forces-code of practice

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Seismic Soil-Structure Interaction: soil effect on the ground motion characteristics, Effect of Surface Topography.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-502- 18.1	Appreciate the role of earthquake forces in structural design of building.	2
BTCE-502- 18.2	Develop an understanding of structural defects due to earthquakes by studying past earthquakes	3

BTCE-502- 18.3	Acquire basic knowledge of concept of vibrations in earthquake engineering	2
BTCE-502- 18.4	Analyse the behaviour of structures under dynamic loads	4
BTCE-502- 18.5	Understand engineering seismology, ductility requirement & structural configurations.	2
BTCE-502- 18.6	Apply various codal provisions related to seismic design of buildings.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		2									1	
CO3	3													
CO4	3	3		2					1				2	
CO5	3													
CO6	2	2											2	2

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BTCE-503-18: CONSTRUCTION ENGINEERING & MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONSTRUCTION ENGINEERING & MANAGEMENT	**SEMESTER:** V
COURSE CODE: BTCE-503-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS

I	Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.	03
II	Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.	06
III	Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.	04
IV	Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.	04
V	Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow,sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling-Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction.	05
VI	Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project	06

	sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.	
VII	Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.	05
VIII	Construction Costs: Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.	03

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Varghese, P.C., "*Building Construction"*, Prentice Hall India, 2007.
2.	*National Building Code,* Bureau of Indian Standards, New Delhi, 2017.
3.	Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
4.	Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5.	Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6.	Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7.	Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Cost Analysis: Determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Projects study

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-503- 18.1	An understanding of modern construction practices	2
BTCE-503- 18.2	A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics	2
BTCE-503- 18.3	A basic ability to plan, control and monitor construction projects with respect to time and cost	6
BTCE-503- 18.4	An idea of how to optimise construction projects based on costs	2
BTCE-503- 18.5	An idea how construction projects are administered with respect to contract structures and issues.	2
BTCE-503- 18.6	An ability to put forward ideas and understandings to others with effective communication processes	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				3									
CO2	2				2				2		3			
CO3	2		1						2		3			3
CO4	2	2	2	1					2		3		1	2
CO5	2		1	1					2		3		1	2
CO6	2									3				1

Prepared by **Approved By**

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BTCE-504-18: ENVIRONMENTAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-504-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 508-18	**LAB COURSE NAME:** ENVIRONMENTAL ENGINEERING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	*Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. *Water Treatment:* aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes	08
II	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage-Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water-Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.	10
III	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution.	06
IV	*Noise*- Basic concept, measurement and various control methods.	04
V	*Solid waste management*-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management.	10

VI	*Building Plumbing*-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Storage tanks, building drainage for high rise buildings, various kinds of fixtures and fittings used.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2.	Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3.	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
4.	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
5.	Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6.	Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7.	Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8.	Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development

T/R	Book title suggested by faculty
1	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
2	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low-cost treatment techniques.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations
Inquiry guided instructions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-504- 18.1	Understanding the principles of water treatment processes, their design and distribution systems.	2
BTCE-504- 18.2	Be able to apply the knowledge for selecting the most appropriate technique for the treatment of wastewater.	3
BTCE-504- 18.3	Identify the major sources, effects and monitoring of air pollutants.	2
BTCE-504- 18.4	Impart knowledge on the sources, effects and control techniques of noise pollution.	2
BTCE-504- 18.5	Understand the fundamental principles of existing and emerging technologies for the solid waste management	2
BTCE-504- 18.6	Identify various plumbing systems provided in the buildings.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		1											2
CO2	2	2			2								2	
CO3	2	2					2							
CO4	2	2			1		2							
CO5	2				2		1							
CO6	2	2												

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BTCE-505-18: STRUCTURAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: STRUCTURAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-505-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 509-18	**LAB COURSE NAME:** STRUCTURAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction** Structural Engineering, role of structural engineer, engineer, architect, builder; Objectives of designing a structure, safety, sustainable development in performance.	08
II	**Structural Analysis** Concept of determinacy and indeterminacy, Analyses of indeterminate beams, frames and trusses using Slope deflection method, Moment distribution method, unit load method and castiglano's theorem.	12
III	**Design of concrete Elements** Design Philosophies of Working Stress Method and Limit State Method, Design of Reinforced Concrete Beams for Flexure, Shear; Bond, Anchorage, development length and torsion; Reinforced Concrete Axially Loaded Columns, Reinforced Concrete Slabs: One Way and Two Way.	12
IV	**Design of Steel Elements** Properties of structural steel, I.S. rolled sections, I.S. specifications; Connections- Bolted and welded connections for axial loads; Tension members: Design of members subjected to axial tension; Compression members: Design of axially loaded members, built-up columns, laced and battened columns; Flexural members: Design of laterally restrained and un-restrained rolled section beams.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
2.	McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
3.	Intermediate Structural Analysis - C K Wang, McGraw hill publications.
4.	Limit state design of steel structures: S K Duggal, Mc Graw Hill.

5.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.
6.	Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
7.	NBC, National Building Code, BIS (2017).
8.	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
9.	Theory of structures - B.C. Punima, Laxmi Publications.
10.	Reinforced concrete design - Pillai & Menon, Tata McGrawHill publications

BIS Codes of practice and Design Handbooks:

1.	*IS 456-2000- Indian Standard. Plain and Reinforced concrete -Code of practice
2.	*Design Aid SP 16
3.	*IS 800: 2007 (General construction in steel-Code of practice)*
4.	*SP: 6(1) (Handbook for structural engineers-Structural steel sections
5.	Explanatory hand book SP24.
6.	Detailing of Reinforcement SP 34

T/R	Book title suggested by faculty
1	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
2	Limit state design of steel structures: S K Duggal, Mc Graw Hill.
3.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Introduction to Moving Loads and Influence Line Diagrams, Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-505- 18.1	Apply their knowledge of structural mechanics in addressing design problems of structural engineering	3
BTCE-505- 18.2	Possess the skills to analyse and design concrete and steel structures	4
BTCE-505- 18.3	Knowledge of structural engineering	2
BTCE-505- 18.4	Understand the various design philosophies related to reinforced concrete structures	2
BTCE-505- 18.5	Analyse and design the safe RCC structural members	6
BTCE-505- 18.6	Design various steel structure members i.e., connections, tension members, compression members and flexural members	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									1	2
CO2	3	3	3	2	2				2				2	3
CO3	3													
CO4	3	2	2											2
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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BTCE-506-18: GEOTECHNICAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-506-18	**CREDITS:** 3

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 507-18	**LAB COURSE NAME:** GEOTECHNICAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Basic Concepts***- Definition of soil, Comparison between soil mechanics, rock mechanics and geotechnical engineering, Scope of soil mechanics problems in Civil Engineering. Principal types of soils in India. Characteristics of main Clay mineral groups. Soil as three phase system: weight volume relationship and determination of moisture content from nuclear method, alcohol method and sensors. Determination of Specific gravity by density bottle method, pycnometer method. Field density from sand replacement method and other methods. ***Index Properties***: Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse- and fine-grained soils as per Indian Standard.	08
II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis-Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. ***Effective Stress Principle***- Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.	10
III	***Compaction of Soil***-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. ***Consolidation of Soil*** - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, Concept of various consolidation characteristics i.e., av, mv and cv, primary and secondary consolidation concept of cv, tv& U. Consolidation test: determination of cv from curve fitting methods, Pre consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect disturbance on e-Log σ curves of normally consolidated clays, importance of consolidation settlement in the design of structures. final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.	10

IV	***Shear Strength***- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test ***Stability of Slopes***- Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S. Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M. Das Cengage Publisher
7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers.

T/R	**Book title suggested by faculty**
1	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
2	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons

E- content used:
https://nptel.ac.in/courses/105101201

Additional topics:

Soil particle structures, Derivation of skempton's pore pressure parameters, sliding block analysis, Earth pressures under applied load.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-506- 18.1	Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	2
BTCE-506- 18.2	Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of permeability, total and effective stress approaches in soil strength determination	4
BTCE-506- 18.3	Apply the various specifications of compaction of soils in the construction of highways and earthen dams.	3
BTCE-506- 18.4	Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.	3
BTCE-506- 18.5	Evaluate shear strength and permeability parameters of different soils	5
BTCE-506- 18.6	Design the embankment slopes and check the stability of finite slopes.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3	2	2	2						2			2	2
CO3	3	2	2										2	
CO4	3	2	2	1									2	
CO5	3	2	2	1									2	
CO6	3	2	3	1	2				2				2	3

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BTCE-507- 18: GEOTECHNICAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-507- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of in-situ density by core cutter method and Sand replacement method.
II	Determination of Liquid Limit & Plastic Limit.
III	Determination of specific gravity of soil solids by pyconometer method.
IV	Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
V	Compaction test of soil.
VI	Determination of Relative Density of soil.
VII	Determination of permeability by Constant Head Method.
VIII	Determination of permeability by Variable Head method.
IX	Unconfined Compression Test for fine grained soil.
X	Direct Shear Test
XI	Triaxial Test
XII	Swell Pressure Test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain. Nem Chand & Brothers.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-507- 18.1	Comprehend the procedure for classifying coarse grained and fine-grained soils	2
BTCE-507- 18.2	Evaluate the index properties of soil	5
BTCE-507- 18.3	Determine the engineering properties of soil	5
BTCE-507- 18.4	Interpret the results of compaction test for relative compaction in the field	4
BTCE-507- 18.5	Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis	3
BTCE-507- 18.6	Conduct experiments, analyse and interpret results for geotechnical engineering design	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							2					
CO2	3	2	1						2				1	
CO3	3	2	1						2				1	
CO4	3	2							2				1	
CO5	3	2		1	3				2			2	2	
CO6	3	2	2						2				1	2

BTCE-508- 18: ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING LAB	**SEMESTER:** V
COURSE CODE: BTCE-508- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To measure the pH value of a water/waste water sample.

II	To determine optimum Alum dose for Coagulation.
III	To find MPN for the bacteriological examination of water.
IV	To find the turbidity of a given waste water/water sample
V	To find B.O.D. of a given waste water sample.
VI	To measure D.O. of a given sample of water.
VII	Determination of Hardness of a given water sample
VIII	Determination of total solids, dissolved solids, suspended solids of a given water sample.
IX	To determine the concentration of sulphates in water/wastewater sample.
X	To find chlorides in a given sample of water/waste water.
XI	To find acidity/alkalinity of a given water sample
XII	To determine the COD of a wastewater sample.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2.	Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-508-18.1	Conduct experiments as per standard methods of sampling and analysis.	2
BTCE-508-18.2	Demonstrate the expertise to characterize water and wastewater samples.	5
BTCE-508-18.3	Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.	5
BTCE-508-18.4	Record the experimental observations and interpret the analysis results.	4
BTCE-508-18.5	Use the analysis results for making informed decision about the potability of water and disposal of wastewater.	3

BTCE-508-18.6	Recognize the working of air pollution monitoring equipment and noise meter.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2			1				2					
CO2	3	2			1				2					
CO3	3	1			1				2					
CO4	2	2	1		2				2				2	
CO5	2	2	2	1	2				2				1	
CO6	2	2			2				2				2	

BTCE-509-18: STRUCTURAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-509- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
II	To determine the Flexural Rigidity of a given beam.
III	Deflection of a fixed beam and influence line for reactions.
IV	Deflection studies for a overhang beam and influence line for reactions.
V	Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
VI	Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams,

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Dally J W, and Riley W F, "Experimental Stress Analysis", McGraw-Hill Inc. New York, 1991.
2.	Harrison H.B., "Structural Analysis and Design Vol.I and II", Pergamon Press, 1991

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-509-18.1	Verify theoretical formulas by conducting experiments.	4
BTCE-509-18.2	Predict the behaviour of statically determinate beams and trusses.	6
BTCE-509-18.3	Depict the behaviour of two hinged arch and three hinged arch structures.	4
BTCE-509-18.4	Demonstrate the influence lines for statically determinate and indeterminate beams.	2
BTCE-509-18.5	Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.	5
BTCE-509-18.6	Outline the deflected shapes of columns and struts with different end conditions.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							1					
CO2	3	2	2						1					
CO3	3	2	2						1					
CO4	3	2	2	1					1					
CO5	3	2	1	2					1					
CO6	3	2	1	2					1					

INDEX
SCHEME: B. TECH 6TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2019

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-601-18	Engineering Economics, Estimation & Costing	3-1-0	4	4
B	PECE-602A-18	Foundation Engineering	3-1-0	4	4
C	PECE-603D-18	Structural Analysis and Design	3-1-0	4	4
D	PECE-604B-18	Sustainable Construction Methods	3-1-0	4	4
E	BTEC-402-18	Microprocessors and Microcontrollers	3-0-0	3	3
F	BTES 401-18	Computer Organization & Architecture	3-0-0	3	3
G	BTMC101-18	Constitution of India	3-0-0	3	0
H	BMPD-601-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 22 Hours = 27

BTCE-601-18: ENGINEERING ECONOMICS, ESTIMATION & COSTING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING ECONOMICS, ESTIMATION & COSTING	**SEMESTER:** VI
COURSE CODE: BTCE-601-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Principles of Economics** Demand/Supply – elasticity – Basic Macroeconomic Concepts (including GDP/GNP/NI/ Disposable Income), Aggregate demand and Supply (IS/LM), Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.	04
II	**Elements of Business/Managerial Economics** Cost & Cost Control -Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money.	06
III	**Estimation / Measurements for various items** Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.	08
IV	**Specifications** Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.	06
V	**Rate analysis**: Purpose, importance and necessity of the same, factors affecting, task work,	06

	daily output from different equipment/ productivity.	
VI	**Tender:** Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price build-up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.	08
VII	**Introduction to Acts:** Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2.	V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3.	Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
4.	M Chakravarty, Estimating, Costing Specifications & Valuation
5.	Joy P K, Handbook of Construction Management, Macmillan
6.	B.S. Patil, Building & Engineering Contracts
7.	Relevant Indian Standard Specifications.
8.	World Bank Approved Contract Documents.
9.	FIDIC Contract Conditions.
10.	Acts Related to Minimum Wages, Workmen’s Compensation, Contract, and Arbitration
11.	Typical PWD Rate Analysis documents.
12.	UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
13.	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

T/R	Book title suggested by faculty
1	M Chakravarty, Estimating, Costing Specifications & Valuation
2	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

E- content used:
https://nptel.ac.in/courses/105103093

Additional topics:

Schedule of Rates- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-601- 18.1	Have an idea of basic principles and elements of economics in general.	2
BTCE-601- 18.2	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.	5
BTCE-601- 18.3	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.	2
BTCE-601- 18.4	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	5
BTCE-601- 18.5	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	2
BTCE-601- 18.6	Demonstrate the knowledge related to various rules and regulations applicable to construction industry.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2								

CO2		2				2					3			
CO3	2	2				2					2			
CO4	2	2				2					3			
CO5	2					2				2	3	1		
CO6	2					2				2	2	1		

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PECE-602A-18: FOUNDATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FOUNDATION ENGINEERING	**SEMESTER:** VI
COURSE CODE: PECE-602A-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Soil Exploration** Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, - standard penetration test -static and dynamic cone penetration test, Bore Hole log for S.P.T. Geophysical exploration by seismic and resistivity methods **Stresses Distribution:** Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, Newmark's chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Pressure Bulb and Isobar. Related Numerical Problems	10
II	**Earth Pressure** Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and K_p for horizontal backfills. Rankine's theory both for active and passive	12

	earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfills. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).	
III	**Shallow Foundation** Type of shallow foundations, Depth and factors affecting it. Definitionof ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of Shear failures. Factors affecting bearing capacity. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration test. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by Plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code.	11
IV	**Pile Foundations** Types and function of pile - factors influencing the selection of pile - carrying capacity of single pile in cohesionless and cohesive soil by static formula. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile- dynamic formulae (Engineering News and Hileys) Types of pile driving hammers & their comparison. Limitations of pile driving formulae. Negative skin friction - Carrying capacity of Pile group - Pile load test Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Settlement of pile groups in sand, Negative skin friction. Related Numerical problems **Well foundations-**shapes, depth of well foundations, components, factors affecting well foundation design, Scour Depth, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.	11

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M.Das Cengage Publisher

7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

T/R	Book title suggested by faculty
1	Soil Mech. & Foundation Engg, by K.R. Arora Standard *Publishers* Distributors
2	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers

E- content used:
https://archive.nptel.ac.in/courses/105/105/105105176/

Additional topics:

Danish method of analysis of pile foundation, Equivalent point load method of load distribution.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-602A-18.1	Understand the methods of surface and subsoil exploration and to prepare investigation report.	2
PECE-602A-18.2	Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations.	5
PECE-602A-18.3	Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations	6
PECE-602A-18.4	Estimate the stresses in soils and bearing capacity of soil for shallow foundation.	3
PECE-602A-18.5	Design various types of shallow foundation and to estimate settlement.	6
PECE-602A-	Apply the concepts of deep foundation and solve problems	3

18.6	related with pile foundation.	

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2		2	2				1					
CO2	3	2	2	2	2				1				1	2
CO3	3	2		2	2				1					
CO4	3	2	2	1					1				1	
CO5	3	2	2	2	2				1				2	3
CO6	3	2	2	2	2				1				2	3

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PECE-603D-18: STRUCTURAL ANALYSIS AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL ANALYSIS AND DESIGN	**SEMESTER:** VI
COURSE CODE: PECE-603D-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Review of indeterminacy:** Static and kinematic indeterminacies of beams, rigid-jointed and pin-jointed plane frames.	04
II	**Analysis of indeterminate structures**: Analysis indeterminate beams and frames by Kani's method, Theorem of three moments and other approximate methods- Portal, Cantilever and Substitute frame method.	12

III	**Moving loads and influence lines:** Analysis of moving Loads for determinate beams, Influence lines for indeterminate beams, trusses and frames. Muller Breslau principle.	08
IV	**Design of Concrete structures:** **Columns with moments**: Design of short columns with uni-axial and bi-axial bending; Design of Long columns, use of design charts; **Foundations**: Isolated and combined footing for columns; **Staircases**, Introduction, types and design; **Retaining walls** - Cantilever and Counter-forte type retaining wall.	10
V	**Design of Steel Structures:** **Column bases:** Slab base, Gusseted base; **Beam-column connections:** bracket connections, seated and framed connections.; **Plate girders:** Elements of a plate girder, design of plate girder section, intermediate and bearing stiffeners, **Roof trusses:** Types, Design loads, design of members and joints.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2.	Intermediate structural analysis - C . K. Wang. McGraw Hill
3.	Structural analysis - S Ramamurtham
4.	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
5.	Limit state Design of Reinforced Concrete; Varghese P C; PHI Pvt. Ltd.
6.	Design of concrete structures, B C Punmia
7.	Limit state design of steel structures: S K Duggal, TMH
8.	Design of steel structures: N Subramanian, Oxford publications
9.	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

T/R	**Book title suggested by faculty**
1	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2	Structural analysis - S Ramamurtham
3	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

E- content used:
https://nptel.ac.in/courses/105105166

Additional topics:

Connections: Riveted, bolted and welded connections for axial and eccentric loads, Comparison of working stress method, limit state method and ultimate load method.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems as per codes

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-603D-18.1	To recognize the concept of structural systems, loads, supports and displacements.	2
PECE-603D-18.2	To understand and determine the indeterminacy of different types of structures.	2
PECE-603D-18.3	To calculate forces and moments in indeterminate structures due to static as well as moving loads.	5
PECE-603D-18.4	To develop and use the concept of influence line diagram for calculating different structural quantities in a statically determinate structure.	4
PECE-603D-18.5	To analyse and design concrete structures i.e., column subjected to moments, foundations, retaining walls, etc.	6
PECE-603D-18.6	To analyse and design the steel structures i.e., column bases, beam-column joints, plate girders and roof trusses.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO2	3	2	1	2										
CO3	3	2	1	2										
CO4	3	2	3	2									2	1
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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PECE-604B-18: SUSTAINABLE CONSTRUCTION METHODS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SUSTAINABLE CONSTRUCTION METHODS	**SEMESTER:** VI
COURSE CODE: PECE-604B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION** Definitions- Various types - Pillars of Sustainability - Circle of Sustainability - Need - systems and their sustainability - Green Buildings -Difference between Green and Sustainability - Climate Change, Global warming - National and International policies and Regulations. Identification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.	06
II	**BUILDING CONSTRUCTION METHODS** Conventional vs modular construction methods, development, Engineering principles, benefits**,** Modular construction methods for repetitive works, Green Roofs, Cool Roofs, Passive House, Rammed Earth Brick**,** Passive Solar, Greywater Plumbing Systems, Solar Thermal Cladding, Solar Power, Water Efficiency Technologies, Sustainable Indoor Environment Technologies.	10
III	**PRECAST CONSTRUCTION METHODS** Modular construction methods for repetitive works; Precast concrete construction methods; Benefits , Sustainability in Concrete Mix Design, Greener, Faster and Sustainable Construction Practices Through Precast Solutions, Use of secondary cementitious material (SCM's) like GGBS, fly ash, ultra-fine GGBS in the production of the concrete, Basics of Slip forming for tall structures, Structural 3D Printing, Self-healing Concrete**,** Green Insulation, Sustainable Resource Sourcing, Environmental Sustainability Benefits From Precast Concrete.	10
IV	**CONSTRUCTION METHODS OF BRIDGES** Types of foundations and construction methods; Basics of Formwork and Staging; Proactive Maintenance**,** Prefabrication/Modular Construction, balance between environment and construction activities, reducing problems at site with minimal staging, increasing safety etc, Constructions are sustainable with reduced use of natural resources, Costs of	10

	Construction/Assembly and Transportation, Lifespan, Environmental Impact, harmful emissions during bridge construction, Reducing waste, solar panels to power LED lights to illuminate its deck, water-powered light system powered by the currents of the river, development that meets the needs of the present.	
V	**NEW CONSTRUCTION MATERIALS TECHNOLOGIES** Introduction to new construction materials & technologies, Synthetic Roof Underlayment, Electro chromic Glass, Biodegradable Materials, Reduction of water consumption, Impact on environment, Concepts of climate responsive building, Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process.	08

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Margaret Robertson, Sustainability Principles and Practice, Routledge, 2014
2.	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
3.	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
4.	Stephen M. Stephen, Stephen M. Wheeler, Climate Change and Social Ecology: A New Perspective on the Climate Challenge, Routledge, 2012.
5.	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

T/R	Book title suggested by faculty
1	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
2	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
3	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

E- content used:
https://nptel.ac.in/courses/105102195

Additional topics:

Case studies: Shanghai Tower, China; Bank of America, New York; The Crystal, London, United Kingdom; Council House 2, Melbourne.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-604B-18.1	Create new engineering materials to improve the performance of infrastructure	6
PECE-604B-18.2	Characterize and mitigate natural and man-made hazards	4
PECE-604B-18.3	Understanding various sustainable building construction methods and precast construction methods	2
PECE-604B-18.4	Improve fundamental knowledge of the inter-relationships between the built environment and natural systems.	6
PECE-604B-18.5	Understanding sustainable construction methods for bridges and analysing their economic viability.	4
PECE-604B-18.6	Develop the technological innovations needed to safeguard, improve, and economize infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	2				2				3	
CO2	3	2	2										2	
CO3	2	2					3							
CO4	2	2	2				3		2				2	1
CO5	2	2					3							
CO6	2	2	3	2	3		2		2			2	3	2

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BTEC-402-18: MICROPROCESSORS AND MICROCONTROLLERS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: MICROPROCESSORS AND MICROCONTROLLERS	**SEMESTER:** VI
COURSE CODE: BTEC-402-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Microprocessor 8085:** History of microprocessors; microprocessor 8085 Architecture, Pin configuration; Memory Interfacing; microprocessor programming model; 8085 instructions; Addressing modes; programming techniques, counters and time delays; stack and subroutines; interrupts.	12
II	**Microcontroller 8051 -** Building Blocks Microprocessor vs microcontroller; RISC vs CISC architectures; microcontroller 8051: architecture, pin configuration, flag-bits and PSW register, input-output ports, register banks and stack; semiconductor memories: ROM, SRAM, DRAM, virtual memory, cache memory; memory organization	10
III	**Microcontroller 8051 –** Programming Assembly language programming; data types and directives; jump loop and call instructions; I/O port programming; addressing modes and accessing memory using various addressing modes; arithmetic instructions and programs; logic instructions and programs; single bit instructions and programming, 8051 interrupts; timer/counter programming in the 8051.	12
IV	**Microcontroller 8051 –** Interfacing Parallel and serial ADC&DAC interfacing; LCD interfacing, Keyboard interfacing; sensor interfacing; interfacing with external memory; matrix keypad; stepper motor interfacing; DC motor interfacing and PWM.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	R S Gaonkar, Microprocessor Architecture, Programming and Application with 8085, Penram International Publishing Pvt. Ltd.
2.	Kenneth Ayala, The 8051 Microcontroller, Cengage Learning
3.	Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill
4.	Subrata Ghoshal, 8051 Microcontroller: Internals, Instructions, Programming and Interfacing, Pearson Education
5.	K Uma Rao, Andhe Pallavi, The 8051 Microcontrollers: Architecture, Programming and

	Applications, Pearson Education.

T/R	Book title suggested by faculty
1	R S Gaonkar, Microprocessor Architecture, Programming and Application with 8085, Penram International Publishing Pvt. Ltd.
2	Subrata Ghoshal, 8051 Microcontroller: Internals, Instructions, Programming and Interfacing, Pearson Education

E- content used:
https://nptel.ac.in/courses/108105102

Additional topics:

8051 Programming in C: Data types in 8051 C, programming for time delay, I/O programming in 8051 C, Logic operations in 8051 C, Control statements and loops in embedded C, Functions and Arrays in embedded C.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC-402-18.1	Understand architecture & functionalities of different building block of 8085 microprocessor	2
BTEC-402-18.2	Understand the programming and interfacing of microprocessors and microcontrollers.	2
BTEC-402-18.3	Understand working of different building blocks of 8051 microcontroller.	2
BTEC-402-18.4	Comprehend and apply programming aspects of 8051 microcontroller.	2
BTEC-402-18.5	Interface & interact with different peripherals and devices.	4
BTEC-402-18.6	Provide strong foundation for designing real world applications using microprocessors and microcontrollers.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	2				1				2					
CO2	3				1				2					
CO3	2	2		2	2				2				1	1
CO4	3				2				2				1	1
CO5	3	2		2	2				2					
CO6	2				2				2				2	3

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BTES 401-18: COMPUTER ORGANIZATION & ARCHITECTURE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: COMPUTER ORGANIZATION & ARCHITECTURE	**SEMESTER:** VI
COURSE CODE: BTES 401-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of 8085 processor. Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	12

II	**Introduction to x86 architecture:** CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions, I/O device interfaces – SCII, USB	10
III	**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	12
IV	**Memory Organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	"Computer Organization and Architecture", Moris Mano.
2.	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
3.	"Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
4.	"Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
5.	"Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
6.	"Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

T/R	Book title suggested by faculty
1	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition
2	by David A. Patterson and John L. Hennessy, Elsevier.

E- content used:
https://nptel.ac.in/courses/108102112

Additional topics:

Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTES 401-18.1	Understand functional block diagram of microprocessor;	2
BTES 401-18.2	Apply instruction set for writing assembly language programs.	3
BTES 401-18.3	Design a memory module and analyze its operation by interfacing with the CPU.	6
BTES 401-18.4	Classify hardwired and microprogrammed control units	4
BTES 401-18.5	Understand the concept of pipelining and its performance metrics.	2
BTES 401-18.6	Demonstrate the basic knowledge of I/O devices and interfacing of I/O devices with computer.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				1		1			
CO2	2	1			1				1		1		1	
CO3	3	2	3	2	1				2		2		2	2
CO4	2				1				1		1		1	
CO5	2				1				1		1			
CO6	2				1				1		1		1	

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INDEX
SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2019

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	PECE -701B-18	Airport Planning and Design	3-1-0	4	4
B	OECE-701-18	Metro Systems and Engineering	3-0-0	3	3
C	PECE -701B-18	Solid And Hazardous Waste Management	3-1-0	4	4
D	PECE-703F-18	Urban Hydrology and Hydraulics	3-1-0	4	4
E	HSMC -255	Professional Practice, Law & Ethics	2-0-0	2	2
F		Project	0-0-8	8	7
G	BTMC701-18	Management- I (Organizational Behavior)	2-0-0	2	0

Total Credits = 24 Hours: 27

SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE801-18	Training (one semester)	-	-	16

PECE -701B-18: AIRPORT PLANNING AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: AIRPORT PLANNING AND DESIGN	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Airport Engineering:** Components of airport: Classifications of obstructions, Imaginary surfaces, Approach zone and turning zone. Runway orientation, basic runway length, corrections for elevation, temperature & gradient, airport classification.	10
II	**Runway & Taxiway Design:** Wind-rose diagram, Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons,	12
III	**Structural design** of runway pavements LCN/PCN method of rigid pavement design, different LCN/PCN of aircrafts using runway. Pavement Evaluation for runway & taxiway, design of overlay, Terminal area, building area, parking area, apron, hanger typical airport layouts.	12
IV	**Design of flexible and rigid runways** as per FAA procedure, Specifications for the different layers of runway and taxiway pavements, Pavement management systems for runway pavements. Benkelman Beam method for maintenance.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2.	Rangwala, Airport Engineering, Charotar Publishing House (2019).
3.	Horenjeff Robert, Airport Engineering, McGraw Hill International Publisher (2010).

T/R	Book title suggested by faculty
1	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2	Rangwala, Airport Engineering, Charotar Publishing House (2019).

E- content used:
http://128.173.204.63/courses/cee4674/ce_4674.html

Additional topics:

Visual and navigation aids, Instrument and Visual Flight Rules, Aircraft characteristics.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understand the detail concepts of the airport engineering.	2
PECE -701B-18.2	Estimate the geometric design characteristics of taxiways and runway	5
PECE -701B-18.3	Suggest the runway orientation and the runway length as per FAA & ICAO guidelines.	5
PECE -701B-18.4	Understanding the pavement evaluation techniques and design the overlay for runways and taxiways.	2
PECE -701B-18.5	Specify the guidelines and procedure for the design of flexible and rigid pavement for runways.	6
PECE -701B-18.6	Conceptualise Pavement management system for maintenance	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3		2	1					1					2
CO3	3		3	2					1					3
CO4	3	2	2	2					1					2
CO5	3	2	2	2					1					2

CO6	3		2	`								1	

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OECE-701-18: METRO SYSTEMS AND ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: METRO SYSTEMS AND ENGINEERING	**SEMESTER:** VII/VIII
COURSE CODE: OECE-701-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Metro systems** Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.	04
II	**Planning and Development** Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;	06
III	**Traffic Management Systems** Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems- permanent way. Facilities Management Module	08
IV	**Signalling Systems** Introduction to Signalling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	06
V	**Electrical Systems** OHE, Traction Power; Substations-TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air	06

	mechanics.	
VI	**Mechanical Systems** Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators	06

Total hours – 36

TEXT /REFERENCE BOOKS

1.	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2.	"Metropolitan Railways: Rapid Transit in America (Railroads Past and Present)",Middleton, Indiana University Press 2013.
3.	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

T/R	Book title suggested by faculty
1	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

E- content used:
https://coursecontent.indusuni.ac.in/wp-content/uploads/sites/8/2020/05/METRO-SYSTEMS-AND-ENGINEERING_CV0425_OE-5_UNIT-1.pdf

Additional topics:

Case studies: Baltimore Metro Subway Link, Moscow Metro, Kyoto Municipal Subway, Delhi Metro Rapid Metro Express.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects study
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
OECE-701-18.1	Understand overview of metro systems.	2
OECE-701-18.2	Analyse vehicle dynamics and structure; tunnel ventilation	4

	systems; electrical systems.	
OECE-701-18.3	Understanding electronic signalling systems and automatic fare collection.	2
OECE-701-18.4	Understand the basics of construction planning & management.	2
OECE-701-18.5	Evaluate the construction quality & safety systems	5
OECE-701-18.6	Acquiring the knowledge of mechanical systems in context of metro systems engineering.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3	3		2	3								1	
CO3	3													
CO4	2										3			
CO5	2	2		1										
CO6	3													

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HOD

PECE -701B-18: SOLID AND HAZARDOUS WASTE MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID AND HAZARDOUS WASTE MANAGEMENT	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction:** Definition of solid wastes and hazardous wastes, Nuisance potential and extent of solid waste problems, Objectives and scope of integrated solid waste management. **Collection, Storage and Transportation of Wastes:** Types of collection systems and their components, Concept of waste segregation at source and recycling and reuse of wastes.	08
II	**Solid Waste Processing and Treatment:** Waste processing – processing technologies –biological and chemical conversion technologies–Composting-thermal conversion technologies-energy recovery.	12
III	**Hazardous Waste Treatment and Disposal:** Biological and chemical treatment of hazardous wastes; Solidification and stabilization of wastes; Incineration for the treatment and disposal of hazardous wastes; Land farming; Landfill disposal of hazardous waste; Bioremediation of hazardous waste disposal sites.	12
IV	**Sanitary Landfills:** Design, development, operation and closure of landfills, Management of leachate and landfill gases, environmental monitoring of landfill sites.	06
V	**Legal Requirements:** Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, fly ash, etc.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press
2.	Vesilind, P.A., Solid Waste Engineering, Thomson Learning Inc.
3.	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill
4.	Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engg.", McGraw Hill
5.	CPHEEO, *Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization*, Government of India

T/R	Book title suggested by faculty
1	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill

2	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press

E- content used:
https://nptel.ac.in/courses/120108005

Additional topics:

Resource Conservation and Recovery Act, Health and Safety at Work Act, Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments and Reauthorization Act.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Case studies

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.	2
PECE -701B-18.2	Knowledge of waste processing technologies and various waste treatment methods	2
PECE -701B-18.3	Become aware of Environment and health impacts solid waste mismanagement.	2
PECE -701B-18.4	Understand engineering, financial and technical options for waste management.	2
PECE -701B-18.5	Plan, design, manage and operate sanitary landfills for effective waste management.	6
PECE -701B-18.6	Knowledge of legal, institutional and financial aspects of management of solid wastes	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2				2									
CO3							2							
CO4	2						2				3			
CO5	3	2	3	1	2		2				2		2	3
CO6						2	2				2			

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PECE-703F-18: URBAN HYDROLOGY AND HYDRAULICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: URBAN HYDROLOGY AND HYDRAULICS	**SEMESTER:** VII/VIII
COURSE CODE: PECE-703F-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction-** Trends of Urbanization and Industrialization, Urban water supply demand forecast, urban hydrological cycle.	08
II	**Urban water Management-** Rain water harvesting, managed aquifer recharge, effect of water management practices on urban water infrastructure, hydrology and ground water regime, mapping of water supply and sewage networks. **Urban water Infrastructure-** water supply, sanitation, sewerage and wastewater conveyance infrastructures, Water supply and sewerage network hydraulics, Structural safety and mitigating plans against natural and human caused threats.	14
III	**Urban Storm water-** Master drainage plans, Estimation of urban stormwater quantity, Wastewater collection systems, Design of storm sewer network systems, Storage facilities. Interaction between urban drainage and solid waste management, Stormwater Management, Operation and maintenance of urban drainage system.	12
IV	**Sustainable Design-** Sustainable urban designs, Methodologies for assessing sustainability of urban water infrastructures, Emerging sustainable materials and design procedures for water supply and sewerage pipelines, determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2.	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.
3.	Hall, M.J., (1984), *"Urban Hydrology*", Elsevier Applied Science Publishers.
4.	Mays, L.W., Hydraulic Design Handbook, McGraw-Hill, 1999

T/R	Book title suggested by faculty
1	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.

E- content used:
https://nptel.ac.in/courses/105104029

Additional topics:

Urban Runoff hydrology, Urban Runoff pollution, Stormwater best management practices.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instruction
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-703F-18.1	Build understanding of hydrological aspects of water resources.	2
PECE-703F-18.2	Develop competence to propose effective convergence and design features of water supply projects.	6
PECE-703F-18.3	Outline the principles of engineered systems for aeration in wastewater treatment.	6
PECE-703F-18.4	Recommend principles of need-based activities such as pumps, mixers related to water.	6

PECE-703F-18.5	Illustrate the application of pipe flow and open channel flow in water distribution networks and sewers.	2
PECE-703F-18.6	Formulate the effective use of surface and ground water sources.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	3	2	2								2	3
CO3	2													
CO4	3	2	3	2	2							2	2	3
CO5	3	2		2	1									
CO6	2		2										2	

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HSMC -255: PROFESSIONAL PRACTICE, LAW & ETHICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: PROFESSIONAL PRACTICE, LAW & ETHICS	**SEMESTER:** VII/VIII
COURSE CODE: HSMC -255	**CREDITS:** 2
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Professional Ethics** – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.	04

II	***General Principles of Contracts Management: Indian Contract Act, 1972 and amendments*** covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms.	05
III	***Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:*** Arbitration –meaning, scope and types – distinction between laws of 1940 and 1996;UNCITRAL model law –Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat.	05
IV	**Engagement *of Labour and Labour & other construction-related Laws:*** Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	04
V	***Law relating to Intellectual property:*** Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2.	The National Building Code, BIS, 2017
3.	RERA Act, 2017
4.	Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5.	Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6.	Anson W.R. (1979), Law of Contract, Oxford University Press
7.	Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
8.	Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
9.	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
10.	O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

T/R	Book title suggested by faculty
1	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974
2	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

E- content used:
https://nptel.ac.in/courses/110105097

Additional topics:

Accounts-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects
Class room discussions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)

HSMC -255.1	Understanding basic purpose of profession, professional ethics and various moral and social issues.	2
HSMC -255.2	Awareness of professional rights and responsibilities of an Engineer, safety and risk benefit analysis of an Engineer	2
HSMC -255.3	Understanding professional ethical values and contemporary issues	6
HSMC -255.4	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels	2
HSMC -255.5	Awareness of Law relating to Intellectual property	2
HSMC -255.6	Excelling in competitive and challenging environment to contribute to industrial growth.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2		3		1				
CO2						2		3		1				
CO3						2		3						
CO4						2		3						
CO5						2		3						
CO6						2	2	3	2	3	2			

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Study Scheme & Syllabus of

Bachelor of Technology

Civil Engineering

(3rd -8th Semester, 2020 batch)

DEPARTMENT OF CIVIL ENGINEERING

BHAI GURDAS INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPROVED BY AICTE, NEW DELHI, AFFILIATED TO IKGPTU, JALANDHAR

INDEX
SCHEME: B. TECH 3RD SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2020

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-301-18	Surveying & Geomatics	3-1-0	4	4
B	BTCE-302-18	Solid Mechanics	3-0-0	3	3
C	BTCE-303-18	Fluid Mechanics	3-0-0	3	3
D	BTAM-301-18	Mathematics-III (Transform & Discrete Mathematics)	4-0-0	4	4
E	BTEC- 305-18	Basic Electronics & Applications in Civil Engineering	3-0-0	3	3
F	HSMC-132-18	Civil Engineering- Introduction, Societal & Global Impact	3-0-0	3	3
G	BTCE-306-18	Surveying & Geomatics Lab	0-0-2	2	1
H	BTCE-307-18	Fluid Mechanics Lab	0-0-2	2	1
I	BTCE-308-18	Solid Mechanics Lab	0-0-2	2	1
J	BMPD-301-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-301-18: SURVEYING & GEOMATICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS	**SEMESTER:** III
COURSE CODE: BTCE-301-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-306-18	**LAB COURSE NAME:** SURVEYING & GEOMATICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Surveying:** Principles, Survey stations, Survey lines-ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction, Levelling: Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; Contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three-point problem only).	10
II	**Triangulation and Trilateration:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline choices - extension of base lines - corrections - Trigonometric levelling.	12
III	**Curves:** Elements of simple and compound curves – Method of setting out transition curve – length of curve – Elements of transition curve. **Photogrammetry Surveying:** Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping-mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	10
IV	**Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based). **Remote Sensing:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2.	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications
3.	Agor, R., Surveying, Khanna Publishers
4.	Bhavikatti, S.S., Surveying & Levelling Volume I & II

T/R	Book title suggested by faculty
1	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications

E- content used:
https://nptel.ac.in/courses/105107122

Additional topics:

Chain and Tape survey (Corrections), Overview of Indian Topographic Map, Reliability and Quality of Measurement.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team teaching method
Apparatus demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-301- 18.1	Understand the concept, various methods and techniques of surveying.	2
BTCE-301- 18.2	Compute angles, distances and levels for given area.	5
BTCE-301- 18.3	Apply the concept of tachometry survey in difficult and hilly terrain.	3
BTCE-301- 18.4	Select appropriate instruments for data collection and survey purpose.	1

BTCE-301- 18.5	Analyze and retrieve the information from remotely sensed data and interpret the data for survey.	4
BTCE-301- 18.6	Understand the concepts related to GIS and GPS and analyse the geographical data.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	1				2			1	1	1
CO2	3	2	2	2	2				2			1	1	2
CO3	3	2	2	2	2				2			1	1	1
CO4	2	2	3	2	3				1			2	2	2
CO5	1	2	2	3	2				1			2	2	1
CO6	2	1	1	2	3							2	2	1

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BTCE-302-18: SOLID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-302-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-308-18	**LAB COURSE NAME:** SOLID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concept of Equilibrium**: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem. **Stresses and Strains**: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain,	08

	Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.	
II	**Principal Stresses and Strains:** Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress. **Shear Force and Bending Moment Diagrams**: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.	10
III	**Slope and deflection-** Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. **Bending and Shear Stresses:** Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross-sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.	08
IV	**Columns and Struts**: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load. **Torsion of Circular Shafts**: Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending. **Stresses and strains in thin cylinders:** spherical shells subjected to internal pressures; Normal stress, tangential stress.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2.	'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3.	'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4.	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5.	'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.

6.	'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7.	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

T/R	Book title suggested by faculty
1	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.
2	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.

E- content used:
https://nptel.ac.in/courses/112102284

Additional topics:

Mathematical Concepts: Working with Vectors & Tensors, Theories of Failure, Moment of Inertia for different types of bodies/shapes.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-302- 18.1	Understand the concept of static equilibrium, deformations, and material constitutive behaviour.	2
BTCE-302- 18.2	Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyse structural members subjected to tension, compression and torsion.	3
BTCE-302- 18.3	Apply the concept of Mohr's circle in the stress/strain calculations.	3
BTCE-302- 18.4	Develop SFD and BMD for different type of beams subjected to different types of loads.	6
BTCE-302- 18.5	Plot elastic curves for beams undergoing displacements under different loadings.	6

BTCE-302- 18.6	Understand the behaviour of columns and struts under axial loading.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	1	2								2	1	
CO3	3	2	3	3	1								2	2
CO4	3	2	3	3	1								3	2
CO5	2	3	3	2	2								2	3
CO6	2	2		1								1		

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BTCE-303-18: FLUID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-303-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-307-18	**LAB COURSE NAME:** FLUID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Concepts and Definitions** – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics** - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	08

II	**Fluid Kinematics** - Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates. **Fluid Dynamics -** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	10
III	**Laminar Flow & Turbulent Flow** - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel. **Boundary Layer Analysis**- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.	10
IV	**Open Channel Flow** - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2.	Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth
3.	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker
4.	Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman

5.	Fluid Mechanics: Streetes VL & Wylie EB;
6.	Fluid Mechanics by Potter, Cengage Learning

T/R	Book title suggested by faculty
1	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker

E- content used:
https://nptel.ac.in/courses/112104118

Additional topics: Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-303- 18.1	Understand the basic terms used in fluid mechanics and its broad principles	2
BTCE-303- 18.2	Estimate the forces induced on a plane/ submerged bodies.	5
BTCE-303- 18.3	Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.	5
BTCE-303- 18.4	Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.	3
BTCE-303- 18.5	Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.	5
BTCE-303- 18.6	Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	2	2								2	2	
CO3	3	2	2	1								2	2	3
CO4	3	2	3	3	1							2	3	3
CO5	3	3	1	2									2	1
CO6	2	3	3	2	2							2	2	3

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BTAM-301-18: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)	**SEMESTER:** III
COURSE CODE: BTAM-301-18	**CREDITS:** 4
COURSE TYPE: BASIC SCIENCE COURSE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Vector Calculus-I:** Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.	10
II	**Vector Calculus-II:** Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.	11
III	**Transforms Calculus-I:** Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution	10

	theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.	
IV	**Transforms Calculus-II:** Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications	11

Total hours – 42

TEXT /REFERENCE BOOKS

1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3.	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4.	Thomas and Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 2017.
5.	R. K. Jain and S.R.K Iyengar Advanced Engineering Mathematics, 5th Edition, 2017.

T/R	Book title suggested by faculty
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

E- content used:
https://nptel.ac.in/courses/111105121

Additional Topics:

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Small Group Instructions
Problem solving

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTAM-301-18.1	Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.	2

BTAM-301-18.2	Find length, area and volume using integral calculus that is an important application in engineering.	5
BTAM-301-18.3	Solve some real problems in engineering using Gauss Divergence and Stokes' theorem	5
BTAM-301-18.4	Understand the concept of orthogonal curvilinear coordinates and the applications of Green, Gauss and Stokes Theorems.	2
BTAM-301-18.5	Formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.	5
BTAM-301-18.6	Formulate Fourier Series, its properties and its applications to solve problems in engineering.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1									1	
CO2	2		2		1									1
CO3	1	2		2										
CO4	1		2		1								1	
CO5	2	1	1	1										
CO6	2			1									1	1

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BTEC- 305-18: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING	**SEMESTER:** III
COURSE CODE: BTEC- 305-18	**CREDITS:** 3
COURSE TYPE: ENGINEERING SCIENCE COURSE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE	**LAB COURSE NAME:** NA

(IF ANY): NA	

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications.	08
II	**Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.	08
III	**Operational Amplifiers and Applications -** Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.	10
IV	**Digital Electronics** -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K-Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2.	SantiramKal (2002), Basic Electronics- Devices, Circuits and IT undamentals, Prentice Hall, India. 3.Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education.
3.	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
4.	R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson.

T/R	Book title suggested by faculty

1	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH

E- content used:
https://nptel.ac.in/courses/122106025

Additional topics:

Basic laws and theorems in Basic Electronics, Wave Shaping using Diodes

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC- 305-18.1	Identify areas of application of electronics in civil engineering.	2
BTEC- 305-18.2	Understand construction of diodes and their rectifier applications.	1
BTEC- 305-18.3	Appreciate the construction and working bipolar junction transistors and MOSFETs.	6
BTEC- 305-18.4	Design Op-Amp IC based fundamental applications.	1
BTEC- 305-18.5	Appraise the use of integrated circuits in civil engineering applications.	2
BTEC- 305-18.6	Comprehend working of basic elements of digital electronics and circuits.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1		1					2		2	1		
CO2	2				2				1		1			
CO3	2				2				1		1			
CO4	2		2		2						1		1	
CO5	1	1			2						1		1	
CO6					2						1		1	

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HSMC-132-18: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT	**SEMESTER:** III
COURSE CODE: HSMC-132-18	**CREDITS:** 3
COURSE TYPE: HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Civil Engineering and its historical developments;** Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.	08
II	**Understanding the past to look into the future**; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.	10
III	**Infrastructure development and growth of the Nation**; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals,	08

	Tunnels, bridges.	
IV	**Energy Generation**: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Salvadori, M and Heller, M, Strctures in Architectures, PHI.
2.	Fintel, C, Handbook of Civil Engineering, CBS Publications.
3.	*Žiga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
4.	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
5.	NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004

T/R	Book title suggested by faculty
1	Fintel, C, Handbook of Civil Engineering, CBS Publications.
2	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition.

E- content used:
https://www.dce-darbhanga.org/wp-content/uploads/2020/04/file_5e8ca9c9a4968.pdf

Additional topics: Present and future scenario of energy generation methods.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team Teaching Method
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
HSMC-132-18.1	Introduction to what constitutes Civil Engineering	1
HSMC-132-18.2	Understanding the vast interfaces this field has with the society at large	2
HSMC-132-18.3	Providing inspiration for doing creative and innovative work for the benefit of the society	1
HSMC-132-18.4	Need to think innovatively to ensure Sustainability	1
HSMC-132-18.5	Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field	2
HSMC-132-18.6	Illustrate the Futuristic engineering systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1											1		
CO2						2	1	1						
CO3					2	3	2	2					2	
CO4						2	3						2	
CO5												2		
CO6	2				2							2		

Prepared by **Approved By**

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BTCE-306-18: SURVEYING & GEOMATICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-306-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
II	Different methods of leveling, height of instrument, rise & fall methods.
III	Measurement of horizontal and vertical angle by theodolite.
IV	Determination of tachometric constants and determination of reduced levels by tachometric observations.
V	Plane table survey, different methods of plotting, three-point problem.
VI	Determination of height of an inaccessible object.
VII	Setting out of circular curves in the field using different methods.
VIII	Plotting of traverse using the Total Station and GPS.

Total hours – 20

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-306- 18.1	Assess horizontal & vertical angles by Theodolite.	5
BTCE-306- 18.2	Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.	1
BTCE-306- 18.3	Compute the reduce levels using various methods of levelling.	5
BTCE-306- 18.4	Predict the location of any point horizontally and vertically using Tachometry.	3
BTCE-306- 18.5	Setting out curves in the field.	3
BTCE-306- 18.6	Use electronic survey instruments.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2

CO1	2	2		2	1				2			1	2	
CO2	2	2	1	2	1				2			1	1	1
CO3	2	2	2	1	2				2			1	2	1
CO4	2	2			1				2					
CO5	2	2			1				2					
CO6	2	2		1	2				1				2	

BTCE-307-18: FLUID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-307-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges.
II	To verify Bernoulli's Theorem
III	To determine the Meta centric height of a Floating Body under different condition.
IV	To determine the coefficient of discharge of a Venturimeter.
V	To determine the coefficient of discharge of a Orifice Meter
VI	To determine the coefficient of friction of different diameter pipes.
VII	To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
VIII	To determine the coefficient of discharge on rectangular and V-notches.
IX	To determine the various element of a hydraulic jump.

Total hours – 18

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2.	Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3.	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4.	Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-307- 18.1	Select appropriate pressure measuring device under different condition of flow.	1
BTCE-307- 18.2	Determine the stability of a floating body.	5
BTCE-307- 18.3	Understand and apply Bernoulli's theorem practically.	2
BTCE-307- 18.4	Find discharge of fluid through pipe, orifices and in open channel.	5
BTCE-307- 18.5	Estimate the major and minor losses in pipe.	5
BTCE-307- 18.6	Estimate the various elements and energy losses in hydraulic jump.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				2							1		
CO2	2	2		1	1							2	1	
CO3	2	2		2					1			1	2	
CO4	2	2		1	2				2			2	2	
CO5	2	2		1	2				1			2	2	
CO6	2	2		1	2				1			2	2	

BTCE-308-18: SOLID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS LAB	**SEMESTER:** III

COURSE CODE: BTCE-308-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of physical properties of steel including strength and ductility.
II	Study of tensile and compressive stress-strain behaviour of steel.
III	Compression test on brick.
IV	Development of shear stress-strain curve for steel in torsion.
V	Determination of hardness of a material by Rockwell and Brinell hardness testing machine.
VI	Determination of impact strength of a material by Izod and Charpy tests.
VII	Determination of bending strength of a wooden beam specimen.
VIII	Determination of fatigue strength of a material.
IX	Study of behavior of columns and struts with different end conditions.
X	To verify the moment area theorem for slope and deflection of a given beam.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-308- 18.1	Understand the importance of physical properties of steel.	2
BTCE-308- 18.2	Identify and comprehend code provisions for testing different properties of steel.	1
BTCE-308- 18.3	Develop stress-strain curve for axial compression, axial tension and shear.	1

BTCE-308- 18.4	Assess hardness and impact strength of steel.	5
BTCE-308- 18.5	Assess flexural strength of a given material.	5
BTCE-308- 18.6	Evaluate fatigue and impact strength of steel.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		1
CO2	2	1		1								2		2
CO3	2	3	3	1	1				2			2	3	1
CO4	2	1			2							1	1	
CO5	2	1			2				2			1	1	
CO6	2	1			2				2			1	1	

BTCE-308-18: TRAINING -I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRAINING -I	**SEMESTER:** III
COURSE CODE: BTCE-308-18	**CREDITS:** --
COURSE TYPE: Professional Skill Enhancement	**CONTACT HOURS:** --

SYLLABUS:

EXPERIMENT	DETAILS
I	**Institutional Training (3 weeks)** 5. Hands-on-training on MS Office/ Office suite (Word processor, Spreadsheet, Math tools, presentation/ ppt, etc.) 6. Introduction to Civil Engineering software's and basic overview of drafting tools such as AutoCAD, etc.
II	**Field and Market Study** 5. Student shall visit construction site of significantly scale and make an inventory construction and finishing materials being used. 6. Student shall do Market Survey for availability and rates of materials in the already prepared inventory.

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-332- 18.1	Visualize things/ concepts and express the thoughts in the form of sketches, models, etc	1
BTCE-332- 18.2	Create a well-organized document using computers	6
BTCE-332- 18.3	Work in teams	1
BTCE-332- 18.4	Acknowledge the work of other in a consistent manner	1
BTCE-332- 18.5	Understanding of ethical and professional issues	2
BTCE-332- 18.6	Demonstrate effective oral communication and presentation skills	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1			2				1	2			1	
CO2					2				1	2			2	
CO3									3	2				
CO4									3	1				
CO5							2	3	1	1				
CO6									1	3				

INDEX
SCHEME: B. TECH 4TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2020

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-401- 18	Concrete Technology	3-0-0	3	3
B	BTCE-402- 18	Materials, Testing & Evaluation	4-0-0	4	4
C	BTCE-403- 18	Hydrology & Water Resources Engineering	3-1-0	4	4
D	BTCE-404- 18	Transportation Engineering	3-1-0	4	4
E	BTCE-405- 18	Disaster Preparedness & Planning	3-0-0	3	3
F	EVS-101-18	Environmental Science	2-0-0	2	0
G	BTCE-406- 18	Concrete Testing Lab	0-0-2	2	1
H	BTCE-407- 18	Transportation Lab	0-0-2	2	1
I	BMPD-401-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 20 **Hours: 26**

BTCE-401- 18: CONCRETE TECHNOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TECHNOLOGY	**SEMESTER:** IV
COURSE CODE: BTCE-401- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 406-18	**LAB COURSE NAME:** CONCRETE TESTING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concrete and its ingredients**: Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines. **Concrete behaviour in fresh and hardened states**: Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.	08
II	**Production of concrete**: Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions. **Concrete mix design:** Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.	10
III	**Inspection and testing of concrete**: Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pull-out etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.	09
IV	**Special concretes:** Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self-Healing Concrete.	09

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Properties of Concrete', A. M. Neville, Prentice Hall
2.	'Concrete Technology', M. S. Shetty, S.Chand & Co.
3.	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4.	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi
5.	P Kumar Mehta, Monteiro; Concrete Technology, Indian Concrete Institute

T/R	Book title suggested by faculty
1	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
2	'Concrete Technology', M. S. Shetty, S. Chand & Co.
3	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

E- content used:
https://nptel.ac.in/courses/105102012

Additional topics:

Mix Design of concrete: Packing Density, Rheology, testing of mixing water, Abram's Law.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-401- 18.1	Understand the relevance of different properties of constituent materials on properties of concrete.	2
BTCE-401- 18.2	Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.	2
BTCE-401- 18.3	Understand the issues involved in production and use of concrete.	2
BTCE-401- 18.4	Design of concrete mixes as per BIS specifications.	6
BTCE-401- 18.5	Understand various testing methods for concrete and their applicability.	2

BTCE-401- 18.6	Knowledge of special type of non-conventional concretes.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2													
CO4	3		3		2								2	3
CO5	3	2			2							1	2	1
CO6					3							1	2	

Prepared by **Approved By**

HOD

BTCE-402- 18: MATERIALS, TESTING & EVALUATION

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATERIALS, TESTING & EVALUATION	**SEMESTER:** IV
COURSE CODE: BTCE-402- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes; Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's Bricks; Concrete hollow blocks & Interlocking tiles. Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,	10

II	Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behaviour (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep –fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.	12
III	Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	10
IV	Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regard for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2.	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3.	Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. correspondingto materials used for Civil Engineering applications
4.	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5.	E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6.	American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

T/R	**Book title suggested by faculty**
1	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
2	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition

E- content used:
https://nptel.ac.in/courses/105102088

Additional topics:

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Class discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-402- 18.1	Appraisal about the role of materials in civil engineering	5
BTCE-402- 18.2	Introduce common measurement instruments, equipment and devices to capture the material response under loading	2
BTCE-402- 18.3	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice	2
BTCE-402- 18.4	Ability to write a technical laboratory report.	1
BTCE-402- 18.5	Interpret the observations/ test reports for selection of suitable material.	2
BTCE-402- 18.6	Utilize the relevant information from the standards and guidelines.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		1	2								2	
CO3	2	2		2	1								2	
CO4									2	2				
CO5	1	2		1					1					
CO6	2													

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BTCE-403- 18: HYDROLOGY & WATER RESOURCES ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: HYDROLOGY & WATER RESOURCES ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-403- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction -** Hydrologic Cycle, History of Hydrology, Water-Budget Equation, World Water Balance, Applications in Engineering, Sources of Data. **Precipitation -** Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.	12
II	**Abstractions from precipitation** - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices. **Runoff -** Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.	12
III	**Unit III: Water withdrawals and uses –** Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation. **Distribution systems** - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime	10

	Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets.	
IV	**Water Logging**: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods. **Dams and spillways** - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2.	K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3.	K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4.	G L Asawa, Irrigation Engineering, Wiley Eastern
5.	L W Mays, Water Resources Engineering, Wiley.
6.	J. D Zimmerman, Irrigation, John Wiley & Sons
7.	C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

T/R	Book title suggested by faculty
1	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2	L W Mays, Water Resources Engineering, Wiley.

E- content used:
https://archive.nptel.ac.in/courses/105/103/105103213/

Additional topics:

Water vapour dynamics, Gumbel's method, Thunderstorm Cell Model, Infiltration: Green Amp Equation.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-403- 18.1	Understand the interaction among various processes in the hydrologic cycle.	2
BTCE-403- 18.2	Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc.	5
BTCE-403- 18.3	Understand the various component of hydro graphs and able to estimate the run off.	2
BTCE-403- 18.4	Find the water requirement for different crops and able to proposed appropriate method of applying water.	5
BTCE-403- 18.5	Understand the distribution system of canal and various components of irrigation system.	1
BTCE-403- 18.6	Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	1	2	1				1				1	
CO3	3	2	2	2										
CO4	2	1	3	2	2								1	2
CO5	2				1							1		
CO6	3	2		1										

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BTCE-404- 18: TRANSPORTATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-404- 18	**CREDITS:** 4

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 407-18	**LAB COURSE NAME:** TRANSPORTATION LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction:*** Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport. ***Transportation Systems****:* Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.	10
II	***Highway Development & Planning****:* Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements	12
III	***Railway Engineering****:* History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge. ***Railway Track****:* Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.	12
IV	***Airport Engineering*****:** Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration. ***Aircraft Parking System & Visual Aids****:* Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers,

	Roorkee,1998.
2.	Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3.	Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4.	Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5.	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
6.	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

T/R	Book title suggested by faculty
1	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee,1998.
2	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
3	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

E- content used:
https://nptel.ac.in/courses/105105107

https://archive.nptel.ac.in/courses/105/107/105107123/

Additional topics:

Overview to geometric design of highways, Overview to Mix design methods for construction of flexible pavement, Introduction to superelevation, transition curve in railways, Introduction to railway equipment and junctions.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Student led classrooms
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom’s Level (B.L)
BTCE-404- 18.1	Appreciate the importance of different modes of transportation and characterize the road transportation.	2

BTCE-404- 18.2	Alignment and geometry of pavement as per Indian Standards according to topography.	1
BTCE-404- 18.3	Assess the properties of highway materials in laboratory	5
BTCE-404- 18.4	Understand the importance of railway infrastructure planning and design.	2
BTCE-404- 18.5	Identify the functions of different component of railway track.	2
BTCE-404- 18.6	Outline the importance of Airport Infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2	2			2									
CO4	2		1		1									
CO5	2	1			1									
CO6	2				1									

Prepared by **Approved By**

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BTCE-405- 18: DISASTER PREPAREDNESS & PLANNING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: DISASTER PREPAREDNESS & PLANNING	**SEMESTER:** IV
COURSE CODE: BTCE-405- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction to Disaster Management:*** Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation. ***Disasters****:* Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender, age, special needs), Lessons and experiences from important disasters with specific reference to civil engineering.	10
II	***Disaster Mitigation and Preparedness:*** Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; Preparedness for natural disasters in urban areas. ***Risk Assessment****:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.	08
III	***Post disaster response****:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.	10
IV	***Integration of public policy****:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	www.http//ndma.gov.in
2.	http://www.ndmindia.nic.in
3.	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4.	Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5.	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

6.	Disaster Management, R.B. Singh (Ed), Rawat Publications

T/R	Book title suggested by faculty
1	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
2	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

E- content used:
https://nptel.ac.in/courses/124107010

Additional topics:

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-405- 18.1	Identify various types of disasters, their causes, effects & mitigation measures.	2
BTCE-405- 18.2	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.	2
BTCE-405- 18.3	Understand the use of emergency management system to tackle the problems.	2
BTCE-405- 18.4	Discuss the role of media, various agencies and organisations for effective disaster management.	6
BTCE-405- 18.5	Design early warning system and understand the utilization of advanced technologies in disaster management.	6
BTCE-405- 18.6	Compare different models for disaster management and plan & design of infrastructure for effective disaster management.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	2	1										1		
CO2	1	1	2									1	1	1
CO3	1											1		
CO4						3	2		2	2				
CO5	2		2		3				2	2		1	2	3
CO6		2	3						2	2			1	3

Prepared by **Approved By**

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EVS-101-18: ENVIRONMENTAL SCIENCE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL SCIENCE	**SEMESTER:** IV
COURSE CODE: EVS-101-18	**CREDITS:** 0
COURSE TYPE: BASIC SCIENCES (MANDATORY COURSES)	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Natural Resources: Renewable and non-renewable resources** Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resource: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.	06

II	**Ecosystems** Concept of an ecosystem, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	06
III	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India	06
IV	**Social Issues and the Environment** From Unsustainable to Sustainable development, Resettlement and rehabilitation of people; its problems and concerns., Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies, Public awareness.	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	Textbook of Environmental studies, Erach Bharucha, UGC Weblink: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2.	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
3.	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
4.	Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
5.	Principle of Environment Science by Cunninghan, W.P.
6.	Elements of Environment Science & Engineering by Meenakshi.
7.	Elements of Environment Engineering by Duggal.

T/R	**Book title suggested by faculty**
1	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
2	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

E- content used:
https://evspgdavevening.blogspot.com/p/e-content.html

Additional topics:

Biomedical Waste Management, Environmental Acts and Rules.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Student led classrooms

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
EVS-101-18.1	Understand environmental problems at local and national level through literature and general awareness.	2
EVS-101-18.2	Acquire practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.	2
EVS-101-18.3	Apply interdisciplinary approach to understand key environmental issues and critically analyse them to explore the possibilities to mitigate these problems.	4
EVS-101-18.4	Create awareness among people about protection of wild life & forests.	2
EVS-101-18.5	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.	2
EVS-101-18.6	Understand the need of conservation of natural resources, ecological balance and biodiversity to achieve sustainable development.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1							3			2				
CO2							3			2				
CO3	1	1				2	3		1			1		
CO4						2	3		1	2				
CO5						2	2	2	1	2				
CO6						2	3	1	1	2				

Prepared by **Approved By**

HOD

BTCE-406- 18: CONCRETE TESTING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TESTING LAB	**SEMESTER:** IV
COURSE CODE: BTCE-406- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on cement • Fineness • Consistency • Setting time • Soundness • Specific gravity • Strength
II	Tests on aggregates (fine and coarse) • Specific gravity • Bulk Density • Fineness Modulus • Moisture content • Water Absorption • Bulking of sand
III	Design mix of concrete as per BIS method.
IV	Workability tests on concrete • Slump test • Compaction Factor test • Vee-Bee test
V	Strength tests on concrete • Compressive strength (Cube and Cylinder) • Split Tensile strength • Flexural strength • Abrasion resistance
VI	Non-Destructive Techniques • Rebound hammer test • Ultra-sonic pulse velocity test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	'Concrete Lab Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2.	'Concrete Lab Manual', TTTI Chandigarh.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-406- 18.1	Evaluate properties of building materials, such as cement and aggregates.	5
BTCE-406- 18.2	Conduct experiments and check the acceptance criteria (if any).	4
BTCE-406- 18.3	Design concrete mixes as per BIS provisions.	6
BTCE-406- 18.4	Analyze the properties of concrete in fresh and hardened state.	4
BTCE-406- 18.5	Create a well-organized document and present the results appropriately.	6
BTCE-406- 18.6	Understand and apply non-destructive testing (NDT) for evaluating concrete quality.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				2			1	1	
CO2	2	1		2	1				1			1		
CO3	2	1	3		2				1			1	2	3
CO4	2	2		1	2				1			1	2	
CO5	1								2	3	1	1		
CO6	2	1		1	3				1			1	2	

BTCE-407- 18: TRANSPORTATION LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION LAB	**SEMESTER:** IV
COURSE CODE: BTCE-407- 18	**CREDITS:** 1

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on Sub-grade Soil 1. California Bearing Ratio Test
II	Tests on Road Aggregates 10. Crushing Value Test 11. Los Angles Abrasion Value Test 12. Impact Value Test 13. Shape Test (Flakiness and Elongation Index)
III	Tests on Bituminous Materials and Mixes 20. Penetration Test 21. Ductility Test 22. Softening Point Test 23. Flash & Fire Point Test 24. Bitumen Extraction Test
IV	Field Tests 25. Study of Roughometer/Bump Indicator 26. Study of Benkelman Beam Method

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", NemChand and Brothers, Roorkee.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-407- 18.1	Characterize the pavement materials as per the Indian Standard guidelines.	4
BTCE-407- 18.2	Evaluate the strength of subgrade soil by CBR test.	5
BTCE-407- 18.3	Conduct experiments to evaluate aggregate properties.	5
BTCE-407- 18.4	Determine properties of bitumen material and mixes	5
BTCE-407- 18.5	Evaluate the pavement condition by rough meter and	5

	Benkelman beam test.	
BTCE-407- 18.6	Create a well-organized report and present the results appropriately	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		
CO2	2				1				1			1	1	
CO3	2			1	1				1			1	1	
CO4	2				1				1			1	1	
CO5	2			2	2				1			1	2	
CO6	1								2	3	1	1		

INDEX
SCHEME: B. TECH 5TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2020

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-501-18	Engineering Geology	3-0-0	3	3
B	BTCE-502-18	Elements of Earthquake Engineering	3-0-0	3	3
C	BTCE-503-18	Construction Engineering & Management	3-0-0	3	3
D	BTCE-504- 18	Environmental Engineering	4-0-0	4	4
E	BTCE-505-18	Structural Engineering	3-1-0	4	4
F	BTCE-506-18	Geotechnical Engineering	3-0-0	3	3
G	BTCE-507- 18	Geotechnical Lab	0-0-2	2	1
H	BTCE-508- 18	Environmental Engineering Lab	0-0-2	2	1
I	BTCE-509- 18	Structural Lab	0-0-2	2	1
J	BMPD-501-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 Hours: 28

BTCE-501-18: ENGINEERING GEOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING GEOLOGY	**SEMESTER:** V
COURSE CODE: BTCE-501-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**General Geology:** Scope of geology in Civil Engineering - the earth, its structure and environment - Standard geological time scale, unit & fossils. physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes –weathering – types, weathered products, assessment of degree of weathering, Fluvial processes, glaciation, wind action, and their significance in Civil Engineering.	04
II	**Mineralogy and Petrology:** Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Horn blend, Mica family, calcite, Iron oxide minerals, Augite, Horn blend, and Clay minerals and their behaviour and significance in the field of Civil Engineering. Classification of rock - mode of formation -distinction between igneous, sedimentary and metamorphic rocks. Formation, textures, structure, Classification, and Engineering, Characteristic of rocks. Study of imp rocks granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia, conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate	07
III	**Strength Behaviour of Rocks:** Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold-Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.	07
IV	**Geological Hazards:** Rock Instability and Slope movement: Concept of	08

	sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslides. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence.	
V	**Rock masses as construction material:** Definition of Rock masses. Main features constituting rock mass. Main features that affect the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging. Rock Quality Designation. Rock mass description.	06
VI	**Geology of dam and reservoir site:** Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2.	Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3.	Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
4.	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995
5.	Leggot, R.F.," Geology and Engineers ", McGraw Hill, New York.2002 2.
6.	Blyth, F.G.M., "A Geology for Engineers", Arnold, Londo, (2003.
7.	Bell.F.G, " Fundamentals of Engineering Geology" Butterworth, 1983

T/R	Book title suggested by faculty
1	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995

E- content used:
https://nptel.ac.in/courses/105105106

Additional topics:

Classification of rocks for engineering purposes. Rock quality designation (RQD).

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Topic delivery by students
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-501- 18.1	Understanding geological processes and their importance in civil Engineering	2
BTCE-501- 18.2	Identification of rocks and minerals and their characteristics	2
BTCE-501- 18.3	Significance of geological structures and processes in civil engineering projects	2
BTCE-501- 18.4	Identify the geological hazards associated with civil engineering structures and suggest remedies.	2
BTCE-501- 18.5	Site characterization and geologic considerations in construction	4
BTCE-501- 18.6	Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	1												
CO3	2													
CO4	2	2	2						1				2	
CO5	2	2	2						1					
CO6	2	2	1	2					1				2	

Prepared by **Approved By**

HOD

BTCE-502-18: ELEMENTS OF EARTHQUAKE ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ELEMENTS OF EARTHQUAKE ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-502-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.	04
II	Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.	04
III	Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.	08
IV	Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.	06
V	Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.	06
VI	Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.	04
VII	Introduction to provisions of IS 4326. Unit 8: Introduction to provision of IS 13920.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2.	Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra,

	Prentice Hall
3.	Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4.	Structural Dynamics by Mario & Paz, Springer.
5.	Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6.	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7.	IS 1893-2016Indian Standard Criteria for Earthquake Resistant Design of Structures.
8.	IS 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9.	IS 13920:2016- Ductile design and detailing of Reinforced Concrete Structures subjected to Seismic Forces-code of practice

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Seismic Soil-Structure Interaction: soil effect on the ground motion characteristics, Effect of Surface Topography.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-502- 18.1	Appreciate the role of earthquake forces in structural design of building.	2
BTCE-502- 18.2	Develop an understanding of structural defects due to earthquakes by studying past earthquakes	3

BTCE-502- 18.3	Acquire basic knowledge of concept of vibrations in earthquake engineering	2
BTCE-502- 18.4	Analyse the behaviour of structures under dynamic loads	4
BTCE-502- 18.5	Understand engineering seismology, ductility requirement & structural configurations.	2
BTCE-502- 18.6	Apply various codal provisions related to seismic design of buildings.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		2									1	
CO3	3													
CO4	3	3		2					1				2	
CO5	3													
CO6	2	2											2	2

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BTCE-503-18: CONSTRUCTION ENGINEERING & MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONSTRUCTION ENGINEERING & MANAGEMENT	**SEMESTER:** V
COURSE CODE: BTCE-503-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS

I	Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.	03
II	Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.	06
III	Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.	04
IV	Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.	04
V	Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow,sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling-Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction.	05
VI	Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project	06

	sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.	
VII	Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.	05
VIII	Construction Costs: Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.	03

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Varghese, P.C., "*Building Construction"*, Prentice Hall India, 2007.
2.	*National Building Code,* Bureau of Indian Standards, New Delhi, 2017.
3.	Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
4.	Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5.	Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6.	Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7.	Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Cost Analysis: Determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Projects study

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-503- 18.1	An understanding of modern construction practices	2
BTCE-503- 18.2	A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics	2
BTCE-503- 18.3	A basic ability to plan, control and monitor construction projects with respect to time and cost	6
BTCE-503- 18.4	An idea of how to optimise construction projects based on costs	2
BTCE-503- 18.5	An idea how construction projects are administered with respect to contract structures and issues.	2
BTCE-503- 18.6	An ability to put forward ideas and understandings to others with effective communication processes	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				3									
CO2	2				2				2		3			
CO3	2		1						2		3			3
CO4	2	2	2	1					2		3		1	2
CO5	2		1	1					2		3		1	2
CO6	2									3				1

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BTCE-504-18: ENVIRONMENTAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-504-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 508-18	**LAB COURSE NAME:** ENVIRONMENTAL ENGINEERING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	*Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. *Water Treatment:* aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes	08
II	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage-Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water-Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.	10
III	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution.	06
IV	*Noise*- Basic concept, measurement and various control methods.	04
V	*Solid waste management*-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management.	10

VI	*Building Plumbing*-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Storage tanks, building drainage for high rise buildings, various kinds of fixtures and fittings used.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2.	Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3.	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
4.	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
5.	Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6.	Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7.	Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8.	Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development

T/R	Book title suggested by faculty
1	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
2	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low-cost treatment techniques.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations
Inquiry guided instructions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-504- 18.1	Understanding the principles of water treatment processes, their design and distribution systems.	2
BTCE-504- 18.2	Be able to apply the knowledge for selecting the most appropriate technique for the treatment of wastewater.	3
BTCE-504- 18.3	Identify the major sources, effects and monitoring of air pollutants.	2
BTCE-504- 18.4	Impart knowledge on the sources, effects and control techniques of noise pollution.	2
BTCE-504- 18.5	Understand the fundamental principles of existing and emerging technologies for the solid waste management	2
BTCE-504- 18.6	Identify various plumbing systems provided in the buildings.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		1											2
CO2	2	2			2								2	
CO3	2	2					2							
CO4	2	2			1		2							
CO5	2				2		1							
CO6	2	2												

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HOD

BTCE-505-18: STRUCTURAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: STRUCTURAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-505-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 509-18	**LAB COURSE NAME:** STRUCTURAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction** Structural Engineering, role of structural engineer, engineer, architect, builder; Objectives of designing a structure, safety, sustainable development in performance.	08
II	**Structural Analysis** Concept of determinacy and indeterminacy, Analyses of indeterminate beams, frames and trusses using Slope deflection method, Moment distribution method, unit load method and castiglano's theorem.	12
III	**Design of concrete Elements** Design Philosophies of Working Stress Method and Limit State Method, Design of Reinforced Concrete Beams for Flexure, Shear; Bond, Anchorage, development length and torsion; Reinforced Concrete Axially Loaded Columns, Reinforced Concrete Slabs: One Way and Two Way.	12
IV	**Design of Steel Elements** Properties of structural steel, I.S. rolled sections, I.S. specifications; Connections- Bolted and welded connections for axial loads; Tension members: Design of members subjected to axial tension; Compression members: Design of axially loaded members, built-up columns, laced and battened columns; Flexural members: Design of laterally restrained and un-restrained rolled section beams.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
2.	McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
3.	Intermediate Structural Analysis - C K Wang, McGraw hill publications.
4.	Limit state design of steel structures: S K Duggal, Mc Graw Hill.

5.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.
6.	Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
7.	NBC, National Building Code, BIS (2017).
8.	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
9.	Theory of structures - B.C. Punima, Laxmi Publications.
10.	Reinforced concrete design - Pillai & Menon, Tata McGrawHill publications

BIS Codes of practice and Design Handbooks:

1.	*IS 456-2000- Indian Standard. Plain and Reinforced concrete -Code of practice
2.	*Design Aid SP 16
3.	*IS 800: 2007 (General construction in steel-Code of practice)*
4.	*SP: 6(1) (Handbook for structural engineers-Structural steel sections
5.	Explanatory hand book SP24.
6.	Detailing of Reinforcement SP 34

T/R	Book title suggested by faculty
1	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
2	Limit state design of steel structures: S K Duggal, Mc Graw Hill.
3.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Introduction to Moving Loads and Influence Line Diagrams, Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-505- 18.1	Apply their knowledge of structural mechanics in addressing design problems of structural engineering	3
BTCE-505- 18.2	Possess the skills to analyse and design concrete and steel structures	4
BTCE-505- 18.3	Knowledge of structural engineering	2
BTCE-505- 18.4	Understand the various design philosophies related to reinforced concrete structures	2
BTCE-505- 18.5	Analyse and design the safe RCC structural members	6
BTCE-505- 18.6	Design various steel structure members i.e., connections, tension members, compression members and flexural members	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									1	2
CO2	3	3	3	2	2				2				2	3
CO3	3													
CO4	3	2	2											2
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

Prepared by **Approved By**

HOD

BTCE-506-18: GEOTECHNICAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-506-18	**CREDITS:** 3

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 507-18	**LAB COURSE NAME:** GEOTECHNICAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Basic Concepts***- Definition of soil, Comparison between soil mechanics, rock mechanics and geotechnical engineering, Scope of soil mechanics problems in Civil Engineering. Principal types of soils in India. Characteristics of main Clay mineral groups. Soil as three phase system: weight volume relationship and determination of moisture content from nuclear method, alcohol method and sensors. Determination of Specific gravity by density bottle method, pycnometer method. Field density from sand replacement method and other methods. ***Index Properties***: Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse- and fine-grained soils as per Indian Standard.	08
II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis-Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. ***Effective Stress Principle***- Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.	10
III	***Compaction of Soil***-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. ***Consolidation of Soil*** - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, Concept of various consolidation characteristics i.e., av, mv and cv, primary and secondary consolidation concept of cv, tv& U. Consolidation test: determination of cv from curve fitting methods, Pre consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect disturbance on e-Log σ curves of normally consolidated clays, importance of consolidation settlement in the design of structures. final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.	10

IV	***Shear Strength***- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test ***Stability of Slopes***- Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S. Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M. Das Cengage Publisher
7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers.

T/R	**Book title suggested by faculty**
1	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
2	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons

E- content used:
https://nptel.ac.in/courses/105101201

Additional topics:

Soil particle structures, Derivation of skempton's pore pressure parameters, sliding block analysis, Earth pressures under applied load.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-506- 18.1	Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	2
BTCE-506- 18.2	Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of permeability, total and effective stress approaches in soil strength determination	4
BTCE-506- 18.3	Apply the various specifications of compaction of soils in the construction of highways and earthen dams.	3
BTCE-506- 18.4	Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.	3
BTCE-506- 18.5	Evaluate shear strength and permeability parameters of different soils	5
BTCE-506- 18.6	Design the embankment slopes and check the stability of finite slopes.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3	2	2	2						2			2	2
CO3	3	2	2										2	
CO4	3	2	2	1									2	
CO5	3	2	2	1									2	
CO6	3	2	3	1	2				2				2	3

Prepared by **Approved By**

HOD

BTCE-507- 18: GEOTECHNICAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-507- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of in-situ density by core cutter method and Sand replacement method.
II	Determination of Liquid Limit & Plastic Limit.
III	Determination of specific gravity of soil solids by pyconometer method.
IV	Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
V	Compaction test of soil.
VI	Determination of Relative Density of soil.
VII	Determination of permeability by Constant Head Method.
VIII	Determination of permeability by Variable Head method.
IX	Unconfined Compression Test for fine grained soil.
X	Direct Shear Test
XI	Triaxial Test
XII	Swell Pressure Test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain. Nem Chand & Brothers.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-507- 18.1	Comprehend the procedure for classifying coarse grained and fine-grained soils	2
BTCE-507- 18.2	Evaluate the index properties of soil	5
BTCE-507- 18.3	Determine the engineering properties of soil	5
BTCE-507- 18.4	Interpret the results of compaction test for relative compaction in the field	4
BTCE-507- 18.5	Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis	3
BTCE-507- 18.6	Conduct experiments, analyse and interpret results for geotechnical engineering design	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							2					
CO2	3	2	1						2				1	
CO3	3	2	1						2				1	
CO4	3	2							2				1	
CO5	3	2		1	3				2			2	2	
CO6	3	2	2						2				1	2

BTCE-508- 18: ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING LAB	**SEMESTER:** V
COURSE CODE: BTCE-508- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To measure the pH value of a water/waste water sample.

II	To determine optimum Alum dose for Coagulation.
III	To find MPN for the bacteriological examination of water.
IV	To find the turbidity of a given waste water/water sample
V	To find B.O.D. of a given waste water sample.
VI	To measure D.O. of a given sample of water.
VII	Determination of Hardness of a given water sample
VIII	Determination of total solids, dissolved solids, suspended solids of a given water sample.
IX	To determine the concentration of sulphates in water/wastewater sample.
X	To find chlorides in a given sample of water/waste water.
XI	To find acidity/alkalinity of a given water sample
XII	To determine the COD of a wastewater sample.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2.	Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-508-18.1	Conduct experiments as per standard methods of sampling and analysis.	2
BTCE-508-18.2	Demonstrate the expertise to characterize water and wastewater samples.	5
BTCE-508-18.3	Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.	5
BTCE-508-18.4	Record the experimental observations and interpret the analysis results.	4
BTCE-508-18.5	Use the analysis results for making informed decision about the potability of water and disposal of wastewater.	3

BTCE-508-18.6	Recognize the working of air pollution monitoring equipment and noise meter.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2			1				2					
CO2	3	2			1				2					
CO3	3	1			1				2					
CO4	2	2	1		2				2				2	
CO5	2	2	2	1	2				2				1	
CO6	2	2			2				2				2	

BTCE-509-18: STRUCTURAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-509- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
II	To determine the Flexural Rigidity of a given beam.
III	Deflection of a fixed beam and influence line for reactions.
IV	Deflection studies for a overhang beam and influence line for reactions.
V	Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
VI	Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams,

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Dally J W, and Riley W F, "Experimental Stress Analysis", McGraw-Hill Inc. New York, 1991.
2.	Harrison H.B., "Structural Analysis and Design Vol.I and II", Pergamon Press, 1991

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-509-18.1	Verify theoretical formulas by conducting experiments.	4
BTCE-509-18.2	Predict the behaviour of statically determinate beams and trusses.	6
BTCE-509-18.3	Depict the behaviour of two hinged arch and three hinged arch structures.	4
BTCE-509-18.4	Demonstrate the influence lines for statically determinate and indeterminate beams.	2
BTCE-509-18.5	Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.	5
BTCE-509-18.6	Outline the deflected shapes of columns and struts with different end conditions.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							1					
CO2	3	2	2						1					
CO3	3	2	2						1					
CO4	3	2	2	1					1					
CO5	3	2	1	2					1					
CO6	3	2	1	2					1					

INDEX
SCHEME: B. TECH 6TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2020

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-601-18	Engineering Economics, Estimation & Costing	3-1-0	4	4
B	PECE-602A-18	Foundation Engineering	3-1-0	4	4
C	PECE-603D-18	Structural Analysis and Design	3-1-0	4	4
D	PECE-604B-18	Sustainable Construction Methods	3-1-0	4	4
E	BTEE-603D-18	Wind And Solar Energy Systems	3-0-0	3	3
F	BTES 401-18	Computer Organization & Architecture	3-0-0	3	3
G	BTMC101-18	Constitution of India	3-0-0	3	0
H	BMPD-601-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 22 Hours = 27

BTCE-601-18: ENGINEERING ECONOMICS, ESTIMATION & COSTING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING ECONOMICS, ESTIMATION & COSTING	**SEMESTER:** VI
COURSE CODE: BTCE-601-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Principles of Economics** Demand/Supply – elasticity – Basic Macroeconomic Concepts (including GDP/GNP/NI/ Disposable Income), Aggregate demand and Supply (IS/LM), Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.	04
II	**Elements of Business/Managerial Economics** Cost & Cost Control -Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money.	06
III	**Estimation / Measurements for various items** Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.	08
IV	**Specifications** Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.	06
V	**Rate analysis**: Purpose, importance and necessity of the same, factors affecting, task work,	06

	daily output from different equipment/ productivity.	
VI	**Tender:** Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price build-up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.	08
VII	**Introduction to Acts:** Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2.	V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3.	Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
4.	M Chakravarty, Estimating, Costing Specifications & Valuation
5.	Joy P K, Handbook of Construction Management, Macmillan
6.	B.S. Patil, Building & Engineering Contracts
7.	Relevant Indian Standard Specifications.
8.	World Bank Approved Contract Documents.
9.	FIDIC Contract Conditions.
10.	Acts Related to Minimum Wages, Workmen’s Compensation, Contract, and Arbitration
11.	Typical PWD Rate Analysis documents.
12.	UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
13.	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

T/R	Book title suggested by faculty
1	M Chakravarty, Estimating, Costing Specifications & Valuation
2	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

E- content used:
https://nptel.ac.in/courses/105103093

Additional topics:

Schedule of Rates- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-601- 18.1	Have an idea of basic principles and elements of economics in general.	2
BTCE-601- 18.2	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.	5
BTCE-601- 18.3	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.	2
BTCE-601- 18.4	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	5
BTCE-601- 18.5	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	2
BTCE-601- 18.6	Demonstrate the knowledge related to various rules and regulations applicable to construction industry.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2								

CO2		2				2					3			
CO3	2	2				2					2			
CO4	2	2				2					3			
CO5	2					2				2	3	1		
CO6	2					2				2	2	1		

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PECE-602A-18: FOUNDATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FOUNDATION ENGINEERING	**SEMESTER:** VI
COURSE CODE: PECE-602A-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Soil Exploration** Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, - standard penetration test -static and dynamic cone penetration test, Bore Hole log for S.P.T. Geophysical exploration by seismic and resistivity methods **Stresses Distribution:** Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, Newmark's chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Pressure Bulb and Isobar. Related Numerical Problems	10
II	**Earth Pressure** Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and K_p for horizontal backfills. Rankine's theory both for active and passive	12

	earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfills. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).	
III	**Shallow Foundation** Type of shallow foundations, Depth and factors affecting it. Definitionof ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of Shear failures. Factors affecting bearing capacity. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration test. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by Plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code.	11
IV	**Pile Foundations** Types and function of pile - factors influencing the selection of pile - carrying capacity of single pile in cohesionless and cohesive soil by static formula. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile- dynamic formulae (Engineering News and Hileys) Types of pile driving hammers & their comparison. Limitations of pile driving formulae. Negative skin friction - Carrying capacity of Pile group - Pile load test Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Settlement of pile groups in sand, Negative skin friction. Related Numerical problems **Well foundations-**shapes, depth of well foundations, components, factors affecting well foundation design, Scour Depth, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.	11

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M.Das Cengage Publisher

7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

T/R	Book title suggested by faculty
1	Soil Mech. & Foundation Engg, by K.R. Arora Standard *Publishers* Distributors
2	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers

E- content used:
https://archive.nptel.ac.in/courses/105/105/105105176/

Additional topics:

Danish method of analysis of pile foundation, Equivalent point load method of load distribution.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-602A-18.1	Understand the methods of surface and subsoil exploration and to prepare investigation report.	2
PECE-602A-18.2	Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations.	5
PECE-602A-18.3	Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations	6
PECE-602A-18.4	Estimate the stresses in soils and bearing capacity of soil for shallow foundation.	3
PECE-602A-18.5	Design various types of shallow foundation and to estimate settlement.	6
PECE-602A-	Apply the concepts of deep foundation and solve problems	3

18.6	related with pile foundation.	

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2		2	2				1					
CO2	3	2	2	2	2				1				1	2
CO3	3	2		2	2				1					
CO4	3	2	2	1					1				1	
CO5	3	2	2	2	2				1				2	3
CO6	3	2	2	2	2				1				2	3

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PECE-603D-18: STRUCTURAL ANALYSIS AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL ANALYSIS AND DESIGN	**SEMESTER:** VI
COURSE CODE: PECE-603D-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Review of indeterminacy:** Static and kinematic indeterminacies of beams, rigid-jointed and pin-jointed plane frames.	04
II	**Analysis of indeterminate structures**: Analysis indeterminate beams and frames by Kani's method, Theorem of three moments and other approximate methods- Portal, Cantilever and Substitute frame method.	12

III	**Moving loads and influence lines:** Analysis of moving Loads for determinate beams, Influence lines for indeterminate beams, trusses and frames. Muller Breslau principle.	08
IV	**Design of Concrete structures:** **Columns with moments**: Design of short columns with uni-axial and bi-axial bending; Design of Long columns, use of design charts; **Foundations**: Isolated and combined footing for columns; **Staircases**, Introduction, types and design; **Retaining walls** - Cantilever and Counter-forte type retaining wall.	10
V	**Design of Steel Structures:** **Column bases:** Slab base, Gusseted base; **Beam-column connections:** bracket connections, seated and framed connections.; **Plate girders:** Elements of a plate girder, design of plate girder section, intermediate and bearing stiffeners, **Roof trusses:** Types, Design loads, design of members and joints.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2.	Intermediate structural analysis - C . K. Wang. McGraw Hill
3.	Structural analysis - S Ramamurtham
4.	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
5.	Limit state Design of Reinforced Concrete; Varghese P C; PHI Pvt. Ltd.
6.	Design of concrete structures, B C Punmia
7.	Limit state design of steel structures: S K Duggal, TMH
8.	Design of steel structures: N Subramanian, Oxford publications
9.	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

T/R	**Book title suggested by faculty**
1	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2	Structural analysis - S Ramamurtham
3	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

E- content used:
https://nptel.ac.in/courses/105105166

Additional topics:

Connections: Riveted, bolted and welded connections for axial and eccentric loads, Comparison of working stress method, limit state method and ultimate load method.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems as per codes

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-603D-18.1	To recognize the concept of structural systems, loads, supports and displacements.	2
PECE-603D-18.2	To understand and determine the indeterminacy of different types of structures.	2
PECE-603D-18.3	To calculate forces and moments in indeterminate structures due to static as well as moving loads.	5
PECE-603D-18.4	To develop and use the concept of influence line diagram for calculating different structural quantities in a statically determinate structure.	4
PECE-603D-18.5	To analyse and design concrete structures i.e., column subjected to moments, foundations, retaining walls, etc.	6
PECE-603D-18.6	To analyse and design the steel structures i.e., column bases, beam-column joints, plate girders and roof trusses.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO2	3	2	1	2										
CO3	3	2	1	2										
CO4	3	2	3	2									2	1
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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PECE-604B-18: SUSTAINABLE CONSTRUCTION METHODS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SUSTAINABLE CONSTRUCTION METHODS	**SEMESTER:** VI
COURSE CODE: PECE-604B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION** Definitions- Various types - Pillars of Sustainability - Circle of Sustainability - Need - systems and their sustainability - Green Buildings -Difference between Green and Sustainability - Climate Change, Global warming - National and International policies and Regulations. Identification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.	06
II	**BUILDING CONSTRUCTION METHODS** Conventional vs modular construction methods, development, Engineering principles, benefits**,** Modular construction methods for repetitive works, Green Roofs, Cool Roofs, Passive House, Rammed Earth Brick**,** Passive Solar, Greywater Plumbing Systems, Solar Thermal Cladding, Solar Power, Water Efficiency Technologies, Sustainable Indoor Environment Technologies.	10
III	**PRECAST CONSTRUCTION METHODS** Modular construction methods for repetitive works; Precast concrete construction methods; Benefits , Sustainability in Concrete Mix Design, Greener, Faster and Sustainable Construction Practices Through Precast Solutions, Use of secondary cementitious material (SCM's) like GGBS, fly ash, ultra-fine GGBS in the production of the concrete, Basics of Slip forming for tall structures, Structural 3D Printing, Self-healing Concrete**,** Green Insulation, Sustainable Resource Sourcing, Environmental Sustainability Benefits From Precast Concrete.	10
IV	**CONSTRUCTION METHODS OF BRIDGES** Types of foundations and construction methods; Basics of Formwork and Staging; Proactive Maintenance**,** Prefabrication/Modular Construction, balance between environment and construction activities, reducing problems at site with minimal staging, increasing safety etc, Constructions are sustainable with reduced use of natural resources, Costs of	10

	Construction/Assembly and Transportation, Lifespan, Environmental Impact, harmful emissions during bridge construction, Reducing waste, solar panels to power LED lights to illuminate its deck, water-powered light system powered by the currents of the river, development that meets the needs of the present.	
V	**NEW CONSTRUCTION MATERIALS TECHNOLOGIES** Introduction to new construction materials & technologies, Synthetic Roof Underlayment, Electro chromic Glass, Biodegradable Materials, Reduction of water consumption, Impact on environment, Concepts of climate responsive building, Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process.	08

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Margaret Robertson, Sustainability Principles and Practice, Routledge, 2014
2.	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
3.	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
4.	Stephen M. Stephen, Stephen M. Wheeler, Climate Change and Social Ecology: A New Perspective on the Climate Challenge, Routledge, 2012.
5.	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

T/R	Book title suggested by faculty
1	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
2	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
3	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

E- content used:
https://nptel.ac.in/courses/105102195

Additional topics:

Case studies: Shanghai Tower, China; Bank of America, New York; The Crystal, London, United Kingdom; Council House 2, Melbourne.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-604B-18.1	Create new engineering materials to improve the performance of infrastructure	6
PECE-604B-18.2	Characterize and mitigate natural and man-made hazards	4
PECE-604B-18.3	Understanding various sustainable building construction methods and precast construction methods	2
PECE-604B-18.4	Improve fundamental knowledge of the inter-relationships between the built environment and natural systems.	6
PECE-604B-18.5	Understanding sustainable construction methods for bridges and analysing their economic viability.	4
PECE-604B-18.6	Develop the technological innovations needed to safeguard, improve, and economize infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	2				2				3	
CO2	3	2	2										2	
CO3	2	2					3							
CO4	2	2	2				3		2				2	1
CO5	2	2					3							
CO6	2	2	3	2	3		2		2			2	3	2

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BTEE-603D-18: WIND AND SOLAR ENERGY SYSTEMS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: WIND AND SOLAR ENERGY SYSTEMS	**SEMESTER:** VI
COURSE CODE: BTEE-603D-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power cumulative distribution functions.	08
II	**Wind generator topologies:** Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.	08
III	**The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.	08
IV	**Solar energy Technologies -** Solar photovoltaic Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.	10
V	**Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2.	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3.	S. P. Sukhatme, Solar Energy: Principles of Thermal Collection & Storage, McGraw Hill, 1984.

4.	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.
5.	G. N. Tiwari and M. K. Ghosal, Renewable Energy Applications, Narosa Publications, 2004.
6.	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley & Sons, 1991.

T/R	Book title suggested by faculty
1	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.

E- content used:
https://nptel.ac.in/courses/103103206

Additional topics:

Non-concentrating solar collectors, Parabolic solar collectors, Turbulence in Wakes and Wind Farms, Turbulence in Complex Terrain.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEE-603D-18.1	Understand the global energy scenario and the consequent growth of the power generation from renewable energy sources.	2
BTEE-603D-18.2	Understand the basic physics of wind and solar power generation.	2
BTEE-603D-18.3	Apply the knowledge of electrical machines to generate electrical power from wind	3
BTEE-603D-18.4	Understand and analyse the solar photo-voltaic technology for energy generation	4

BTEE-603D-18.5	Understand the power electronic interfaces for wind and solar generation.	2
BTEE-603D-18.6	Understand the issues related to the grid-integration of solar and wind energy systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1		2		1		1	2							
CO2	2				1		2							
CO3	3		2		2		2						2	2
CO4	3	2	2	2	2		2						2	
CO5	3				2		2							
CO6	2					1	2						1	

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BTES 401-18: COMPUTER ORGANIZATION & ARCHITECTURE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: COMPUTER ORGANIZATION & ARCHITECTURE	**SEMESTER:** VI
COURSE CODE: BTES 401-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of 8085 processor. Data representation: signed number representation, fixed and floating-point	12

	representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	
II	**Introduction to x86 architecture:** CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions, I/O device interfaces – SCII, USB	10
III	**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	12
IV	**Memory Organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	"Computer Organization and Architecture", Moris Mano.
2.	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
3.	"Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
4.	"Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
5.	"Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
6.	"Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

T/R	Book title suggested by faculty
1	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition
2	by David A. Patterson and John L. Hennessy, Elsevier.

E- content used:

https://nptel.ac.in/courses/108102112

Additional topics:

Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTES 401-18.1	Understand functional block diagram of microprocessor;	2
BTES 401-18.2	Apply instruction set for writing assembly language programs.	3
BTES 401-18.3	Design a memory module and analyze its operation by interfacing with the CPU.	6
BTES 401-18.4	Classify hardwired and microprogrammed control units	4
BTES 401-18.5	Understand the concept of pipelining and its performance metrics.	2
BTES 401-18.6	Demonstrate the basic knowledge of I/O devices and interfacing of I/O devices with computer.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				1		1			
CO2	2	1			1				1		1		1	
CO3	3	2	3	2	1				2		2		2	2
CO4	2				1				1		1		1	
CO5	2				1				1		1			
CO6	2				1				1		1		1	

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INDEX
SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2020

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	PECE -701B-18	Airport Planning and Design	3-1-0	4	4
B	OECE-701-18	Metro Systems and Engineering	3-0-0	3	3
C	PECE -701B-18	Solid And Hazardous Waste Management	3-1-0	4	4
D	PECE-703F-18	Urban Hydrology and Hydraulics	3-1-0	4	4
E	HSMC -255	Professional Practice, Law & Ethics	2-0-0	2	2
F		Project	0-0-8	8	7
G	BTMC701-18	Management- I (Organizational Behavior)	2-0-0	2	0

Total Credits = 24 Hours: 27

SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE801-18	Training (one semester)	-	-	16

PECE -701B-18: AIRPORT PLANNING AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: AIRPORT PLANNING AND DESIGN	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Airport Engineering:** Components of airport: Classifications of obstructions, Imaginary surfaces, Approach zone and turning zone. Runway orientation, basic runway length, corrections for elevation, temperature & gradient, airport classification.	10
II	**Runway & Taxiway Design:** Wind-rose diagram, Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons,	12
III	**Structural design** of runway pavements LCN/PCN method of rigid pavement design, different LCN/PCN of aircrafts using runway. Pavement Evaluation for runway & taxiway, design of overlay, Terminal area, building area, parking area, apron, hanger typical airport layouts.	12
IV	**Design of flexible and rigid runways** as per FAA procedure, Specifications for the different layers of runway and taxiway pavements, Pavement management systems for runway pavements. Benkelman Beam method for maintenance.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).

2.	Rangwala, Airport Engineering, Charotar Publishing House (2019).
3.	Horenjeff Robert, Airport Engineering, McGraw Hill International Publisher (2010).

T/R	Book title suggested by faculty
1	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2	Rangwala, Airport Engineering, Charotar Publishing House (2019).

E- content used:
http://128.173.204.63/courses/cee4674/ce_4674.html

Additional topics:

Visual and navigation aids, Instrument and Visual Flight Rules, Aircraft characteristics.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understand the detail concepts of the airport engineering.	2
PECE -701B-18.2	Estimate the geometric design characteristics of taxiways and runway	5
PECE -701B-18.3	Suggest the runway orientation and the runway length as per FAA & ICAO guidelines.	5
PECE -701B-18.4	Understanding the pavement evaluation techniques and design the overlay for runways and taxiways.	2
PECE -701B-18.5	Specify the guidelines and procedure for the design of flexible and rigid pavement for runways.	6
PECE -701B-18.6	Conceptualise Pavement management system for maintenance	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	3													
CO2	3		2	1					1					2
CO3	3		3	2					1					3
CO4	3	2	2	2					1					2
CO5	3	2	2	2					1					2
CO6	3		2	`									1	

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OECE-701-18: METRO SYSTEMS AND ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: METRO SYSTEMS AND ENGINEERING	**SEMESTER:** VII/VIII
COURSE CODE: OECE-701-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Metro systems** Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.	04
II	**Planning and Development** Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;	06
III	**Traffic Management Systems** Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems- permanent way. Facilities Management Module	08
IV	**Signalling Systems** Introduction to Signalling systems; Automatic fare	06

	collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	
V	**Electrical Systems** OHE, Traction Power; Substations-TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics.	06
VI	**Mechanical Systems** Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators	06

Total hours – 36

TEXT /REFERENCE BOOKS

1.	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2.	"Metropolitan Railways: Rapid Transit in America (Railroads Past and Present)",Middleton, Indiana University Press 2013.
3.	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

T/R	Book title suggested by faculty
1	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

E- content used:
https://coursecontent.indusuni.ac.in/wp-content/uploads/sites/8/2020/05/METRO-SYSTEMS-AND-ENGINEERING_CV0425_OE-5_UNIT-1.pdf

Additional topics:

Case studies: Baltimore Metro Subway Link, Moscow Metro, Kyoto Municipal Subway, Delhi Metro Rapid Metro Express.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects study
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
OECE-701-18.1	Understand overview of metro systems.	2
OECE-701-18.2	Analyse vehicle dynamics and structure; tunnel ventilation systems; electrical systems.	4
OECE-701-18.3	Understanding electronic signalling systems and automatic fare collection.	2
OECE-701-18.4	Understand the basics of construction planning & management.	2
OECE-701-18.5	Evaluate the construction quality & safety systems	5
OECE-701-18.6	Acquiring the knowledge of mechanical systems in context of metro systems engineering.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3	3		2	3								1	
CO3	3													
CO4	2										3			
CO5	2	2		1										
CO6	3													

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PECE -701B-18: SOLID AND HAZARDOUS WASTE MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID AND HAZARDOUS WASTE MANAGEMENT	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0

CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction:** Definition of solid wastes and hazardous wastes, Nuisance potential and extent of solid waste problems, Objectives and scope of integrated solid waste management. **Collection, Storage and Transportation of Wastes:** Types of collection systems and their components, Concept of waste segregation at source and recycling and reuse of wastes.	08
II	**Solid Waste Processing and Treatment:** Waste processing – processing technologies –biological and chemical conversion technologies–Composting-thermal conversion technologies-energy recovery.	12
III	**Hazardous Waste Treatment and Disposal:** Biological and chemical treatment of hazardous wastes; Solidification and stabilization of wastes; Incineration for the treatment and disposal of hazardous wastes; Land farming; Landfill disposal of hazardous waste; Bioremediation of hazardous waste disposal sites.	12
IV	**Sanitary Landfills:** Design, development, operation and closure of landfills, Management of leachate and landfill gases, environmental monitoring of landfill sites.	06
V	**Legal Requirements:** Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, fly ash, etc.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press
2.	Vesilind, P.A., Solid Waste Engineering, Thomson Learning Inc.
3.	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill
4.	Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, “Environmental Engg.”, McGraw Hill
5.	CPHEEO, *Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization*, Government of India

T/R	Book title suggested by faculty
1	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill
2	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press

E- content used:
https://nptel.ac.in/courses/120108005

Additional topics:

Resource Conservation and Recovery Act, Health and Safety at Work Act, Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments and Reauthorization Act.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Case studies

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.	2
PECE -701B-18.2	Knowledge of waste processing technologies and various waste treatment methods	2
PECE -701B-18.3	Become aware of Environment and health impacts solid waste mismanagement.	2
PECE -701B-18.4	Understand engineering, financial and technical options for waste management.	2
PECE -701B-18.5	Plan, design, manage and operate sanitary landfills for effective waste management.	6
PECE -701B-18.6	Knowledge of legal, institutional and financial aspects of management of solid wastes	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													

CO2	2				2									
CO3							2							
CO4	2						2				3			
CO5	3	2	3	1	2		2				2		2	3
CO6						2	2				2			

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PECE-703F-18: URBAN HYDROLOGY AND HYDRAULICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: URBAN HYDROLOGY AND HYDRAULICS	**SEMESTER:** VII/VIII
COURSE CODE: PECE-703F-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction-** Trends of Urbanization and Industrialization, Urban water supply demand forecast, urban hydrological cycle.	08
II	**Urban water Management-** Rain water harvesting, managed aquifer recharge, effect of water management practices on urban water infrastructure, hydrology and ground water regime, mapping of water supply and sewage networks. **Urban water Infrastructure-** water supply, sanitation, sewerage and wastewater conveyance infrastructures, Water supply and sewerage network hydraulics, Structural safety and mitigating plans against natural and human caused threats.	14
III	**Urban Storm water-** Master drainage plans, Estimation of urban stormwater quantity, Wastewater collection systems, Design of storm sewer network systems, Storage facilities. Interaction between urban drainage and solid waste management, Stormwater Management, Operation and maintenance of urban drainage system.	12

IV	**Sustainable Design-** Sustainable urban designs, Methodologies for assessing sustainability of urban water infrastructures, Emerging sustainable materials and design procedures for water supply and sewerage pipelines, determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2.	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.
3.	Hall, M.J., (1984), *"Urban Hydrology*", Elsevier Applied Science Publishers.
4.	Mays, L.W., Hydraulic Design Handbook, McGraw-Hill, 1999

T/R	Book title suggested by faculty
1	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.

E- content used:
https://nptel.ac.in/courses/105104029

Additional topics:

Urban Runoff hydrology, Urban Runoff pollution, Stormwater best management practices.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instruction
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-703F-18.1	Build understanding of hydrological aspects of water resources.	2
PECE-703F-	Develop competence to propose effective convergence and	6

18.2	design features of water supply projects.	
PECE-703F-18.3	Outline the principles of engineered systems for aeration in wastewater treatment.	6
PECE-703F-18.4	Recommend principles of need-based activities such as pumps, mixers related to water.	6
PECE-703F-18.5	Illustrate the application of pipe flow and open channel flow in water distribution networks and sewers.	2
PECE-703F-18.6	Formulate the effective use of surface and ground water sources.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	3	2	2								2	3
CO3	2													
CO4	3	2	3	2	2							2	2	3
CO5	3	2		2	1									
CO6	2		2										2	

Prepared by **Approved By**

HOD

HSMC -255: PROFESSIONAL PRACTICE, LAW & ETHICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: PROFESSIONAL PRACTICE, LAW & ETHICS	**SEMESTER:** VII/VIII
COURSE CODE: HSMC -255	**CREDITS:** 2
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Professional Ethics** – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.	04
II	***General Principles of Contracts Management: Indian Contract Act, 1972 and amendments*** covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms.	05
III	***Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:*** Arbitration –meaning, scope and types – distinction between laws of 1940 and 1996;UNCITRAL model law –Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat.	05
IV	**Engagement *of Labour and Labour & other construction-related Laws:*** Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	04
V	***Law relating to Intellectual property:*** Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law	06

	in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;	

Total hours – 24

TEXT /REFERENCE BOOKS

1.	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2.	The National Building Code, BIS, 2017
3.	RERA Act, 2017
4.	Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5.	Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6.	Anson W.R. (1979), Law of Contract, Oxford University Press
7.	Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
8.	Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
9.	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
10.	O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

T/R	Book title suggested by faculty
1	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974
2	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

E- content used:
https://nptel.ac.in/courses/110105097

Additional topics:

Accounts-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects
Class room discussions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
HSMC -255.1	Understanding basic purpose of profession, professional ethics and various moral and social issues.	2
HSMC -255.2	Awareness of professional rights and responsibilities of an Engineer, safety and risk benefit analysis of an Engineer	2
HSMC -255.3	Understanding professional ethical values and contemporary issues	6
HSMC -255.4	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels	2
HSMC -255.5	Awareness of Law relating to Intellectual property	2
HSMC -255.6	Excelling in competitive and challenging environment to contribute to industrial growth.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2		3		1				
CO2						2		3		1				
CO3						2		3						
CO4						2		3						
CO5						2		3						
CO6						2	2	3	2	3	2			

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Study Scheme & Syllabus of

Bachelor of Technology

Civil Engineering

(3rd -8th Semester, 2021 batch)

DEPARTMENT OF CIVIL ENGINEERING

BHAI GURDAS INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPROVED BY AICTE, NEW DELHI, AFFILIATED TO IKGPTU, JALANDHAR

INDEX
SCHEME: B. TECH 3RD SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-301-18	Surveying & Geomatics	3-1-0	4	4
B	BTCE-302-18	Solid Mechanics	3-0-0	3	3
C	BTCE-303-18	Fluid Mechanics	3-0-0	3	3
D	BTAM-301-18	Mathematics-III (Transform & Discrete Mathematics)	4-0-0	4	4
E	BTEC- 305-18	Basic Electronics & Applications in Civil Engineering	3-0-0	3	3
F	HSMC-132-18	Civil Engineering- Introduction, Societal & Global Impact	3-0-0	3	3
G	BTCE-306-18	Surveying & Geomatics Lab	0-0-2	2	1
H	BTCE-307-18	Fluid Mechanics Lab	0-0-2	2	1
I	BTCE-308-18	Solid Mechanics Lab	0-0-2	2	1
J	BMPD-301-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-301-18: SURVEYING & GEOMATICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS	**SEMESTER:** III
COURSE CODE: BTCE-301-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-306-18	**LAB COURSE NAME:** SURVEYING & GEOMATICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Surveying:** Principles, Survey stations, Survey lines-ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction, Levelling: Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; Contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three-point problem only).	10
II	**Triangulation and Trilateration:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline choices - extension of base lines - corrections - Trigonometric levelling.	12
III	**Curves:** Elements of simple and compound curves – Method of setting out transition curve – length of curve – Elements of transition curve. **Photogrammetry Surveying:** Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping-mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	10
IV	**Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based). **Remote Sensing:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2.	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications
3.	Agor, R., Surveying, Khanna Publishers
4.	Bhavikatti, S.S., Surveying & Levelling Volume I & II

T/R	Book title suggested by faculty
1	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications

E- content used:
https://nptel.ac.in/courses/105107122

Additional topics:

Chain and Tape survey (Corrections), Overview of Indian Topographic Map, Reliability and Quality of Measurement.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team teaching method
Apparatus demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-301- 18.1	Understand the concept, various methods and techniques of surveying.	2
BTCE-301- 18.2	Compute angles, distances and levels for given area.	5
BTCE-301- 18.3	Apply the concept of tachometry survey in difficult and hilly terrain.	3
BTCE-301- 18.4	Select appropriate instruments for data collection and survey purpose.	1

BTCE-301- 18.5	Analyze and retrieve the information from remotely sensed data and interpret the data for survey.	4
BTCE-301- 18.6	Understand the concepts related to GIS and GPS and analyse the geographical data.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	1				2			1	1	1
CO2	3	2	2	2	2				2			1	1	2
CO3	3	2	2	2	2				2			1	1	1
CO4	2	2	3	2	3				1			2	2	2
CO5	1	2	2	3	2				1			2	2	1
CO6	2	1	1	2	3							2	2	1

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BTCE-302-18: SOLID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-302-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-308-18	**LAB COURSE NAME:** SOLID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concept of Equilibrium**: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem. **Stresses and Strains**: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain,	08

	Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.	
II	**Principal Stresses and Strains:** Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress. **Shear Force and Bending Moment Diagrams**: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.	10
III	**Slope and deflection-** Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. **Bending and Shear Stresses:** Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross-sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.	08
IV	**Columns and Struts**: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load. **Torsion of Circular Shafts**: Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending. **Stresses and strains in thin cylinders:** spherical shells subjected to internal pressures; Normal stress, tangential stress.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2.	'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3.	'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4.	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5.	'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.

6.	'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7.	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

T/R	Book title suggested by faculty
1	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.
2	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.

E- content used:
https://nptel.ac.in/courses/112102284

Additional topics:

Mathematical Concepts: Working with Vectors & Tensors, Theories of Failure, Moment of Inertia for different types of bodies/shapes.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-302- 18.1	Understand the concept of static equilibrium, deformations, and material constitutive behaviour.	2
BTCE-302- 18.2	Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyse structural members subjected to tension, compression and torsion.	3
BTCE-302- 18.3	Apply the concept of Mohr's circle in the stress/strain calculations.	3
BTCE-302- 18.4	Develop SFD and BMD for different type of beams subjected to different types of loads.	6
BTCE-302- 18.5	Plot elastic curves for beams undergoing displacements under different loadings.	6

BTCE-302- 18.6	Understand the behaviour of columns and struts under axial loading.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	1	2								2	1	
CO3	3	2	3	3	1								2	2
CO4	3	2	3	3	1								3	2
CO5	2	3	3	2	2								2	3
CO6	2	2		1								1		

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BTCE-303-18: FLUID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-303-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-307-18	**LAB COURSE NAME:** FLUID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Concepts and Definitions** – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics** - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	08

II	**Fluid Kinematics** - Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates. **Fluid Dynamics -** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	10
III	**Laminar Flow & Turbulent Flow** - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel. **Boundary Layer Analysis**- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.	10
IV	**Open Channel Flow** - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2.	Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth
3.	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker
4.	Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman

5.	Fluid Mechanics: Streetes VL & Wylie EB;
6.	Fluid Mechanics by Potter, Cengage Learning

T/R	Book title suggested by faculty
1	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker

E- content used:
https://nptel.ac.in/courses/112104118

Additional topics: Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-303- 18.1	Understand the basic terms used in fluid mechanics and its broad principles	2
BTCE-303- 18.2	Estimate the forces induced on a plane/ submerged bodies.	5
BTCE-303- 18.3	Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.	5
BTCE-303- 18.4	Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.	3
BTCE-303- 18.5	Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.	5
BTCE-303- 18.6	Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	2	2								2	2	
CO3	3	2	2	1								2	2	3
CO4	3	2	3	3	1							2	3	3
CO5	3	3	1	2									2	1
CO6	2	3	3	2	2							2	2	3

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BTAM-301-18: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)	**SEMESTER:** III
COURSE CODE: BTAM-301-18	**CREDITS:** 4
COURSE TYPE: BASIC SCIENCE COURSE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Vector Calculus-I:** Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.	10
II	**Vector Calculus-II:** Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.	11
III	**Transforms Calculus-I:** Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution	10

	theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.	
IV	**Transforms Calculus-II:** Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications	11

Total hours – 42

TEXT /REFERENCE BOOKS

1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3.	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4.	Thomas and Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 2017.
5.	R. K. Jain and S.R.K Iyengar Advanced Engineering Mathematics, 5th Edition, 2017.

T/R	Book title suggested by faculty
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

E- content used:
https://nptel.ac.in/courses/111105121

Additional Topics:

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Small Group Instructions
Problem solving

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTAM-301-18.1	Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.	2

BTAM-301-18.2	Find length, area and volume using integral calculus that is an important application in engineering.	5
BTAM-301-18.3	Solve some real problems in engineering using Gauss Divergence and Stokes' theorem	5
BTAM-301-18.4	Understand the concept of orthogonal curvilinear coordinates and the applications of Green, Gauss and Stokes Theorems.	2
BTAM-301-18.5	Formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.	5
BTAM-301-18.6	Formulate Fourier Series, its properties and its applications to solve problems in engineering.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1									1	
CO2	2		2		1									1
CO3	1	2		2										
CO4	1		2		1								1	
CO5	2	1	1	1										
CO6	2			1									1	1

Prepared by **Approved By**

HOD

BTEC- 305-18: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING	**SEMESTER:** III
COURSE CODE: BTEC- 305-18	**CREDITS:** 3
COURSE TYPE: ENGINEERING SCIENCE COURSE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE	**LAB COURSE NAME:** NA

(IF ANY): NA	

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications.	08
II	**Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.	08
III	**Operational Amplifiers and Applications -** Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.	10
IV	**Digital Electronics** -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K-Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2.	SantiramKal (2002), Basic Electronics- Devices, Circuits and IT undamentals, Prentice Hall, India. 3.Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education.
3.	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
4.	R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson.

T/R	Book title suggested by faculty

1	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH

E- content used:
https://nptel.ac.in/courses/122106025

Additional topics:

Basic laws and theorems in Basic Electronics, Wave Shaping using Diodes

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC- 305-18.1	Identify areas of application of electronics in civil engineering.	2
BTEC- 305-18.2	Understand construction of diodes and their rectifier applications.	1
BTEC- 305-18.3	Appreciate the construction and working bipolar junction transistors and MOSFETs.	6
BTEC- 305-18.4	Design Op-Amp IC based fundamental applications.	1
BTEC- 305-18.5	Appraise the use of integrated circuits in civil engineering applications.	2
BTEC- 305-18.6	Comprehend working of basic elements of digital electronics and circuits.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1		1					2		2	1		
CO2	2				2				1		1			
CO3	2				2				1		1			
CO4	2		2		2						1		1	
CO5	1	1			2						1		1	
CO6					2						1		1	

Prepared by **Approved By**

HOD

HSMC-132-18: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT	**SEMESTER:** III
COURSE CODE: HSMC-132-18	**CREDITS:** 3
COURSE TYPE: HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Civil Engineering and its historical developments;** Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.	08
II	**Understanding the past to look into the future**; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.	10
III	**Infrastructure development and growth of the Nation**; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals,	08

	Tunnels, bridges.	
IV	**Energy Generation**: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Salvadori, M and Heller, M, Strctures in Architectures, PHI.
2.	Fintel, C, Handbook of Civil Engineering, CBS Publications.
3.	*Žiga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
4.	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
5.	NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004

T/R	Book title suggested by faculty
1	Fintel, C, Handbook of Civil Engineering, CBS Publications.
2	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition.

E- content used:
https://www.dce-darbhanga.org/wp-content/uploads/2020/04/file_5e8ca9c9a4968.pdf

Additional topics: Present and future scenario of energy generation methods.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team Teaching Method
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
HSMC-132-18.1	Introduction to what constitutes Civil Engineering	1
HSMC-132-18.2	Understanding the vast interfaces this field has with the society at large	2
HSMC-132-18.3	Providing inspiration for doing creative and innovative work for the benefit of the society	1
HSMC-132-18.4	Need to think innovatively to ensure Sustainability	1
HSMC-132-18.5	Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field	2
HSMC-132-18.6	Illustrate the Futuristic engineering systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1											1		
CO2						2	1	1						
CO3					2	3	2	2					2	
CO4						2	3						2	
CO5												2		
CO6	2				2							2		

Prepared by **Approved By**

HOD

BTCE-306-18: SURVEYING & GEOMATICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-306-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
II	Different methods of leveling, height of instrument, rise & fall methods.
III	Measurement of horizontal and vertical angle by theodolite.
IV	Determination of tachometric constants and determination of reduced levels by tachometric observations.
V	Plane table survey, different methods of plotting, three-point problem.
VI	Determination of height of an inaccessible object.
VII	Setting out of circular curves in the field using different methods.
VIII	Plotting of traverse using the Total Station and GPS.

Total hours – 20

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-306- 18.1	Assess horizontal & vertical angles by Theodolite.	5
BTCE-306- 18.2	Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.	1
BTCE-306- 18.3	Compute the reduce levels using various methods of levelling.	5
BTCE-306- 18.4	Predict the location of any point horizontally and vertically using Tachometry.	3
BTCE-306- 18.5	Setting out curves in the field.	3
BTCE-306- 18.6	Use electronic survey instruments.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2

CO1	2	2		2	1				2			1	2	
CO2	2	2	1	2	1				2			1	1	1
CO3	2	2	2	1	2				2			1	2	1
CO4	2	2			1				2					
CO5	2	2			1				2					
CO6	2	2		1	2				1				2	

BTCE-307-18: FLUID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-307-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges.
II	To verify Bernoulli's Theorem
III	To determine the Meta centric height of a Floating Body under different condition.
IV	To determine the coefficient of discharge of a Venturimeter.
V	To determine the coefficient of discharge of a Orifice Meter
VI	To determine the coefficient of friction of different diameter pipes.
VII	To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
VIII	To determine the coefficient of discharge on rectangular and V-notches.
IX	To determine the various element of a hydraulic jump.

Total hours – 18

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2.	Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3.	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4.	Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-307- 18.1	Select appropriate pressure measuring device under different condition of flow.	1
BTCE-307- 18.2	Determine the stability of a floating body.	5
BTCE-307- 18.3	Understand and apply Bernoulli's theorem practically.	2
BTCE-307- 18.4	Find discharge of fluid through pipe, orifices and in open channel.	5
BTCE-307- 18.5	Estimate the major and minor losses in pipe.	5
BTCE-307- 18.6	Estimate the various elements and energy losses in hydraulic jump.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				2							1		
CO2	2	2		1	1							2	1	
CO3	2	2		2					1			1	2	
CO4	2	2		1	2				2			2	2	
CO5	2	2		1	2				1			2	2	
CO6	2	2		1	2				1			2	2	

BTCE-308-18: SOLID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS LAB	**SEMESTER:** III

COURSE CODE: BTCE-308-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of physical properties of steel including strength and ductility.
II	Study of tensile and compressive stress-strain behaviour of steel.
III	Compression test on brick.
IV	Development of shear stress-strain curve for steel in torsion.
V	Determination of hardness of a material by Rockwell and Brinell hardness testing machine.
VI	Determination of impact strength of a material by Izod and Charpy tests.
VII	Determination of bending strength of a wooden beam specimen.
VIII	Determination of fatigue strength of a material.
IX	Study of behavior of columns and struts with different end conditions.
X	To verify the moment area theorem for slope and deflection of a given beam.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-308- 18.1	Understand the importance of physical properties of steel.	2
BTCE-308- 18.2	Identify and comprehend code provisions for testing different properties of steel.	1
BTCE-308- 18.3	Develop stress-strain curve for axial compression, axial tension and shear.	1

BTCE-308- 18.4	Assess hardness and impact strength of steel.	5
BTCE-308- 18.5	Assess flexural strength of a given material.	5
BTCE-308- 18.6	Evaluate fatigue and impact strength of steel.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		1
CO2	2	1		1								2		2
CO3	2	3	3	1	1				2			2	3	1
CO4	2	1			2							1	1	
CO5	2	1			2				2			1	1	
CO6	2	1			2				2			1	1	

BTCE-308-18: TRAINING -I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRAINING -I	**SEMESTER:** III
COURSE CODE: BTCE-308-18	**CREDITS:** --
COURSE TYPE: Professional Skill Enhancement	**CONTACT HOURS:** --

SYLLABUS:

EXPERIMENT	DETAILS
I	**Institutional Training (3 weeks)** 7. Hands-on-training on MS Office/ Office suite (Word processor, Spreadsheet, Math tools, presentation/ ppt, etc.) 8. Introduction to Civil Engineering software's and basic overview of drafting tools such as AutoCAD, etc.
II	**Field and Market Study** 7. Student shall visit construction site of significantly scale and make an inventory construction and finishing materials being used. 8. Student shall do Market Survey for availability and rates of materials in the already prepared inventory.

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-332- 18.1	Visualize things/ concepts and express the thoughts in the form of sketches, models, etc	1
BTCE-332- 18.2	Create a well-organized document using computers	6
BTCE-332- 18.3	Work in teams	1
BTCE-332- 18.4	Acknowledge the work of other in a consistent manner	1
BTCE-332- 18.5	Understanding of ethical and professional issues	2
BTCE-332- 18.6	Demonstrate effective oral communication and presentation skills	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1			2				1	2			1	
CO2					2				1	2			2	
CO3									3	2				
CO4									3	1				
CO5							2	3	1	1				
CO6									1	3				

INDEX
SCHEME: B. TECH 4TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-401- 18	Concrete Technology	3-0-0	3	3
B	BTCE-402- 18	Materials, Testing & Evaluation	4-0-0	4	4
C	BTCE-403- 18	Hydrology & Water Resources Engineering	3-1-0	4	4
D	BTCE-404- 18	Transportation Engineering	3-1-0	4	4
E	BTCE-405- 18	Disaster Preparedness & Planning	3-0-0	3	3
F	EVS-101-18	Environmental Science	2-0-0	2	0
G	BTCE-406- 18	Concrete Testing Lab	0-0-2	2	1
H	BTCE-407- 18	Transportation Lab	0-0-2	2	1
I	BMPD-401-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 20 **Hours: 26**

BTCE-401- 18: CONCRETE TECHNOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TECHNOLOGY	**SEMESTER:** IV
COURSE CODE: BTCE-401- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 406-18	**LAB COURSE NAME:** CONCRETE TESTING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concrete and its ingredients**: Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines. **Concrete behaviour in fresh and hardened states**: Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.	08
II	**Production of concrete**: Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions. **Concrete mix design:** Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.	10
III	**Inspection and testing of concrete**: Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pull-out etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.	09
IV	**Special concretes:** Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self-Healing Concrete.	09

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Properties of Concrete', A. M. Neville, Prentice Hall
2.	'Concrete Technology', M. S. Shetty, S.Chand & Co.
3.	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4.	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi
5.	P Kumar Mehta, Monteiro; Concrete Technology, Indian Concrete Institute

T/R	Book title suggested by faculty
1	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
2	'Concrete Technology', M. S. Shetty, S. Chand & Co.
3	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

E- content used:
https://nptel.ac.in/courses/105102012

Additional topics:

Mix Design of concrete: Packing Density, Rheology, testing of mixing water, Abram's Law.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-401- 18.1	Understand the relevance of different properties of constituent materials on properties of concrete.	2
BTCE-401- 18.2	Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.	2
BTCE-401- 18.3	Understand the issues involved in production and use of concrete.	2
BTCE-401- 18.4	Design of concrete mixes as per BIS specifications.	6
BTCE-401- 18.5	Understand various testing methods for concrete and their applicability.	2

BTCE-401- 18.6	Knowledge of special type of non-conventional concretes.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2													
CO4	3		3		2								2	3
CO5	3	2			2							1	2	1
CO6					3							1	2	

Prepared by **Approved By**

HOD

BTCE-402- 18: MATERIALS, TESTING & EVALUATION

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATERIALS, TESTING & EVALUATION	**SEMESTER:** IV
COURSE CODE: BTCE-402- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes; Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's Bricks; Concrete hollow blocks & Interlocking tiles. Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,	10

II	Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behaviour (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep –fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.	12
III	Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	10
IV	Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regard for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2.	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3.	Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. correspondingto materials used for Civil Engineering applications
4.	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5.	E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6.	American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

T/R	**Book title suggested by faculty**
1	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
2	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition

E- content used:
https://nptel.ac.in/courses/105102088

Additional topics:

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Class discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-402- 18.1	Appraisal about the role of materials in civil engineering	5
BTCE-402- 18.2	Introduce common measurement instruments, equipment and devices to capture the material response under loading	2
BTCE-402- 18.3	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice	2
BTCE-402- 18.4	Ability to write a technical laboratory report.	1
BTCE-402- 18.5	Interpret the observations/ test reports for selection of suitable material.	2
BTCE-402- 18.6	Utilize the relevant information from the standards and guidelines.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		1	2								2	
CO3	2	2		2	1								2	
CO4									2	2				
CO5	1	2		1					1					
CO6	2													

Prepared by **Approved By**

HOD

BTCE-403- 18: HYDROLOGY & WATER RESOURCES ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: HYDROLOGY & WATER RESOURCES ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-403- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction -** Hydrologic Cycle, History of Hydrology, Water-Budget Equation, World Water Balance, Applications in Engineering, Sources of Data. **Precipitation -** Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.	12
II	**Abstractions from precipitation** - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices. **Runoff -** Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.	12
III	**Unit III: Water withdrawals and uses –** Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation. **Distribution systems** - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime	10

	Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets.	
IV	**Water Logging**: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods. **Dams and spillways** - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2.	K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3.	K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4.	G L Asawa, Irrigation Engineering, Wiley Eastern
5.	L W Mays, Water Resources Engineering, Wiley.
6.	J. D Zimmerman, Irrigation, John Wiley & Sons
7.	C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

T/R	Book title suggested by faculty
1	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2	L W Mays, Water Resources Engineering, Wiley.

E- content used:
https://archive.nptel.ac.in/courses/105/103/105103213/

Additional topics:

Water vapour dynamics, Gumbel's method, Thunderstorm Cell Model, Infiltration: Green Amp Equation.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-403- 18.1	Understand the interaction among various processes in the hydrologic cycle.	2
BTCE-403- 18.2	Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc.	5
BTCE-403- 18.3	Understand the various component of hydro graphs and able to estimate the run off.	2
BTCE-403- 18.4	Find the water requirement for different crops and able to proposed appropriate method of applying water.	5
BTCE-403- 18.5	Understand the distribution system of canal and various components of irrigation system.	1
BTCE-403- 18.6	Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	1	2	1				1				1	
CO3	3	2	2	2										
CO4	2	1	3	2	2								1	2
CO5	2				1							1		
CO6	3	2		1										

Prepared by **Approved By**

HOD

BTCE-404- 18: TRANSPORTATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-404- 18	**CREDITS:** 4

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 407-18	**LAB COURSE NAME:** TRANSPORTATION LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction:*** Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport. ***Transportation Systems****:* Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.	10
II	***Highway Development & Planning****:* Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements	12
III	***Railway Engineering****:* History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge. ***Railway Track****:* Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.	12
IV	***Airport Engineering*****:** Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration. ***Aircraft Parking System & Visual Aids****:* Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers,

	Roorkee,1998.
2.	Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3.	Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4.	Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5.	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
6.	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

T/R	Book title suggested by faculty
1	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee,1998.
2	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
3	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

E- content used:
https://nptel.ac.in/courses/105105107

https://archive.nptel.ac.in/courses/105/107/105107123/

Additional topics:

Overview to geometric design of highways, Overview to Mix design methods for construction of flexible pavement, Introduction to superelevation, transition curve in railways, Introduction to railway equipment and junctions.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Student led classrooms
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom’s Level (B.L)
BTCE-404- 18.1	Appreciate the importance of different modes of transportation and characterize the road transportation.	2

BTCE-404- 18.2	Alignment and geometry of pavement as per Indian Standards according to topography.	1
BTCE-404- 18.3	Assess the properties of highway materials in laboratory	5
BTCE-404- 18.4	Understand the importance of railway infrastructure planning and design.	2
BTCE-404- 18.5	Identify the functions of different component of railway track.	2
BTCE-404- 18.6	Outline the importance of Airport Infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2	2			2									
CO4	2		1		1									
CO5	2	1			1									
CO6	2				1									

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HOD

BTCE-405- 18: DISASTER PREPAREDNESS & PLANNING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: DISASTER PREPAREDNESS & PLANNING	**SEMESTER:** IV
COURSE CODE: BTCE-405- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction to Disaster Management:*** Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation. ***Disasters****:* Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender, age, special needs), Lessons and experiences from important disasters with specific reference to civil engineering.	10
II	***Disaster Mitigation and Preparedness:*** Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; Preparedness for natural disasters in urban areas. ***Risk Assessment****:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.	08
III	***Post disaster response****:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.	10
IV	***Integration of public policy****:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	www.http//ndma.gov.in
2.	http://www.ndmindia.nic.in
3.	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4.	Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5.	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

6.	Disaster Management, R.B. Singh (Ed), Rawat Publications

T/R	Book title suggested by faculty
1	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
2	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

E- content used:
https://nptel.ac.in/courses/124107010

Additional topics:

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-405- 18.1	Identify various types of disasters, their causes, effects & mitigation measures.	2
BTCE-405- 18.2	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.	2
BTCE-405- 18.3	Understand the use of emergency management system to tackle the problems.	2
BTCE-405- 18.4	Discuss the role of media, various agencies and organisations for effective disaster management.	6
BTCE-405- 18.5	Design early warning system and understand the utilization of advanced technologies in disaster management.	6
BTCE-405- 18.6	Compare different models for disaster management and plan & design of infrastructure for effective disaster management.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	2	1										1		
CO2	1	1	2									1	1	1
CO3	1											1		
CO4						3	2		2	2				
CO5	2		2		3				2	2		1	2	3
CO6		2	3						2	2			1	3

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EVS-101-18: ENVIRONMENTAL SCIENCE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL SCIENCE	**SEMESTER:** IV
COURSE CODE: EVS-101-18	**CREDITS:** 0
COURSE TYPE: BASIC SCIENCES (MANDATORY COURSES)	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Natural Resources: Renewable and non-renewable resources** Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resource: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.	06

II	**Ecosystems** Concept of an ecosystem, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	06
III	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India	06
IV	**Social Issues and the Environment** From Unsustainable to Sustainable development, Resettlement and rehabilitation of people; its problems and concerns., Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies, Public awareness.	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	Textbook of Environmental studies, Erach Bharucha, UGC Weblink: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2.	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
3.	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
4.	Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
5.	Principle of Environment Science by Cunninghan, W.P.
6.	Elements of Environment Science & Engineering by Meenakshi.
7.	Elements of Environment Engineering by Duggal.

T/R	**Book title suggested by faculty**
1	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
2	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

E- content used:
https://evspgdavevening.blogspot.com/p/e-content.html

Additional topics:

Biomedical Waste Management, Environmental Acts and Rules.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Student led classrooms

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
EVS-101-18.1	Understand environmental problems at local and national level through literature and general awareness.	2
EVS-101-18.2	Acquire practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.	2
EVS-101-18.3	Apply interdisciplinary approach to understand key environmental issues and critically analyse them to explore the possibilities to mitigate these problems.	4
EVS-101-18.4	Create awareness among people about protection of wild life & forests.	2
EVS-101-18.5	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.	2
EVS-101-18.6	Understand the need of conservation of natural resources, ecological balance and biodiversity to achieve sustainable development.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1							3			2				
CO2							3			2				
CO3	1	1				2	3		1			1		
CO4						2	3		1	2				
CO5						2	2	2	1	2				
CO6						2	3	1	1	2				

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BTCE-406- 18: CONCRETE TESTING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TESTING LAB	**SEMESTER:** IV
COURSE CODE: BTCE-406- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on cement • Fineness • Consistency • Setting time • Soundness • Specific gravity • Strength
II	Tests on aggregates (fine and coarse) • Specific gravity • Bulk Density • Fineness Modulus • Moisture content • Water Absorption • Bulking of sand
III	Design mix of concrete as per BIS method.
IV	Workability tests on concrete • Slump test • Compaction Factor test • Vee-Bee test
V	Strength tests on concrete • Compressive strength (Cube and Cylinder) • Split Tensile strength • Flexural strength • Abrasion resistance
VI	Non-Destructive Techniques • Rebound hammer test • Ultra-sonic pulse velocity test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	'Concrete Lab Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2.	'Concrete Lab Manual', TTTI Chandigarh.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-406- 18.1	Evaluate properties of building materials, such as cement and aggregates.	5
BTCE-406- 18.2	Conduct experiments and check the acceptance criteria (if any).	4
BTCE-406- 18.3	Design concrete mixes as per BIS provisions.	6
BTCE-406- 18.4	Analyze the properties of concrete in fresh and hardened state.	4
BTCE-406- 18.5	Create a well-organized document and present the results appropriately.	6
BTCE-406- 18.6	Understand and apply non-destructive testing (NDT) for evaluating concrete quality.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				2			1	1	
CO2	2	1		2	1				1			1		
CO3	2	1	3		2				1			1	2	3
CO4	2	2		1	2				1			1	2	
CO5	1								2	3	1	1		
CO6	2	1		1	3				1			1	2	

BTCE-407- 18: TRANSPORTATION LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION LAB	**SEMESTER:** IV
COURSE CODE: BTCE-407- 18	**CREDITS:** 1

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on Sub-grade Soil 1. California Bearing Ratio Test
II	Tests on Road Aggregates 14. Crushing Value Test 15. Los Angles Abrasion Value Test 16. Impact Value Test 17. Shape Test (Flakiness and Elongation Index)
III	Tests on Bituminous Materials and Mixes 27. Penetration Test 28. Ductility Test 29. Softening Point Test 30. Flash & Fire Point Test 31. Bitumen Extraction Test
IV	Field Tests 32. Study of Roughometer/Bump Indicator 33. Study of Benkelman Beam Method

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", NemChand and Brothers, Roorkee.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-407- 18.1	Characterize the pavement materials as per the Indian Standard guidelines.	4
BTCE-407- 18.2	Evaluate the strength of subgrade soil by CBR test.	5
BTCE-407- 18.3	Conduct experiments to evaluate aggregate properties.	5
BTCE-407- 18.4	Determine properties of bitumen material and mixes	5
BTCE-407- 18.5	Evaluate the pavement condition by rough meter and	5

	Benkelman beam test.	
BTCE-407- 18.6	Create a well-organized report and present the results appropriately	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		
CO2	2				1				1			1	1	
CO3	2			1	1				1			1	1	
CO4	2				1				1			1	1	
CO5	2			2	2				1			1	2	
CO6	1								2	3	1	1		

INDEX
SCHEME: B. TECH 5TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-501-18	Engineering Geology	3-0-0	3	3
B	BTCE-502-18	Elements of Earthquake Engineering	3-0-0	3	3
C	BTCE-503-18	Construction Engineering & Management	3-0-0	3	3
D	BTCE-504- 18	Environmental Engineering	4-0-0	4	4
E	BTCE-505-18	Structural Engineering	3-1-0	4	4
F	BTCE-506-18	Geotechnical Engineering	3-0-0	3	3
G	BTCE-507- 18	Geotechnical Lab	0-0-2	2	1
H	BTCE-508- 18	Environmental Engineering Lab	0-0-2	2	1
I	BTCE-509- 18	Structural Lab	0-0-2	2	1
J	BMPD-501-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-501-18: ENGINEERING GEOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING GEOLOGY	**SEMESTER:** V
COURSE CODE: BTCE-501-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**General Geology:** Scope of geology in Civil Engineering - the earth, its structure and environment - Standard geological time scale, unit & fossils. physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes –weathering – types, weathered products, assessment of degree of weathering, Fluvial processes, glaciation, wind action, and their significance in Civil Engineering.	04
II	**Mineralogy and Petrology:** Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Horn blend, Mica family, calcite, Iron oxide minerals, Augite, Horn blend, and Clay minerals and their behaviour and significance in the field of Civil Engineering. Classification of rock - mode of formation -distinction between igneous, sedimentary and metamorphic rocks. Formation, textures, structure, Classification, and Engineering, Characteristic of rocks. Study of imp rocks granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia, conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate	07
III	**Strength Behaviour of Rocks:** Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold-Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.	07
IV	**Geological Hazards:** Rock Instability and Slope movement: Concept of	08

	sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslides. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence.	
V	**Rock masses as construction material:** Definition of Rock masses. Main features constituting rock mass. Main features that affect the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging. Rock Quality Designation. Rock mass description.	06
VI	**Geology of dam and reservoir site:** Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2.	Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3.	Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
4.	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995
5.	Leggot, R.F.," Geology and Engineers ", McGraw Hill, New York.2002 2.
6.	Blyth, F.G.M., "A Geology for Engineers", Arnold, Londo, (2003.
7.	Bell.F.G, " Fundamentals of Engineering Geology" Butterworth, 1983

T/R	Book title suggested by faculty
1	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995

E- content used:
https://nptel.ac.in/courses/105105106

Additional topics:

Classification of rocks for engineering purposes. Rock quality designation (RQD).

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Topic delivery by students
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-501- 18.1	Understanding geological processes and their importance in civil Engineering	2
BTCE-501- 18.2	Identification of rocks and minerals and their characteristics	2
BTCE-501- 18.3	Significance of geological structures and processes in civil engineering projects	2
BTCE-501- 18.4	Identify the geological hazards associated with civil engineering structures and suggest remedies.	2
BTCE-501- 18.5	Site characterization and geologic considerations in construction	4
BTCE-501- 18.6	Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	1												
CO3	2													
CO4	2	2	2						1				2	
CO5	2	2	2						1					
CO6	2	2	1	2					1				2	

Prepared by **Approved By**

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BTCE-502-18: ELEMENTS OF EARTHQUAKE ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ELEMENTS OF EARTHQUAKE ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-502-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.	04
II	Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.	04
III	Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.	08
IV	Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.	06
V	Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.	06
VI	Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.	04
VII	Introduction to provisions of IS 4326. Unit 8: Introduction to provision of IS 13920.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2.	Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra,

	Prentice Hall
3.	Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4.	Structural Dynamics by Mario & Paz, Springer.
5.	Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6.	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7.	IS 1893-2016Indian Standard Criteria for Earthquake Resistant Design of Structures.
8.	IS 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9.	IS 13920:2016- Ductile design and detailing of Reinforced Concrete Structures subjected to Seismic Forces-code of practice

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Seismic Soil-Structure Interaction: soil effect on the ground motion characteristics, Effect of Surface Topography.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-502- 18.1	Appreciate the role of earthquake forces in structural design of building.	2
BTCE-502- 18.2	Develop an understanding of structural defects due to earthquakes by studying past earthquakes	3

BTCE-502- 18.3	Acquire basic knowledge of concept of vibrations in earthquake engineering	2
BTCE-502- 18.4	Analyse the behaviour of structures under dynamic loads	4
BTCE-502- 18.5	Understand engineering seismology, ductility requirement & structural configurations.	2
BTCE-502- 18.6	Apply various codal provisions related to seismic design of buildings.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		2									1	
CO3	3													
CO4	3	3		2					1				2	
CO5	3													
CO6	2	2											2	2

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BTCE-503-18: CONSTRUCTION ENGINEERING & MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONSTRUCTION ENGINEERING & MANAGEMENT	**SEMESTER:** V
COURSE CODE: BTCE-503-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS

I	Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.	03
II	Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.	06
III	Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.	04
IV	Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.	04
V	Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow,sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling-Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction.	05
VI	Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project	06

	sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.	
VII	Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.	05
VIII	Construction Costs: Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.	03

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Varghese, P.C., "*Building Construction"*, Prentice Hall India, 2007.
2.	*National Building Code,* Bureau of Indian Standards, New Delhi, 2017.
3.	Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
4.	Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5.	Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6.	Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7.	Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Cost Analysis: Determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Projects study

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-503- 18.1	An understanding of modern construction practices	2
BTCE-503- 18.2	A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics	2
BTCE-503- 18.3	A basic ability to plan, control and monitor construction projects with respect to time and cost	6
BTCE-503- 18.4	An idea of how to optimise construction projects based on costs	2
BTCE-503- 18.5	An idea how construction projects are administered with respect to contract structures and issues.	2
BTCE-503- 18.6	An ability to put forward ideas and understandings to others with effective communication processes	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				3									
CO2	2				2				2		3			
CO3	2		1						2		3			3
CO4	2	2	2	1					2		3		1	2
CO5	2		1	1					2		3		1	2
CO6	2									3				1

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BTCE-504-18: ENVIRONMENTAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-504-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 508-18	**LAB COURSE NAME:** ENVIRONMENTAL ENGINEERING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	*Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. *Water Treatment:* aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes	08
II	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage-Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water-Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.	10
III	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution.	06
IV	*Noise*- Basic concept, measurement and various control methods.	04
V	*Solid waste management*-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management.	10

VI	*Building Plumbing*-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Storage tanks, building drainage for high rise buildings, various kinds of fixtures and fittings used.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2.	Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3.	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
4.	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
5.	Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6.	Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7.	Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8.	Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development

T/R	Book title suggested by faculty
1	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
2	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low-cost treatment techniques.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations
Inquiry guided instructions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-504- 18.1	Understanding the principles of water treatment processes, their design and distribution systems.	2
BTCE-504- 18.2	Be able to apply the knowledge for selecting the most appropriate technique for the treatment of wastewater.	3
BTCE-504- 18.3	Identify the major sources, effects and monitoring of air pollutants.	2
BTCE-504- 18.4	Impart knowledge on the sources, effects and control techniques of noise pollution.	2
BTCE-504- 18.5	Understand the fundamental principles of existing and emerging technologies for the solid waste management	2
BTCE-504- 18.6	Identify various plumbing systems provided in the buildings.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		1											2
CO2	2	2			2								2	
CO3	2	2					2							
CO4	2	2			1		2							
CO5	2				2		1							
CO6	2	2												

Prepared by **Approved By**

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BTCE-505-18: STRUCTURAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: STRUCTURAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-505-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 509-18	**LAB COURSE NAME:** STRUCTURAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction** Structural Engineering, role of structural engineer, engineer, architect, builder; Objectives of designing a structure, safety, sustainable development in performance.	08
II	**Structural Analysis** Concept of determinacy and indeterminacy, Analyses of indeterminate beams, frames and trusses using Slope deflection method, Moment distribution method, unit load method and castiglano's theorem.	12
III	**Design of concrete Elements** Design Philosophies of Working Stress Method and Limit State Method, Design of Reinforced Concrete Beams for Flexure, Shear; Bond, Anchorage, development length and torsion; Reinforced Concrete Axially Loaded Columns, Reinforced Concrete Slabs: One Way and Two Way.	12
IV	**Design of Steel Elements** Properties of structural steel, I.S. rolled sections, I.S. specifications; Connections- Bolted and welded connections for axial loads; Tension members: Design of members subjected to axial tension; Compression members: Design of axially loaded members, built-up columns, laced and battened columns; Flexural members: Design of laterally restrained and un-restrained rolled section beams.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
2.	McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
3.	Intermediate Structural Analysis - C K Wang, McGraw hill publications.
4.	Limit state design of steel structures: S K Duggal, Mc Graw Hill.

5.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.
6.	Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
7.	NBC, National Building Code, BIS (2017).
8.	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
9.	Theory of structures - B.C. Punima, Laxmi Publications.
10.	Reinforced concrete design - Pillai & Menon, Tata McGrawHill publications

BIS Codes of practice and Design Handbooks:

1.	*IS 456-2000- Indian Standard. Plain and Reinforced concrete -Code of practice
2.	*Design Aid SP 16
3.	*IS 800: 2007 (General construction in steel-Code of practice)*
4.	*SP: 6(1) (Handbook for structural engineers-Structural steel sections
5.	Explanatory hand book SP24.
6.	Detailing of Reinforcement SP 34

T/R	Book title suggested by faculty
1	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
2	Limit state design of steel structures: S K Duggal, Mc Graw Hill.
3.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Introduction to Moving Loads and Influence Line Diagrams, Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-505- 18.1	Apply their knowledge of structural mechanics in addressing design problems of structural engineering	3
BTCE-505- 18.2	Possess the skills to analyse and design concrete and steel structures	4
BTCE-505- 18.3	Knowledge of structural engineering	2
BTCE-505- 18.4	Understand the various design philosophies related to reinforced concrete structures	2
BTCE-505- 18.5	Analyse and design the safe RCC structural members	6
BTCE-505- 18.6	Design various steel structure members i.e., connections, tension members, compression members and flexural members	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									1	2
CO2	3	3	3	2	2				2				2	3
CO3	3													
CO4	3	2	2											2
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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BTCE-506-18: GEOTECHNICAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-506-18	**CREDITS:** 3

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 507-18	**LAB COURSE NAME:** GEOTECHNICAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Basic Concepts***- Definition of soil, Comparison between soil mechanics, rock mechanics and geotechnical engineering, Scope of soil mechanics problems in Civil Engineering. Principal types of soils in India. Characteristics of main Clay mineral groups. Soil as three phase system: weight volume relationship and determination of moisture content from nuclear method, alcohol method and sensors. Determination of Specific gravity by density bottle method, pycnometer method. Field density from sand replacement method and other methods. ***Index Properties***: Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse- and fine-grained soils as per Indian Standard.	08
II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis-Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. ***Effective Stress Principle***- Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.	10
III	***Compaction of Soil***-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. ***Consolidation of Soil*** - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, Concept of various consolidation characteristics i.e., av, mv and cv, primary and secondary consolidation concept of cv, tv& U. Consolidation test: determination of cv from curve fitting methods, Pre consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect disturbance on e-Log σ curves of normally consolidated clays, importance of consolidation settlement in the design of structures. final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.	10

IV	***Shear Strength***- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test ***Stability of Slopes***- Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S. Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M. Das Cengage Publisher
7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers.

T/R	**Book title suggested by faculty**
1	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
2	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons

E- content used:
https://nptel.ac.in/courses/105101201

Additional topics:

Soil particle structures, Derivation of skempton's pore pressure parameters, sliding block analysis, Earth pressures under applied load.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-506- 18.1	Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	2
BTCE-506- 18.2	Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of permeability, total and effective stress approaches in soil strength determination	4
BTCE-506- 18.3	Apply the various specifications of compaction of soils in the construction of highways and earthen dams.	3
BTCE-506- 18.4	Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.	3
BTCE-506- 18.5	Evaluate shear strength and permeability parameters of different soils	5
BTCE-506- 18.6	Design the embankment slopes and check the stability of finite slopes.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3	2	2	2						2			2	2
CO3	3	2	2										2	
CO4	3	2	2	1									2	
CO5	3	2	2	1									2	
CO6	3	2	3	1	2				2				2	3

Prepared by **Approved By**

HOD

BTCE-507- 18: GEOTECHNICAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-507- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of in-situ density by core cutter method and Sand replacement method.
II	Determination of Liquid Limit & Plastic Limit.
III	Determination of specific gravity of soil solids by pyconometer method.
IV	Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
V	Compaction test of soil.
VI	Determination of Relative Density of soil.
VII	Determination of permeability by Constant Head Method.
VIII	Determination of permeability by Variable Head method.
IX	Unconfined Compression Test for fine grained soil.
X	Direct Shear Test
XI	Triaxial Test
XII	Swell Pressure Test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain. Nem Chand & Brothers.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-507- 18.1	Comprehend the procedure for classifying coarse grained and fine-grained soils	2
BTCE-507- 18.2	Evaluate the index properties of soil	5
BTCE-507- 18.3	Determine the engineering properties of soil	5
BTCE-507- 18.4	Interpret the results of compaction test for relative compaction in the field	4
BTCE-507- 18.5	Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis	3
BTCE-507- 18.6	Conduct experiments, analyse and interpret results for geotechnical engineering design	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							2					
CO2	3	2	1						2				1	
CO3	3	2	1						2				1	
CO4	3	2							2				1	
CO5	3	2		1	3				2			2	2	
CO6	3	2	2						2				1	2

BTCE-508- 18: ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING LAB	**SEMESTER:** V
COURSE CODE: BTCE-508- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To measure the pH value of a water/waste water sample.

II	To determine optimum Alum dose for Coagulation.
III	To find MPN for the bacteriological examination of water.
IV	To find the turbidity of a given waste water/water sample
V	To find B.O.D. of a given waste water sample.
VI	To measure D.O. of a given sample of water.
VII	Determination of Hardness of a given water sample
VIII	Determination of total solids, dissolved solids, suspended solids of a given water sample.
IX	To determine the concentration of sulphates in water/wastewater sample.
X	To find chlorides in a given sample of water/waste water.
XI	To find acidity/alkalinity of a given water sample
XII	To determine the COD of a wastewater sample.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2.	Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-508-18.1	Conduct experiments as per standard methods of sampling and analysis.	2
BTCE-508-18.2	Demonstrate the expertise to characterize water and wastewater samples.	5
BTCE-508-18.3	Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.	5
BTCE-508-18.4	Record the experimental observations and interpret the analysis results.	4
BTCE-508-18.5	Use the analysis results for making informed decision about the potability of water and disposal of wastewater.	3

BTCE-508-18.6	Recognize the working of air pollution monitoring equipment and noise meter.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2			1				2					
CO2	3	2			1				2					
CO3	3	1			1				2					
CO4	2	2	1		2				2				2	
CO5	2	2	2	1	2				2				1	
CO6	2	2			2				2				2	

BTCE-509-18: STRUCTURAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-509- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
II	To determine the Flexural Rigidity of a given beam.
III	Deflection of a fixed beam and influence line for reactions.
IV	Deflection studies for a overhang beam and influence line for reactions.
V	Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
VI	Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams,

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Dally J W, and Riley W F, "Experimental Stress Analysis", McGraw-Hill Inc. New York, 1991.
2.	Harrison H.B., "Structural Analysis and Design Vol.I and II", Pergamon Press, 1991

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-509-18.1	Verify theoretical formulas by conducting experiments.	4
BTCE-509-18.2	Predict the behaviour of statically determinate beams and trusses.	6
BTCE-509-18.3	Depict the behaviour of two hinged arch and three hinged arch structures.	4
BTCE-509-18.4	Demonstrate the influence lines for statically determinate and indeterminate beams.	2
BTCE-509-18.5	Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.	5
BTCE-509-18.6	Outline the deflected shapes of columns and struts with different end conditions.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							1					
CO2	3	2	2						1					
CO3	3	2	2						1					
CO4	3	2	2	1					1					
CO5	3	2	1	2					1					
CO6	3	2	1	2					1					

INDEX
SCHEME: B. TECH 6TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-601-18	Engineering Economics, Estimation & Costing	3-1-0	4	4
B	PECE-602A-18	Foundation Engineering	3-1-0	4	4
C	PECE-603D-18	Structural Analysis and Design	3-1-0	4	4
D	PECE-604B-18	Sustainable Construction Methods	3-1-0	4	4
E	BTES 401-18	Computer Organization & Architecture	3-0-0	3	3
F	BTEE-603D-18	Wind And Solar Energy Systems	3-0-0	3	3
G	BTMC101-18	Constitution of India	3-0-0	3	0
H	BMPD-601-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 22 Hours = 27

BTCE-601-18: ENGINEERING ECONOMICS, ESTIMATION & COSTING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING ECONOMICS, ESTIMATION & COSTING	**SEMESTER:** VI
COURSE CODE: BTCE-601-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Principles of Economics** Demand/Supply – elasticity – Basic Macroeconomic Concepts (including GDP/GNP/NI/ Disposable Income), Aggregate demand and Supply (IS/LM), Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.	04
II	**Elements of Business/Managerial Economics** Cost & Cost Control -Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money.	06
III	**Estimation / Measurements for various items** Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.	08
IV	**Specifications** Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.	06
V	**Rate analysis**: Purpose, importance and necessity of the same, factors affecting, task work,	06

	daily output from different equipment/ productivity.	
VI	**Tender:** Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price build-up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.	08
VII	**Introduction to Acts:** Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2.	V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3.	Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
4.	M Chakravarty, Estimating, Costing Specifications & Valuation
5.	Joy P K, Handbook of Construction Management, Macmillan
6.	B.S. Patil, Building & Engineering Contracts
7.	Relevant Indian Standard Specifications.
8.	World Bank Approved Contract Documents.
9.	FIDIC Contract Conditions.
10.	Acts Related to Minimum Wages, Workmen’s Compensation, Contract, and Arbitration
11.	Typical PWD Rate Analysis documents.
12.	UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
13.	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

T/R	Book title suggested by faculty
1	M Chakravarty, Estimating, Costing Specifications & Valuation
2	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

E- content used:
https://nptel.ac.in/courses/105103093

Additional topics:

Schedule of Rates- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-601- 18.1	Have an idea of basic principles and elements of economics in general.	2
BTCE-601- 18.2	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.	5
BTCE-601- 18.3	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.	2
BTCE-601- 18.4	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	5
BTCE-601- 18.5	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	2
BTCE-601- 18.6	Demonstrate the knowledge related to various rules and regulations applicable to construction industry.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2								

CO2		2				2					3			
CO3	2	2				2					2			
CO4	2	2				2					3			
CO5	2					2				2	3	1		
CO6	2					2				2	2	1		

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PECE-602A-18: FOUNDATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FOUNDATION ENGINEERING	**SEMESTER:** VI
COURSE CODE: PECE-602A-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Soil Exploration** Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, - standard penetration test -static and dynamic cone penetration test, Bore Hole log for S.P.T. Geophysical exploration by seismic and resistivity methods **Stresses Distribution:** Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, Newmark's chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Pressure Bulb and Isobar. Related Numerical Problems	10
II	**Earth Pressure** Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and K_p for horizontal backfills. Rankine's theory both for active and passive	12

	earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfills. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).	
III	**Shallow Foundation** Type of shallow foundations, Depth and factors affecting it. Definitionof ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of Shear failures. Factors affecting bearing capacity. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration test. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by Plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code.	11
IV	**Pile Foundations** Types and function of pile - factors influencing the selection of pile - carrying capacity of single pile in cohesionless and cohesive soil by static formula. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile- dynamic formulae (Engineering News and Hileys) Types of pile driving hammers & their comparison. Limitations of pile driving formulae. Negative skin friction - Carrying capacity of Pile group - Pile load test Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Settlement of pile groups in sand, Negative skin friction. Related Numerical problems **Well foundations-**shapes, depth of well foundations, components, factors affecting well foundation design, Scour Depth, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.	11

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M.Das Cengage Publisher

7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

T/R	Book title suggested by faculty
1	Soil Mech. & Foundation Engg, by K.R. Arora Standard *Publishers* Distributors
2	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers

E- content used:
https://archive.nptel.ac.in/courses/105/105/105105176/

Additional topics:

Danish method of analysis of pile foundation, Equivalent point load method of load distribution.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-602A-18.1	Understand the methods of surface and subsoil exploration and to prepare investigation report.	2
PECE-602A-18.2	Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations.	5
PECE-602A-18.3	Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations	6
PECE-602A-18.4	Estimate the stresses in soils and bearing capacity of soil for shallow foundation.	3
PECE-602A-18.5	Design various types of shallow foundation and to estimate settlement.	6
PECE-602A-	Apply the concepts of deep foundation and solve problems	3

18.6	related with pile foundation.	

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2		2	2				1					
CO2	3	2	2	2	2				1				1	2
CO3	3	2		2	2				1					
CO4	3	2	2	1					1				1	
CO5	3	2	2	2	2				1				2	3
CO6	3	2	2	2	2				1				2	3

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PECE-603D-18: STRUCTURAL ANALYSIS AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL ANALYSIS AND DESIGN	**SEMESTER:** VI
COURSE CODE: PECE-603D-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Review of indeterminacy:** Static and kinematic indeterminacies of beams, rigid-jointed and pin-jointed plane frames.	04
II	**Analysis of indeterminate structures**: Analysis indeterminate beams and frames by Kani's method, Theorem of three moments and other approximate methods- Portal, Cantilever and Substitute frame method.	12

III	**Moving loads and influence lines:** Analysis of moving Loads for determinate beams, Influence lines for indeterminate beams, trusses and frames. Muller Breslau principle.	08
IV	**Design of Concrete structures:** **Columns with moments**: Design of short columns with uni-axial and bi-axial bending; Design of Long columns, use of design charts; **Foundations**: Isolated and combined footing for columns; **Staircases**, Introduction, types and design; **Retaining walls** - Cantilever and Counter-forte type retaining wall.	10
V	**Design of Steel Structures:** **Column bases:** Slab base, Gusseted base; **Beam-column connections:** bracket connections, seated and framed connections.; **Plate girders:** Elements of a plate girder, design of plate girder section, intermediate and bearing stiffeners, **Roof trusses:** Types, Design loads, design of members and joints.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2.	Intermediate structural analysis - C . K. Wang. McGraw Hill
3.	Structural analysis - S Ramamurtham
4.	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
5.	Limit state Design of Reinforced Concrete; Varghese P C; PHI Pvt. Ltd.
6.	Design of concrete structures, B C Punmia
7.	Limit state design of steel structures: S K Duggal, TMH
8.	Design of steel structures: N Subramanian, Oxford publications
9.	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

T/R	**Book title suggested by faculty**
1	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2	Structural analysis - S Ramamurtham
3	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

E- content used:
https://nptel.ac.in/courses/105105166

Additional topics:

Connections: Riveted, bolted and welded connections for axial and eccentric loads, Comparison of working stress method, limit state method and ultimate load method.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems as per codes

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-603D-18.1	To recognize the concept of structural systems, loads, supports and displacements.	2
PECE-603D-18.2	To understand and determine the indeterminacy of different types of structures.	2
PECE-603D-18.3	To calculate forces and moments in indeterminate structures due to static as well as moving loads.	5
PECE-603D-18.4	To develop and use the concept of influence line diagram for calculating different structural quantities in a statically determinate structure.	4
PECE-603D-18.5	To analyse and design concrete structures i.e., column subjected to moments, foundations, retaining walls, etc.	6
PECE-603D-18.6	To analyse and design the steel structures i.e., column bases, beam-column joints, plate girders and roof trusses.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO2	3	2	1	2										
CO3	3	2	1	2										
CO4	3	2	3	2									2	1
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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PECE-604B-18: SUSTAINABLE CONSTRUCTION METHODS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SUSTAINABLE CONSTRUCTION METHODS	**SEMESTER:** VI
COURSE CODE: PECE-604B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION** Definitions- Various types - Pillars of Sustainability - Circle of Sustainability - Need - systems and their sustainability - Green Buildings -Difference between Green and Sustainability - Climate Change, Global warming - National and International policies and Regulations. Identification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.	06
II	**BUILDING CONSTRUCTION METHODS** Conventional vs modular construction methods, development, Engineering principles, benefits**,** Modular construction methods for repetitive works, Green Roofs, Cool Roofs, Passive House, Rammed Earth Brick**,** Passive Solar, Greywater Plumbing Systems, Solar Thermal Cladding, Solar Power, Water Efficiency Technologies, Sustainable Indoor Environment Technologies.	10
III	**PRECAST CONSTRUCTION METHODS** Modular construction methods for repetitive works; Precast concrete construction methods; Benefits , Sustainability in Concrete Mix Design, Greener, Faster and Sustainable Construction Practices Through Precast Solutions, Use of secondary cementitious material (SCM's) like GGBS, fly ash, ultra-fine GGBS in the production of the concrete, Basics of Slip forming for tall structures, Structural 3D Printing, Self-healing Concrete**,** Green Insulation, Sustainable Resource Sourcing, Environmental Sustainability Benefits From Precast Concrete.	10
IV	**CONSTRUCTION METHODS OF BRIDGES** Types of foundations and construction methods; Basics of Formwork and Staging; Proactive Maintenance**,** Prefabrication/Modular Construction, balance between environment and construction activities, reducing problems at site with minimal staging, increasing safety etc, Constructions are sustainable with reduced use of natural resources, Costs of	10

	Construction/Assembly and Transportation, Lifespan, Environmental Impact, harmful emissions during bridge construction, Reducing waste, solar panels to power LED lights to illuminate its deck, water-powered light system powered by the currents of the river, development that meets the needs of the present.	
V	**NEW CONSTRUCTION MATERIALS TECHNOLOGIES** Introduction to new construction materials & technologies, Synthetic Roof Underlayment, Electro chromic Glass, Biodegradable Materials, Reduction of water consumption, Impact on environment, Concepts of climate responsive building, Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process.	08

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Margaret Robertson, Sustainability Principles and Practice, Routledge, 2014
2.	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
3.	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
4.	Stephen M. Stephen, Stephen M. Wheeler, Climate Change and Social Ecology: A New Perspective on the Climate Challenge, Routledge, 2012.
5.	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

T/R	Book title suggested by faculty
1	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
2	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
3	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

E- content used:
https://nptel.ac.in/courses/105102195

Additional topics:

Case studies: Shanghai Tower, China; Bank of America, New York; The Crystal, London, United Kingdom; Council House 2, Melbourne.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-604B-18.1	Create new engineering materials to improve the performance of infrastructure	6
PECE-604B-18.2	Characterize and mitigate natural and man-made hazards	4
PECE-604B-18.3	Understanding various sustainable building construction methods and precast construction methods	2
PECE-604B-18.4	Improve fundamental knowledge of the inter-relationships between the built environment and natural systems.	6
PECE-604B-18.5	Understanding sustainable construction methods for bridges and analysing their economic viability.	4
PECE-604B-18.6	Develop the technological innovations needed to safeguard, improve, and economize infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	2				2				3	
CO2	3	2	2										2	
CO3	2	2					3							
CO4	2	2	2				3		2				2	1
CO5	2	2					3							
CO6	2	2	3	2	3		2		2			2	3	2

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BTES 401-18: COMPUTER ORGANIZATION & ARCHITECTURE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: COMPUTER ORGANIZATION & ARCHITECTURE	**SEMESTER:** VI
COURSE CODE: BTES 401-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of 8085 processor. Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	12
II	**Introduction to x86 architecture:** CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions, I/O device interfaces – SCII, USB	10
III	**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	12
IV	**Memory Organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	"Computer Organization and Architecture", Moris Mano.
2.	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

3.	“Computer Organization and Embedded Systems”, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
4.	“Computer Architecture and Organization”, 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
5.	“Computer Organization and Architecture: Designing for Performance”, 10th Edition by William Stallings, Pearson Education.
6.	“Computer System Design and Architecture”, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

T/R	Book title suggested by faculty
1	“Computer Organization and Design: The Hardware/Software Interface”, 5th Edition
2	by David A. Patterson and John L. Hennessy, Elsevier.

E- content used:
https://nptel.ac.in/courses/108102112

Additional topics:

Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom’s Level (B.L)
BTES 401-18.1	Understand functional block diagram of microprocessor;	2
BTES 401-18.2	Apply instruction set for writing assembly language programs.	3
BTES 401-18.3	Design a memory module and analyze its operation by interfacing with the CPU.	6
BTES 401-18.4	Classify hardwired and microprogrammed control units	4
BTES 401-18.5	Understand the concept of pipelining and its performance metrics.	2

BTES 401-18.6	Demonstrate the basic knowledge of I/O devices and interfacing of I/O devices with computer.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				1		1			
CO2	2	1			1				1		1		1	
CO3	3	2	3	2	1				2		2		2	2
CO4	2				1				1		1		1	
CO5	2				1				1		1			
CO6	2				1				1		1		1	

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BTEE-603D-18: WIND AND SOLAR ENERGY SYSTEMS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: WIND AND SOLAR ENERGY SYSTEMS	**SEMESTER:** VI
COURSE CODE: BTEE-603D-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power cumulative distribution functions.	08

II	**Wind generator topologies:** Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.	08
III	**The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.	08
IV	**Solar energy Technologies -** Solar photovoltaic Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.	10
V	**Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2.	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3.	S. P. Sukhatme, Solar Energy: Principles of Thermal Collection & Storage, McGraw Hill, 1984.
4.	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.
5.	G. N. Tiwari and M. K. Ghosal, Renewable Energy Applications, Narosa Publications, 2004.
6.	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley & Sons, 1991.

T/R	Book title suggested by faculty
1	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.

E- content used:
https://nptel.ac.in/courses/103103206

Additional topics:

Non-concentrating solar collectors, Parabolic solar collectors, Turbulence in Wakes and Wind Farms, Turbulence in Complex Terrain.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEE-603D-18.1	Understand the global energy scenario and the consequent growth of the power generation from renewable energy sources.	2
BTEE-603D-18.2	Understand the basic physics of wind and solar power generation.	2
BTEE-603D-18.3	Apply the knowledge of electrical machines to generate electrical power from wind	3
BTEE-603D-18.4	Understand and analyse the solar photo-voltaic technology for energy generation	4
BTEE-603D-18.5	Understand the power electronic interfaces for wind and solar generation.	2
BTEE-603D-18.6	Understand the issues related to the grid-integration of solar and wind energy systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1		2		1		1	2							
CO2	2				1		2							
CO3	3		2		2		2						2	2
CO4	3	2	2	2	2		2						2	
CO5	3				2		2							
CO6	2					1	2						1	

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INDEX
SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	PECE -701B-18	Airport Planning and Design	3-1-0	4	4
B	OECE-701-18	Metro Systems and Engineering	3-0-0	3	3
C	PECE -701B-18	Solid And Hazardous Waste Management	3-1-0	4	4
D	PECE-703F-18	Urban Hydrology and Hydraulics	3-1-0	4	4
E	HSMC -255	Professional Practice, Law & Ethics	2-0-0	2	2
F		Project	0-0-8	8	7
G	BTMC701-18	Management- I (Organizational Behavior)	2-0-0	2	0

Total Credits = 24 Hours: 27

SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE801-18	Training (one semester)	-	-	16

PECE -701B-18: AIRPORT PLANNING AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: AIRPORT PLANNING AND DESIGN	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Airport Engineering:** Components of airport: Classifications of obstructions, Imaginary surfaces, Approach zone and turning zone. Runway orientation, basic runway length, corrections for elevation, temperature & gradient, airport classification.	10
II	**Runway & Taxiway Design:** Wind-rose diagram, Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons,	12
III	**Structural design** of runway pavements LCN/PCN method of rigid pavement design, different LCN/PCN of aircrafts using runway. Pavement Evaluation for runway & taxiway, design of overlay, Terminal area, building area, parking area, apron, hanger typical airport layouts.	12
IV	**Design of flexible and rigid runways** as per FAA procedure, Specifications for the different layers of runway and taxiway pavements, Pavement management systems for runway pavements. Benkelman Beam method for maintenance.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2.	Rangwala, Airport Engineering, Charotar Publishing House (2019).
3.	Horenjeff Robert, Airport Engineering, McGraw Hill International Publisher (2010).

T/R	Book title suggested by faculty
1	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2	Rangwala, Airport Engineering, Charotar Publishing House (2019).

E- content used:
http://128.173.204.63/courses/cee4674/ce_4674.html

Additional topics:

Visual and navigation aids, Instrument and Visual Flight Rules, Aircraft characteristics.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understand the detail concepts of the airport engineering.	2
PECE -701B-18.2	Estimate the geometric design characteristics of taxiways and runway	5
PECE -701B-18.3	Suggest the runway orientation and the runway length as per FAA & ICAO guidelines.	5
PECE -701B-18.4	Understanding the pavement evaluation techniques and design the overlay for runways and taxiways.	2
PECE -701B-18.5	Specify the guidelines and procedure for the design of flexible and rigid pavement for runways.	6
PECE -701B-18.6	Conceptualise Pavement management system for maintenance	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3		2	1					1					2
CO3	3		3	2					1					3
CO4	3	2	2	2					1					2
CO5	3	2	2	2					1					2

CO6	3		2	`								1	

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OECE-701-18: METRO SYSTEMS AND ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: METRO SYSTEMS AND ENGINEERING	**SEMESTER:** VII/VIII
COURSE CODE: OECE-701-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Metro systems** Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.	04
II	**Planning and Development** Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;	06
III	**Traffic Management Systems** Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems- permanent way. Facilities Management Module	08
IV	**Signalling Systems** Introduction to Signalling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	06
V	**Electrical Systems** OHE, Traction Power; Substations-TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air	06

	mechanics.	
VI	**Mechanical Systems** Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators	06

Total hours – 36

TEXT /REFERENCE BOOKS

1.	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2.	"Metropolitan Railways: Rapid Transit in America (Railroads Past and Present)",Middleton, Indiana University Press 2013.
3.	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

T/R	Book title suggested by faculty
1	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

E- content used:
https://coursecontent.indusuni.ac.in/wp-content/uploads/sites/8/2020/05/METRO-SYSTEMS-AND-ENGINEERING_CV0425_OE-5_UNIT-1.pdf

Additional topics:

Case studies: Baltimore Metro Subway Link, Moscow Metro, Kyoto Municipal Subway, Delhi Metro Rapid Metro Express.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects study
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
OECE-701-18.1	Understand overview of metro systems.	2
OECE-701-18.2	Analyse vehicle dynamics and structure; tunnel ventilation	4

	systems; electrical systems.	
OECE-701-18.3	Understanding electronic signalling systems and automatic fare collection.	2
OECE-701-18.4	Understand the basics of construction planning & management.	2
OECE-701-18.5	Evaluate the construction quality & safety systems	5
OECE-701-18.6	Acquiring the knowledge of mechanical systems in context of metro systems engineering.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3	3		2	3								1	
CO3	3													
CO4	2										3			
CO5	2	2		1										
CO6	3													

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PECE -701B-18: SOLID AND HAZARDOUS WASTE MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID AND HAZARDOUS WASTE MANAGEMENT	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction:** Definition of solid wastes and hazardous wastes, Nuisance potential and extent of solid waste problems, Objectives and scope of integrated solid waste management. **Collection, Storage and Transportation of Wastes:** Types of collection systems and their components, Concept of waste segregation at source and recycling and reuse of wastes.	08
II	**Solid Waste Processing and Treatment:** Waste processing – processing technologies –biological and chemical conversion technologies–Composting-thermal conversion technologies-energy recovery.	12
III	**Hazardous Waste Treatment and Disposal:** Biological and chemical treatment of hazardous wastes; Solidification and stabilization of wastes; Incineration for the treatment and disposal of hazardous wastes; Land farming; Landfill disposal of hazardous waste; Bioremediation of hazardous waste disposal sites.	12
IV	**Sanitary Landfills:** Design, development, operation and closure of landfills, Management of leachate and landfill gases, environmental monitoring of landfill sites.	06
V	**Legal Requirements:** Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, fly ash, etc.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press
2.	Vesilind, P.A., Solid Waste Engineering, Thomson Learning Inc.
3.	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill
4.	Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engg.", McGraw Hill
5.	CPHEEO, *Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization*, Government of India

T/R	Book title suggested by faculty
1	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill

2	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press

E- content used:
https://nptel.ac.in/courses/120108005

Additional topics:

Resource Conservation and Recovery Act, Health and Safety at Work Act, Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments and Reauthorization Act.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Case studies

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.	2
PECE -701B-18.2	Knowledge of waste processing technologies and various waste treatment methods	2
PECE -701B-18.3	Become aware of Environment and health impacts solid waste mismanagement.	2
PECE -701B-18.4	Understand engineering, financial and technical options for waste management.	2
PECE -701B-18.5	Plan, design, manage and operate sanitary landfills for effective waste management.	6
PECE -701B-18.6	Knowledge of legal, institutional and financial aspects of management of solid wastes	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2				2									
CO3							2							
CO4	2						2				3			
CO5	3	2	3	1	2		2				2		2	3
CO6						2	2				2			

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PECE-703F-18: URBAN HYDROLOGY AND HYDRAULICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: URBAN HYDROLOGY AND HYDRAULICS	**SEMESTER:** VII/VIII
COURSE CODE: PECE-703F-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction-** Trends of Urbanization and Industrialization, Urban water supply demand forecast, urban hydrological cycle.	08
II	**Urban water Management-** Rain water harvesting, managed aquifer recharge, effect of water management practices on urban water infrastructure, hydrology and ground water regime, mapping of water supply and sewage networks. **Urban water Infrastructure-** water supply, sanitation, sewerage and wastewater conveyance infrastructures, Water supply and sewerage network hydraulics, Structural safety and mitigating plans against natural and human caused threats.	14
III	**Urban Storm water-** Master drainage plans, Estimation of urban stormwater quantity, Wastewater collection systems, Design of storm sewer network systems, Storage facilities. Interaction between urban drainage and solid waste management, Stormwater Management, Operation and maintenance of urban drainage system.	12
IV	**Sustainable Design-** Sustainable urban designs, Methodologies for assessing sustainability of urban water infrastructures, Emerging sustainable materials and design procedures for water supply and sewerage pipelines, determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2.	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.
3.	Hall, M.J., (1984), *"Urban Hydrology*", Elsevier Applied Science Publishers.
4.	Mays, L.W., Hydraulic Design Handbook, McGraw-Hill, 1999

T/R	Book title suggested by faculty
1	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.

E- content used:
https://nptel.ac.in/courses/105104029

Additional topics:

Urban Runoff hydrology, Urban Runoff pollution, Stormwater best management practices.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instruction
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-703F-18.1	Build understanding of hydrological aspects of water resources.	2
PECE-703F-18.2	Develop competence to propose effective convergence and design features of water supply projects.	6
PECE-703F-18.3	Outline the principles of engineered systems for aeration in wastewater treatment.	6
PECE-703F-18.4	Recommend principles of need-based activities such as pumps, mixers related to water.	6

PECE-703F-18.5	Illustrate the application of pipe flow and open channel flow in water distribution networks and sewers.	2
PECE-703F-18.6	Formulate the effective use of surface and ground water sources.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	3	2	2								2	3
CO3	2													
CO4	3	2	3	2	2							2	2	3
CO5	3	2		2	1									
CO6	2		2										2	

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HSMC -255: PROFESSIONAL PRACTICE, LAW & ETHICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: PROFESSIONAL PRACTICE, LAW & ETHICS	**SEMESTER:** VII/VIII
COURSE CODE: HSMC -255	**CREDITS:** 2
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Professional Ethics** – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.	04

II	***General Principles of Contracts Management: Indian Contract Act, 1972 and amendments*** covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms.	05
III	***Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:*** Arbitration –meaning, scope and types – distinction between laws of 1940 and 1996;UNCITRAL model law –Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat.	05
IV	**Engagement *of Labour and Labour & other construction-related Laws:*** Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	04
V	***Law relating to Intellectual property:*** Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2.	The National Building Code, BIS, 2017
3.	RERA Act, 2017
4.	Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5.	Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6.	Anson W.R. (1979), Law of Contract, Oxford University Press
7.	Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
8.	Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
9.	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
10.	O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

T/R	Book title suggested by faculty
1	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974
2	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

E- content used:
https://nptel.ac.in/courses/110105097

Additional topics:

Accounts-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects
Class room discussions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)

HSMC -255.1	Understanding basic purpose of profession, professional ethics and various moral and social issues.	2
HSMC -255.2	Awareness of professional rights and responsibilities of an Engineer, safety and risk benefit analysis of an Engineer	2
HSMC -255.3	Understanding professional ethical values and contemporary issues	6
HSMC -255.4	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels	2
HSMC -255.5	Awareness of Law relating to Intellectual property	2
HSMC -255.6	Excelling in competitive and challenging environment to contribute to industrial growth.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2		3		1				
CO2						2		3		1				
CO3						2		3						
CO4						2		3						
CO5						2		3						
CO6						2	2	3	2	3	2			

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Study Scheme & Syllabus of

Bachelor of Technology

Civil Engineering

(3rd -8th Semester, 2022 batch)

DEPARTMENT OF CIVIL ENGINEERING

BHAI GURDAS INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPROVED BY AICTE, NEW DELHI, AFFILIATED TO IKGPTU, JALANDHAR

INDEX
SCHEME: B. TECH 3RD SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2022

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-301-18	Surveying & Geomatics	3-1-0	4	4
B	BTCE-302-18	Solid Mechanics	3-0-0	3	3
C	BTCE-303-18	Fluid Mechanics	3-0-0	3	3
D	BTAM-301-18	Mathematics-III (Transform & Discrete Mathematics)	4-0-0	4	4
E	BTEC- 305-18	Basic Electronics & Applications in Civil Engineering	3-0-0	3	3
F	HSMC-132-18	Civil Engineering- Introduction, Societal & Global Impact	3-0-0	3	3
G	BTCE-306-18	Surveying & Geomatics Lab	0-0-2	2	1
H	BTCE-307-18	Fluid Mechanics Lab	0-0-2	2	1
I	BTCE-308-18	Solid Mechanics Lab	0-0-2	2	1
J	BMPD-301-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-301-18: SURVEYING & GEOMATICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS	**SEMESTER:** III
COURSE CODE: BTCE-301-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-306-18	**LAB COURSE NAME:** SURVEYING & GEOMATICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Surveying:** Principles, Survey stations, Survey lines-ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction, Levelling: Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; Contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three-point problem only).	10
II	**Triangulation and Trilateration:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline choices - extension of base lines - corrections - Trigonometric levelling.	12
III	**Curves:** Elements of simple and compound curves – Method of setting out transition curve – length of curve – Elements of transition curve. **Photogrammetry Surveying:** Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping-mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	10
IV	**Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based). **Remote Sensing:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2.	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications
3.	Agor, R., Surveying, Khanna Publishers
4.	Bhavikatti, S.S., Surveying & Levelling Volume I & II

T/R	Book title suggested by faculty
1	Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2	Punmia, B.C., Jain, A. K. and Jain, A. K., Surveying Vol. I, II & III, Laxmi Publications

E- content used:
https://nptel.ac.in/courses/105107122

Additional topics:

Chain and Tape survey (Corrections), Overview of Indian Topographic Map, Reliability and Quality of Measurement.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team teaching method
Apparatus demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-301- 18.1	Understand the concept, various methods and techniques of surveying.	2
BTCE-301- 18.2	Compute angles, distances and levels for given area.	5
BTCE-301- 18.3	Apply the concept of tachometry survey in difficult and hilly terrain.	3
BTCE-301- 18.4	Select appropriate instruments for data collection and survey purpose.	1

BTCE-301- 18.5	Analyze and retrieve the information from remotely sensed data and interpret the data for survey.	4
BTCE-301- 18.6	Understand the concepts related to GIS and GPS and analyse the geographical data.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	1				2			1	1	1
CO2	3	2	2	2	2				2			1	1	2
CO3	3	2	2	2	2				2			1	1	1
CO4	2	2	3	2	3				1			2	2	2
CO5	1	2	2	3	2				1			2	2	1
CO6	2	1	1	2	3							2	2	1

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BTCE-302-18: SOLID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-302-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-308-18	**LAB COURSE NAME:** SOLID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concept of Equilibrium**: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem. **Stresses and Strains**: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain,	08

	Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.	
II	**Principal Stresses and Strains:** Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress. **Shear Force and Bending Moment Diagrams**: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.	10
III	**Slope and deflection-** Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. **Bending and Shear Stresses:** Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross-sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.	08
IV	**Columns and Struts**: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load. **Torsion of Circular Shafts**: Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending. **Stresses and strains in thin cylinders:** spherical shells subjected to internal pressures; Normal stress, tangential stress.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2.	'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3.	'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4.	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5.	'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.

6.	'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7.	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

T/R	Book title suggested by faculty
1	'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.
2	'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.

E- content used:
https://nptel.ac.in/courses/112102284

Additional topics:

Mathematical Concepts: Working with Vectors & Tensors, Theories of Failure, Moment of Inertia for different types of bodies/shapes.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-302- 18.1	Understand the concept of static equilibrium, deformations, and material constitutive behaviour.	2
BTCE-302- 18.2	Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyse structural members subjected to tension, compression and torsion.	3
BTCE-302- 18.3	Apply the concept of Mohr's circle in the stress/strain calculations.	3
BTCE-302- 18.4	Develop SFD and BMD for different type of beams subjected to different types of loads.	6
BTCE-302- 18.5	Plot elastic curves for beams undergoing displacements under different loadings.	6

BTCE-302- 18.6	Understand the behaviour of columns and struts under axial loading.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	1	2								2	1	
CO3	3	2	3	3	1								2	2
CO4	3	2	3	3	1								3	2
CO5	2	3	3	2	2								2	3
CO6	2	2		1								1		

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BTCE-303-18: FLUID MECHANICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS	**SEMESTER:** III
COURSE CODE: BTCE-303-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE-307-18	**LAB COURSE NAME:** FLUID MECHANICS LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Concepts and Definitions** – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics** - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	08

II	**Fluid Kinematics** - Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates. **Fluid Dynamics -** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	10
III	**Laminar Flow & Turbulent Flow** - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel. **Boundary Layer Analysis**- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.	10
IV	**Open Channel Flow** - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2.	Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth
3.	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker
4.	Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman

5.	Fluid Mechanics: Streetes VL & Wylie EB;
6.	Fluid Mechanics by Potter, Cengage Learning

T/R	Book title suggested by faculty
1	Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal
2	Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker

E- content used:
https://nptel.ac.in/courses/112104118

Additional topics: Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-303- 18.1	Understand the basic terms used in fluid mechanics and its broad principles	2
BTCE-303- 18.2	Estimate the forces induced on a plane/ submerged bodies.	5
BTCE-303- 18.3	Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.	5
BTCE-303- 18.4	Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.	3
BTCE-303- 18.5	Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.	5
BTCE-303- 18.6	Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1								2		
CO2	3	3	2	2								2	2	
CO3	3	2	2	1								2	2	3
CO4	3	2	3	3	1							2	3	3
CO5	3	3	1	2									2	1
CO6	2	3	3	2	2							2	2	3

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BTAM-301-18: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)	**SEMESTER:** III
COURSE CODE: BTAM-301-18	**CREDITS:** 4
COURSE TYPE: BASIC SCIENCE COURSE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Vector Calculus-I:** Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.	10
II	**Vector Calculus-II:** Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.	11
III	**Transforms Calculus-I:** Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution	10

	theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.	
IV	**Transforms Calculus-II:** Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications	11

Total hours – 42

TEXT /REFERENCE BOOKS

1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3.	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4.	Thomas and Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 2017.
5.	R. K. Jain and S.R.K Iyengar Advanced Engineering Mathematics, 5th Edition, 2017.

T/R	Book title suggested by faculty
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2	Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

E- content used:
https://nptel.ac.in/courses/111105121

Additional Topics:

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Small Group Instructions
Problem solving

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTAM-301-18.1	Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.	2

BTAM-301-18.2	Find length, area and volume using integral calculus that is an important application in engineering.	5
BTAM-301-18.3	Solve some real problems in engineering using Gauss Divergence and Stokes' theorem	5
BTAM-301-18.4	Understand the concept of orthogonal curvilinear coordinates and the applications of Green, Gauss and Stokes Theorems.	2
BTAM-301-18.5	Formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.	5
BTAM-301-18.6	Formulate Fourier Series, its properties and its applications to solve problems in engineering.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1									1	
CO2	2		2		1									1
CO3	1	2		2										
CO4	1		2		1								1	
CO5	2	1	1	1										
CO6	2			1									1	1

Prepared by **Approved By**

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BTEC- 305-18: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: BASIC ELECTRONICS & APPLICATIONS IN CIVIL ENGINEERING	**SEMESTER:** III
COURSE CODE: BTEC- 305-18	**CREDITS:** 3
COURSE TYPE: ENGINEERING SCIENCE COURSE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE	**LAB COURSE NAME:** NA

(IF ANY): NA	

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications.	08
II	**Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.	08
III	**Operational Amplifiers and Applications -** Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.	10
IV	**Digital Electronics** -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K-Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2.	SantiramKal (2002), Basic Electronics- Devices, Circuits and IT undamentals, Prentice Hall, India. 3.Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education.
3.	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
4.	R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson.

T/R	Book title suggested by faculty

1	David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.
2	Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH

E- content used:
https://nptel.ac.in/courses/122106025

Additional topics:

Basic laws and theorems in Basic Electronics, Wave Shaping using Diodes

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEC- 305-18.1	Identify areas of application of electronics in civil engineering.	2
BTEC- 305-18.2	Understand construction of diodes and their rectifier applications.	1
BTEC- 305-18.3	Appreciate the construction and working bipolar junction transistors and MOSFETs.	6
BTEC- 305-18.4	Design Op-Amp IC based fundamental applications.	1
BTEC- 305-18.5	Appraise the use of integrated circuits in civil engineering applications.	2
BTEC- 305-18.6	Comprehend working of basic elements of digital electronics and circuits.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1		1					2		2	1		
CO2	2				2				1		1			
CO3	2				2				1		1			
CO4	2		2		2						1		1	
CO5	1	1			2						1		1	
CO6					2						1		1	

Prepared by **Approved By**

HOD

HSMC-132-18: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CIVIL ENGINEERING- INTRODUCTION, SOCIETAL & GLOBAL IMPACT	**SEMESTER:** III
COURSE CODE: HSMC-132-18	**CREDITS:** 3
COURSE TYPE: HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Civil Engineering and its historical developments;** Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.	08
II	**Understanding the past to look into the future**; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.	10
III	**Infrastructure development and growth of the Nation**; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals,	08

	Tunnels, bridges.	
IV	**Energy Generation**: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.	10

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Salvadori, M and Heller, M, Strctures in Architectures, PHI.
2.	Fintel, C, Handbook of Civil Engineering, CBS Publications.
3.	*Žiga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
4.	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
5.	NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004

T/R	Book title suggested by faculty
1	Fintel, C, Handbook of Civil Engineering, CBS Publications.
2	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition.

E- content used:
https://www.dce-darbhanga.org/wp-content/uploads/2020/04/file_5e8ca9c9a4968.pdf

Additional topics: Present and future scenario of energy generation methods.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Team Teaching Method
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
HSMC-132-18.1	Introduction to what constitutes Civil Engineering	1
HSMC-132-18.2	Understanding the vast interfaces this field has with the society at large	2
HSMC-132-18.3	Providing inspiration for doing creative and innovative work for the benefit of the society	1
HSMC-132-18.4	Need to think innovatively to ensure Sustainability	1
HSMC-132-18.5	Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field	2
HSMC-132-18.6	Illustrate the Futuristic engineering systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1											1		
CO2						2	1	1						
CO3					2	3	2	2					2	
CO4						2	3						2	
CO5												2		
CO6	2				2							2		

Prepared by **Approved By**

HOD

BTCE-306-18: SURVEYING & GEOMATICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SURVEYING & GEOMATICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-306-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
II	Different methods of leveling, height of instrument, rise & fall methods.
III	Measurement of horizontal and vertical angle by theodolite.
IV	Determination of tachometric constants and determination of reduced levels by tachometric observations.
V	Plane table survey, different methods of plotting, three-point problem.
VI	Determination of height of an inaccessible object.
VII	Setting out of circular curves in the field using different methods.
VIII	Plotting of traverse using the Total Station and GPS.

Total hours – 20

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-306- 18.1	Assess horizontal & vertical angles by Theodolite.	5
BTCE-306- 18.2	Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.	1
BTCE-306- 18.3	Compute the reduce levels using various methods of levelling.	5
BTCE-306- 18.4	Predict the location of any point horizontally and vertically using Tachometry.	3
BTCE-306- 18.5	Setting out curves in the field.	3
BTCE-306- 18.6	Use electronic survey instruments.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2

CO1	2	2		2	1				2			1	2	
CO2	2	2	1	2	1				2			1	1	1
CO3	2	2	2	1	2				2			1	2	1
CO4	2	2			1				2					
CO5	2	2			1				2					
CO6	2	2		1	2				1				2	

BTCE-307-18: FLUID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FLUID MECHANICS LAB	**SEMESTER:** III
COURSE CODE: BTCE-307-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges.
II	To verify Bernoulli's Theorem
III	To determine the Meta centric height of a Floating Body under different condition.
IV	To determine the coefficient of discharge of a Venturimeter.
V	To determine the coefficient of discharge of a Orifice Meter
VI	To determine the coefficient of friction of different diameter pipes.
VII	To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
VIII	To determine the coefficient of discharge on rectangular and V-notches.
IX	To determine the various element of a hydraulic jump.

Total hours – 18

TEXT /REFERENCE BOOKS

1.	Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2.	Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3.	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4.	Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-307- 18.1	Select appropriate pressure measuring device under different condition of flow.	1
BTCE-307- 18.2	Determine the stability of a floating body.	5
BTCE-307- 18.3	Understand and apply Bernoulli's theorem practically.	2
BTCE-307- 18.4	Find discharge of fluid through pipe, orifices and in open channel.	5
BTCE-307- 18.5	Estimate the major and minor losses in pipe.	5
BTCE-307- 18.6	Estimate the various elements and energy losses in hydraulic jump.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				2							1		
CO2	2	2		1	1							2	1	
CO3	2	2		2					1			1	2	
CO4	2	2		1	2				2			2	2	
CO5	2	2		1	2				1			2	2	
CO6	2	2		1	2				1			2	2	

BTCE-308-18: SOLID MECHANICS LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID MECHANICS LAB	**SEMESTER:** III

COURSE CODE: BTCE-308-18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of physical properties of steel including strength and ductility.
II	Study of tensile and compressive stress-strain behaviour of steel.
III	Compression test on brick.
IV	Development of shear stress-strain curve for steel in torsion.
V	Determination of hardness of a material by Rockwell and Brinell hardness testing machine.
VI	Determination of impact strength of a material by Izod and Charpy tests.
VII	Determination of bending strength of a wooden beam specimen.
VIII	Determination of fatigue strength of a material.
IX	Study of behavior of columns and struts with different end conditions.
X	To verify the moment area theorem for slope and deflection of a given beam.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-308- 18.1	Understand the importance of physical properties of steel.	2
BTCE-308- 18.2	Identify and comprehend code provisions for testing different properties of steel.	1
BTCE-308- 18.3	Develop stress-strain curve for axial compression, axial tension and shear.	1

BTCE-308- 18.4	Assess hardness and impact strength of steel.	5
BTCE-308- 18.5	Assess flexural strength of a given material.	5
BTCE-308- 18.6	Evaluate fatigue and impact strength of steel.	5

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		1
CO2	2	1		1								2		2
CO3	2	3	3	1	1				2			2	3	1
CO4	2	1			2							1	1	
CO5	2	1			2				2			1	1	
CO6	2	1			2				2			1	1	

BTCE-308-18: TRAINING -I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRAINING -I	**SEMESTER:** III
COURSE CODE: BTCE-308-18	**CREDITS:** --
COURSE TYPE: Professional Skill Enhancement	**CONTACT HOURS:** --

SYLLABUS:

EXPERIMENT	DETAILS
I	**Institutional Training (3 weeks)** 9. Hands-on-training on MS Office/ Office suite (Word processor, Spreadsheet, Math tools, presentation/ ppt, etc.) 10. Introduction to Civil Engineering software's and basic overview of drafting tools such as AutoCAD, etc.
II	**Field and Market Study** 9. Student shall visit construction site of significantly scale and make an inventory construction and finishing materials being used. 10. Student shall do Market Survey for availability and rates of materials in the already prepared inventory.

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Laboratory Manual of Testing Materials, William Kendrick Hall.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-332- 18.1	Visualize things/ concepts and express the thoughts in the form of sketches, models, etc	1
BTCE-332- 18.2	Create a well-organized document using computers	6
BTCE-332- 18.3	Work in teams	1
BTCE-332- 18.4	Acknowledge the work of other in a consistent manner	1
BTCE-332- 18.5	Understanding of ethical and professional issues	2
BTCE-332- 18.6	Demonstrate effective oral communication and presentation skills	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1			2				1	2			1	
CO2					2				1	2			2	
CO3									3	2				
CO4									3	1				
CO5							2	3	1	1				
CO6									1	3				

INDEX
SCHEME: B. TECH 4TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-401- 18	Concrete Technology	3-0-0	3	3
B	BTCE-402- 18	Materials, Testing & Evaluation	4-0-0	4	4
C	BTCE-403- 18	Hydrology & Water Resources Engineering	3-1-0	4	4
D	BTCE-404- 18	Transportation Engineering	3-1-0	4	4
E	BTCE-405- 18	Disaster Preparedness & Planning	3-0-0	3	3
F	EVS-101-18	Environmental Science	2-0-0	2	0
G	BTCE-406- 18	Concrete Testing Lab	0-0-2	2	1
H	BTCE-407- 18	Transportation Lab	0-0-2	2	1
I	BMPD-401-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 20 **Hours: 26**

BTCE-401- 18: CONCRETE TECHNOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TECHNOLOGY	**SEMESTER:** IV
COURSE CODE: BTCE-401- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 406-18	**LAB COURSE NAME:** CONCRETE TESTING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Concrete and its ingredients**: Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines. **Concrete behaviour in fresh and hardened states**: Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.	08
II	**Production of concrete**: Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions. **Concrete mix design:** Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.	10
III	**Inspection and testing of concrete**: Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pull-out etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.	09
IV	**Special concretes:** Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self-Healing Concrete.	09

Total hours – 36

TEXT /REFERENCE BOOKS

1.	'Properties of Concrete', A. M. Neville, Prentice Hall
2.	'Concrete Technology', M. S. Shetty, S.Chand & Co.
3.	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4.	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi
5.	P Kumar Mehta, Monteiro; Concrete Technology, Indian Concrete Institute

T/R	Book title suggested by faculty
1	'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
2	'Concrete Technology', M. S. Shetty, S. Chand & Co.
3	'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

E- content used:
https://nptel.ac.in/courses/105102012

Additional topics:

Mix Design of concrete: Packing Density, Rheology, testing of mixing water, Abram's Law.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instructions
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-401- 18.1	Understand the relevance of different properties of constituent materials on properties of concrete.	2
BTCE-401- 18.2	Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.	2
BTCE-401- 18.3	Understand the issues involved in production and use of concrete.	2
BTCE-401- 18.4	Design of concrete mixes as per BIS specifications.	6
BTCE-401- 18.5	Understand various testing methods for concrete and their applicability.	2

BTCE-401- 18.6	Knowledge of special type of non-conventional concretes.	1

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2													
CO4	3		3		2								2	3
CO5	3	2			2							1	2	1
CO6					3							1	2	

Prepared by **Approved By**

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BTCE-402- 18: MATERIALS, TESTING & EVALUATION

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: MATERIALS, TESTING & EVALUATION	**SEMESTER:** IV
COURSE CODE: BTCE-402- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes; Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's Bricks; Concrete hollow blocks & Interlocking tiles. Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,	10

II	Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behaviour (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep –fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.	12
III	Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	10
IV	Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regard for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2.	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3.	Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. correspondingto materials used for Civil Engineering applications
4.	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5.	E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6.	American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

T/R	**Book title suggested by faculty**
1	Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
2	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition

E- content used:
https://nptel.ac.in/courses/105102088

Additional topics:

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Class discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-402- 18.1	Appraisal about the role of materials in civil engineering	5
BTCE-402- 18.2	Introduce common measurement instruments, equipment and devices to capture the material response under loading	2
BTCE-402- 18.3	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice	2
BTCE-402- 18.4	Ability to write a technical laboratory report.	1
BTCE-402- 18.5	Interpret the observations/ test reports for selection of suitable material.	2
BTCE-402- 18.6	Utilize the relevant information from the standards and guidelines.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		1	2								2	
CO3	2	2		2	1								2	
CO4									2	2				
CO5	1	2		1					1					
CO6	2													

Prepared by **Approved By**

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BTCE-403- 18: HYDROLOGY & WATER RESOURCES ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: HYDROLOGY & WATER RESOURCES ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-403- 18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction -** Hydrologic Cycle, History of Hydrology, Water-Budget Equation, World Water Balance, Applications in Engineering, Sources of Data. **Precipitation -** Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.	12
II	**Abstractions from precipitation** - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices. **Runoff -** Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.	12
III	**Unit III: Water withdrawals and uses –** Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation. **Distribution systems** - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime	10

	Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets.	
IV	**Water Logging**: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods. **Dams and spillways** - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2.	K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3.	K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4.	G L Asawa, Irrigation Engineering, Wiley Eastern
5.	L W Mays, Water Resources Engineering, Wiley.
6.	J. D Zimmerman, Irrigation, John Wiley & Sons
7.	C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

T/R	Book title suggested by faculty
1	K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2	L W Mays, Water Resources Engineering, Wiley.

E- content used:
https://archive.nptel.ac.in/courses/105/103/105103213/

Additional topics:

Water vapour dynamics, Gumbel's method, Thunderstorm Cell Model, Infiltration: Green Amp Equation.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-403- 18.1	Understand the interaction among various processes in the hydrologic cycle.	2
BTCE-403- 18.2	Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc.	5
BTCE-403- 18.3	Understand the various component of hydro graphs and able to estimate the run off.	2
BTCE-403- 18.4	Find the water requirement for different crops and able to proposed appropriate method of applying water.	5
BTCE-403- 18.5	Understand the distribution system of canal and various components of irrigation system.	1
BTCE-403- 18.6	Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	1	2	1				1				1	
CO3	3	2	2	2										
CO4	2	1	3	2	2								1	2
CO5	2				1							1		
CO6	3	2		1										

Prepared by **Approved By**

HOD

BTCE-404- 18: TRANSPORTATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION ENGINEERING	**SEMESTER:** IV
COURSE CODE: BTCE-404- 18	**CREDITS:** 4

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 407-18	**LAB COURSE NAME:** TRANSPORTATION LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction:*** Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport. ***Transportation Systems****:* Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.	10
II	***Highway Development & Planning****:* Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements	12
III	***Railway Engineering****:* History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge. ***Railway Track****:* Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.	12
IV	***Airport Engineering*****:** Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration. ***Aircraft Parking System & Visual Aids****:* Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers,

	Roorkee,1998.
2.	Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3.	Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4.	Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5.	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
6.	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

T/R	Book title suggested by faculty
1	Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee,1998.
2	Chandra S., and Aggarwal, “Railway Engineering”, M.M. Oxford University Press, New Delhi,2007.
3	Khanna, S.K., Arora, M.G., and Jain, S.S., “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.

E- content used:
https://nptel.ac.in/courses/105105107

https://archive.nptel.ac.in/courses/105/107/105107123/

Additional topics:

Overview to geometric design of highways, Overview to Mix design methods for construction of flexible pavement, Introduction to superelevation, transition curve in railways, Introduction to railway equipment and junctions.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Student led classrooms
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom’s Level (B.L)
BTCE-404- 18.1	Appreciate the importance of different modes of transportation and characterize the road transportation.	2

BTCE-404- 18.2	Alignment and geometry of pavement as per Indian Standards according to topography.	1
BTCE-404- 18.3	Assess the properties of highway materials in laboratory	5
BTCE-404- 18.4	Understand the importance of railway infrastructure planning and design.	2
BTCE-404- 18.5	Identify the functions of different component of railway track.	2
BTCE-404- 18.6	Outline the importance of Airport Infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	2	2			2									
CO4	2		1		1									
CO5	2	1			1									
CO6	2				1									

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HOD

BTCE-405- 18: DISASTER PREPAREDNESS & PLANNING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: DISASTER PREPAREDNESS & PLANNING	**SEMESTER:** IV
COURSE CODE: BTCE-405- 18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Introduction to Disaster Management:*** Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation. ***Disasters****:* Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender, age, special needs), Lessons and experiences from important disasters with specific reference to civil engineering.	10
II	***Disaster Mitigation and Preparedness:*** Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; Preparedness for natural disasters in urban areas. ***Risk Assessment****:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.	08
III	***Post disaster response****:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.	10
IV	***Integration of public policy****:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	www.http//ndma.gov.in
2.	http://www.ndmindia.nic.in
3.	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4.	Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5.	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

6.	Disaster Management, R.B. Singh (Ed), Rawat Publications

T/R	Book title suggested by faculty
1	Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
2	Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.

E- content used:
https://nptel.ac.in/courses/124107010

Additional topics:

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-405- 18.1	Identify various types of disasters, their causes, effects & mitigation measures.	2
BTCE-405- 18.2	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.	2
BTCE-405- 18.3	Understand the use of emergency management system to tackle the problems.	2
BTCE-405- 18.4	Discuss the role of media, various agencies and organisations for effective disaster management.	6
BTCE-405- 18.5	Design early warning system and understand the utilization of advanced technologies in disaster management.	6
BTCE-405- 18.6	Compare different models for disaster management and plan & design of infrastructure for effective disaster management.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO	PO	PO	PO	PO	PO10	PO	PO	PSO	PSO

					5	6	7	8	9		11	12	1	2
CO1	2	1										1		
CO2	1	1	2									1	1	1
CO3	1											1		
CO4						3	2		2	2				
CO5	2		2		3				2	2		1	2	3
CO6		2	3						2	2			1	3

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EVS-101-18: ENVIRONMENTAL SCIENCE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL SCIENCE	**SEMESTER:** IV
COURSE CODE: EVS-101-18	**CREDITS:** 0
COURSE TYPE: BASIC SCIENCES (MANDATORY COURSES)	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Natural Resources: Renewable and non-renewable resources** Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resource: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.	06

II	**Ecosystems** Concept of an ecosystem, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	06
III	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India	06
IV	**Social Issues and the Environment** From Unsustainable to Sustainable development, Resettlement and rehabilitation of people; its problems and concerns., Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies, Public awareness.	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	Textbook of Environmental studies, Erach Bharucha, UGC Weblink: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2.	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
3.	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
4.	Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
5.	Principle of Environment Science by Cunninghan, W.P.
6.	Elements of Environment Science & Engineering by Meenakshi.
7.	Elements of Environment Engineering by Duggal.

T/R	**Book title suggested by faculty**
1	Environmental Studies by Poonia, M.P and Sharma, S.C, Khanna publishing
2	Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

E- content used:
https://evspgdavevening.blogspot.com/p/e-content.html

Additional topics:

Biomedical Waste Management, Environmental Acts and Rules.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case Studies
Student led classrooms

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
EVS-101-18.1	Understand environmental problems at local and national level through literature and general awareness.	2
EVS-101-18.2	Acquire practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.	2
EVS-101-18.3	Apply interdisciplinary approach to understand key environmental issues and critically analyse them to explore the possibilities to mitigate these problems.	4
EVS-101-18.4	Create awareness among people about protection of wild life & forests.	2
EVS-101-18.5	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.	2
EVS-101-18.6	Understand the need of conservation of natural resources, ecological balance and biodiversity to achieve sustainable development.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1							3			2				
CO2							3			2				
CO3	1	1				2	3		1			1		
CO4						2	3		1	2				
CO5						2	2	2	1	2				
CO6						2	3	1	1	2				

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BTCE-406- 18: CONCRETE TESTING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONCRETE TESTING LAB	**SEMESTER:** IV
COURSE CODE: BTCE-406- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on cement • Fineness • Consistency • Setting time • Soundness • Specific gravity • Strength
II	Tests on aggregates (fine and coarse) • Specific gravity • Bulk Density • Fineness Modulus • Moisture content • Water Absorption • Bulking of sand
III	Design mix of concrete as per BIS method.
IV	Workability tests on concrete • Slump test • Compaction Factor test • Vee-Bee test
V	Strength tests on concrete • Compressive strength (Cube and Cylinder) • Split Tensile strength • Flexural strength • Abrasion resistance
VI	Non-Destructive Techniques • Rebound hammer test • Ultra-sonic pulse velocity test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	'Concrete Lab Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2.	'Concrete Lab Manual', TTTI Chandigarh.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-406- 18.1	Evaluate properties of building materials, such as cement and aggregates.	5
BTCE-406- 18.2	Conduct experiments and check the acceptance criteria (if any).	4
BTCE-406- 18.3	Design concrete mixes as per BIS provisions.	6
BTCE-406- 18.4	Analyze the properties of concrete in fresh and hardened state.	4
BTCE-406- 18.5	Create a well-organized document and present the results appropriately.	6
BTCE-406- 18.6	Understand and apply non-destructive testing (NDT) for evaluating concrete quality.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				2			1	1	
CO2	2	1		2	1				1			1		
CO3	2	1	3		2				1			1	2	3
CO4	2	2		1	2				1			1	2	
CO5	1								2	3	1	1		
CO6	2	1		1	3				1			1	2	

BTCE-407- 18: TRANSPORTATION LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: TRANSPORTATION LAB	**SEMESTER:** IV
COURSE CODE: BTCE-407- 18	**CREDITS:** 1

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Tests on Sub-grade Soil 1. California Bearing Ratio Test
II	Tests on Road Aggregates 18. Crushing Value Test 19. Los Angles Abrasion Value Test 20. Impact Value Test 21. Shape Test (Flakiness and Elongation Index)
III	Tests on Bituminous Materials and Mixes 34. Penetration Test 35. Ductility Test 36. Softening Point Test 37. Flash & Fire Point Test 38. Bitumen Extraction Test
IV	Field Tests 39. Study of Roughometer/Bump Indicator 40. Study of Benkelman Beam Method

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", NemChand and Brothers, Roorkee.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-407- 18.1	Characterize the pavement materials as per the Indian Standard guidelines.	4
BTCE-407- 18.2	Evaluate the strength of subgrade soil by CBR test.	5
BTCE-407- 18.3	Conduct experiments to evaluate aggregate properties.	5
BTCE-407- 18.4	Determine properties of bitumen material and mixes	5
BTCE-407- 18.5	Evaluate the pavement condition by rough meter and	5

	Benkelman beam test.	
BTCE-407- 18.6	Create a well-organized report and present the results appropriately	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2											1		
CO2	2				1				1			1	1	
CO3	2			1	1				1			1	1	
CO4	2				1				1			1	1	
CO5	2			2	2				1			1	2	
CO6	1								2	3	1	1		

INDEX
SCHEME: B. TECH 5TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-501-18	Engineering Geology	3-0-0	3	3
B	BTCE-502-18	Elements of Earthquake Engineering	3-0-0	3	3
C	BTCE-503-18	Construction Engineering & Management	3-0-0	3	3
D	BTCE-504- 18	Environmental Engineering	4-0-0	4	4
E	BTCE-505-18	Structural Engineering	3-1-0	4	4
F	BTCE-506-18	Geotechnical Engineering	3-0-0	3	3
G	BTCE-507- 18	Geotechnical Lab	0-0-2	2	1
H	BTCE-508- 18	Environmental Engineering Lab	0-0-2	2	1
I	BTCE-509- 18	Structural Lab	0-0-2	2	1
J	BMPD-501-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 23 **Hours: 28**

BTCE-501-18: ENGINEERING GEOLOGY

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING GEOLOGY	**SEMESTER:** V
COURSE CODE: BTCE-501-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**General Geology:** Scope of geology in Civil Engineering - the earth, its structure and environment - Standard geological time scale, unit & fossils. physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes –weathering – types, weathered products, assessment of degree of weathering, Fluvial processes, glaciation, wind action, and their significance in Civil Engineering.	04
II	**Mineralogy and Petrology:** Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Horn blend, Mica family, calcite, Iron oxide minerals, Augite, Horn blend, and Clay minerals and their behaviour and significance in the field of Civil Engineering. Classification of rock - mode of formation -distinction between igneous, sedimentary and metamorphic rocks. Formation, textures, structure, Classification, and Engineering, Characteristic of rocks. Study of imp rocks granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia, conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate	07
III	**Strength Behaviour of Rocks:** Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold-Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.	07
IV	**Geological Hazards:** Rock Instability and Slope movement: Concept of	08

	sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslides. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence.	
V	**Rock masses as construction material:** Definition of Rock masses. Main features constituting rock mass. Main features that affect the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging. Rock Quality Designation. Rock mass description.	06
VI	**Geology of dam and reservoir site:** Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2.	Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3.	Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
4.	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995
5.	Leggot, R.F.," Geology and Engineers ", McGraw Hill, New York.2002 2.
6.	Blyth, F.G.M., "A Geology for Engineers", Arnold, Londo, (2003.
7.	Bell.F.G, " Fundamentals of Engineering Geology" Butterworth, 1983

T/R	Book title suggested by faculty
1	Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2	Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995

E- content used:
https://nptel.ac.in/courses/105105106

Additional topics:

Classification of rocks for engineering purposes. Rock quality designation (RQD).

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Topic delivery by students
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-501- 18.1	Understanding geological processes and their importance in civil Engineering	2
BTCE-501- 18.2	Identification of rocks and minerals and their characteristics	2
BTCE-501- 18.3	Significance of geological structures and processes in civil engineering projects	2
BTCE-501- 18.4	Identify the geological hazards associated with civil engineering structures and suggest remedies.	2
BTCE-501- 18.5	Site characterization and geologic considerations in construction	4
BTCE-501- 18.6	Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	1												
CO3	2													
CO4	2	2	2						1				2	
CO5	2	2	2						1					
CO6	2	2	1	2					1				2	

Prepared by **Approved By**

HOD

BTCE-502-18: ELEMENTS OF EARTHQUAKE ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ELEMENTS OF EARTHQUAKE ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-502-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.	04
II	Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.	04
III	Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.	08
IV	Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.	06
V	Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.	06
VI	Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.	04
VII	Introduction to provisions of IS 4326. Unit 8: Introduction to provision of IS 13920.	04

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2.	Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra,

	Prentice Hall
3.	Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4.	Structural Dynamics by Mario & Paz, Springer.
5.	Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6.	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7.	IS 1893-2016Indian Standard Criteria for Earthquake Resistant Design of Structures.
8.	IS 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9.	IS 13920:2016- Ductile design and detailing of Reinforced Concrete Structures subjected to Seismic Forces-code of practice

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Seismic Soil-Structure Interaction: soil effect on the ground motion characteristics, Effect of Surface Topography.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-502- 18.1	Appreciate the role of earthquake forces in structural design of building.	2
BTCE-502- 18.2	Develop an understanding of structural defects due to earthquakes by studying past earthquakes	3

BTCE-502- 18.3	Acquire basic knowledge of concept of vibrations in earthquake engineering	2
BTCE-502- 18.4	Analyse the behaviour of structures under dynamic loads	4
BTCE-502- 18.5	Understand engineering seismology, ductility requirement & structural configurations.	2
BTCE-502- 18.6	Apply various codal provisions related to seismic design of buildings.	3

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2	2		2									1	
CO3	3													
CO4	3	3		2					1				2	
CO5	3													
CO6	2	2											2	2

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BTCE-503-18: CONSTRUCTION ENGINEERING & MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: CONSTRUCTION ENGINEERING & MANAGEMENT	**SEMESTER:** V
COURSE CODE: BTCE-503-18	**CREDITS:** 3
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS

I	Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.	03
II	Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.	06
III	Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.	04
IV	Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.	04
V	Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow,sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling-Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction.	05
VI	Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project	06

	sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.	
VII	Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.	05
VIII	Construction Costs: Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.	03

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Varghese, P.C., "*Building Construction"*, Prentice Hall India, 2007.
2.	*National Building Code,* Bureau of Indian Standards, New Delhi, 2017.
3.	Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
4.	Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5.	Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6.	Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7.	Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

T/R	Book title suggested by faculty
1	Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2	Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.

E- content used:
https://nptel.ac.in/courses/105101004

Additional topics:

Cost Analysis: Determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Projects study

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-503- 18.1	An understanding of modern construction practices	2
BTCE-503- 18.2	A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics	2
BTCE-503- 18.3	A basic ability to plan, control and monitor construction projects with respect to time and cost	6
BTCE-503- 18.4	An idea of how to optimise construction projects based on costs	2
BTCE-503- 18.5	An idea how construction projects are administered with respect to contract structures and issues.	2
BTCE-503- 18.6	An ability to put forward ideas and understandings to others with effective communication processes	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				3									
CO2	2				2				2		3			
CO3	2		1						2		3			3
CO4	2	2	2	1					2		3		1	2
CO5	2		1	1					2		3		1	2
CO6	2									3				1

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BTCE-504-18: ENVIRONMENTAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-504-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 4-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 508-18	**LAB COURSE NAME:** ENVIRONMENTAL ENGINEERING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	*Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. *Water Treatment:* aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes	08
II	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage-Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water-Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.	10
III	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution.	06
IV	*Noise*- Basic concept, measurement and various control methods.	04
V	*Solid waste management*-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management.	10

VI	*Building Plumbing*-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Storage tanks, building drainage for high rise buildings, various kinds of fixtures and fittings used.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2.	Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3.	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
4.	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
5.	Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6.	Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7.	Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8.	Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development

T/R	Book title suggested by faculty
1	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
2	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low-cost treatment techniques.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations
Inquiry guided instructions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-504- 18.1	Understanding the principles of water treatment processes, their design and distribution systems.	2
BTCE-504- 18.2	Be able to apply the knowledge for selecting the most appropriate technique for the treatment of wastewater.	3
BTCE-504- 18.3	Identify the major sources, effects and monitoring of air pollutants.	2
BTCE-504- 18.4	Impart knowledge on the sources, effects and control techniques of noise pollution.	2
BTCE-504- 18.5	Understand the fundamental principles of existing and emerging technologies for the solid waste management	2
BTCE-504- 18.6	Identify various plumbing systems provided in the buildings.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		1											2
CO2	2	2			2								2	
CO3	2	2					2							
CO4	2	2			1		2							
CO5	2				2		1							
CO6	2	2												

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BTCE-505-18: STRUCTURAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)

COURSE: STRUCTURAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-505-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 509-18	**LAB COURSE NAME:** STRUCTURAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction** Structural Engineering, role of structural engineer, engineer, architect, builder; Objectives of designing a structure, safety, sustainable development in performance.	08
II	**Structural Analysis** Concept of determinacy and indeterminacy, Analyses of indeterminate beams, frames and trusses using Slope deflection method, Moment distribution method, unit load method and castiglano's theorem.	12
III	**Design of concrete Elements** Design Philosophies of Working Stress Method and Limit State Method, Design of Reinforced Concrete Beams for Flexure, Shear; Bond, Anchorage, development length and torsion; Reinforced Concrete Axially Loaded Columns, Reinforced Concrete Slabs: One Way and Two Way.	12
IV	**Design of Steel Elements** Properties of structural steel, I.S. rolled sections, I.S. specifications; Connections- Bolted and welded connections for axial loads; Tension members: Design of members subjected to axial tension; Compression members: Design of axially loaded members, built-up columns, laced and battened columns; Flexural members: Design of laterally restrained and un-restrained rolled section beams.	12

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
2.	McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
3.	Intermediate Structural Analysis - C K Wang, McGraw hill publications.
4.	Limit state design of steel structures: S K Duggal, Mc Graw Hill.

5.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.
6.	Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
7.	NBC, National Building Code, BIS (2017).
8.	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
9.	Theory of structures - B.C. Punima, Laxmi Publications.
10.	Reinforced concrete design - Pillai & Menon, Tata McGrawHill publications

BIS Codes of practice and Design Handbooks:

1.	*IS 456-2000- Indian Standard. Plain and Reinforced concrete -Code of practice
2.	*Design Aid SP 16
3.	*IS 800: 2007 (General construction in steel-Code of practice)*
4.	*SP: 6(1) (Handbook for structural engineers-Structural steel sections
5.	Explanatory hand book SP24.
6.	Detailing of Reinforcement SP 34

T/R	Book title suggested by faculty
1	Theory of structures - S Ramamurtham, Dhanpat Rai Publications.
2	Limit state design of steel structures: S K Duggal, Mc Graw Hill.
3.	Design of Reinforced Concrete Structures: S. Ramamrutham, Dhanpat Rai Publications.

E- content used:
https://nptel.ac.in/courses/103107084

https://nptel.ac.in/courses/105106119

Additional topics:

Introduction to Moving Loads and Influence Line Diagrams, Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-505- 18.1	Apply their knowledge of structural mechanics in addressing design problems of structural engineering	3
BTCE-505- 18.2	Possess the skills to analyse and design concrete and steel structures	4
BTCE-505- 18.3	Knowledge of structural engineering	2
BTCE-505- 18.4	Understand the various design philosophies related to reinforced concrete structures	2
BTCE-505- 18.5	Analyse and design the safe RCC structural members	6
BTCE-505- 18.6	Design various steel structure members i.e., connections, tension members, compression members and flexural members	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									1	2
CO2	3	3	3	2	2				2				2	3
CO3	3													
CO4	3	2	2											2
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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BTCE-506-18: GEOTECHNICAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL ENGINEERING	**SEMESTER:** V
COURSE CODE: BTCE-506-18	**CREDITS:** 3

COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCE 507-18	**LAB COURSE NAME:** GEOTECHNICAL LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	***Basic Concepts***- Definition of soil, Comparison between soil mechanics, rock mechanics and geotechnical engineering, Scope of soil mechanics problems in Civil Engineering. Principal types of soils in India. Characteristics of main Clay mineral groups. Soil as three phase system: weight volume relationship and determination of moisture content from nuclear method, alcohol method and sensors. Determination of Specific gravity by density bottle method, pycnometer method. Field density from sand replacement method and other methods. ***Index Properties***: Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse- and fine-grained soils as per Indian Standard.	08
II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis-Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. ***Effective Stress Principle***- Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.	10
III	***Compaction of Soil***-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. ***Consolidation of Soil*** - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, Concept of various consolidation characteristics i.e., av, mv and cv, primary and secondary consolidation concept of cv, tv& U. Consolidation test: determination of cv from curve fitting methods, Pre consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect disturbance on e-Log σ curves of normally consolidated clays, importance of consolidation settlement in the design of structures. final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.	10

IV	***Shear Strength***- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test ***Stability of Slopes***- Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.	08

Total hours – 36

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S. Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M. Das Cengage Publisher
7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers.

T/R	**Book title suggested by faculty**
1	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
2	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons

E- content used:
https://nptel.ac.in/courses/105101201

Additional topics:

Soil particle structures, Derivation of skempton's pore pressure parameters, sliding block analysis, Earth pressures under applied load.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-506- 18.1	Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	2
BTCE-506- 18.2	Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of permeability, total and effective stress approaches in soil strength determination	4
BTCE-506- 18.3	Apply the various specifications of compaction of soils in the construction of highways and earthen dams.	3
BTCE-506- 18.4	Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.	3
BTCE-506- 18.5	Evaluate shear strength and permeability parameters of different soils	5
BTCE-506- 18.6	Design the embankment slopes and check the stability of finite slopes.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3	2	2	2						2			2	2
CO3	3	2	2										2	
CO4	3	2	2	1									2	
CO5	3	2	2	1									2	
CO6	3	2	3	1	2				2				2	3

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BTCE-507- 18: GEOTECHNICAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: GEOTECHNICAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-507- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Determination of in-situ density by core cutter method and Sand replacement method.
II	Determination of Liquid Limit & Plastic Limit.
III	Determination of specific gravity of soil solids by pyconometer method.
IV	Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
V	Compaction test of soil.
VI	Determination of Relative Density of soil.
VII	Determination of permeability by Constant Head Method.
VIII	Determination of permeability by Variable Head method.
IX	Unconfined Compression Test for fine grained soil.
X	Direct Shear Test
XI	Triaxial Test
XII	Swell Pressure Test

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain. Nem Chand & Brothers.

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-507- 18.1	Comprehend the procedure for classifying coarse grained and fine-grained soils	2
BTCE-507- 18.2	Evaluate the index properties of soil	5
BTCE-507- 18.3	Determine the engineering properties of soil	5
BTCE-507- 18.4	Interpret the results of compaction test for relative compaction in the field	4
BTCE-507- 18.5	Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis	3
BTCE-507- 18.6	Conduct experiments, analyse and interpret results for geotechnical engineering design	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							2					
CO2	3	2	1						2				1	
CO3	3	2	1						2				1	
CO4	3	2							2				1	
CO5	3	2		1	3				2			2	2	
CO6	3	2	2						2				1	2

BTCE-508- 18: ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENVIRONMENTAL ENGINEERING LAB	**SEMESTER:** V
COURSE CODE: BTCE-508- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	To measure the pH value of a water/waste water sample.

II	To determine optimum Alum dose for Coagulation.
III	To find MPN for the bacteriological examination of water.
IV	To find the turbidity of a given waste water/water sample
V	To find B.O.D. of a given waste water sample.
VI	To measure D.O. of a given sample of water.
VII	Determination of Hardness of a given water sample
VIII	Determination of total solids, dissolved solids, suspended solids of a given water sample.
IX	To determine the concentration of sulphates in water/wastewater sample.
X	To find chlorides in a given sample of water/waste water.
XI	To find acidity/alkalinity of a given water sample
XII	To determine the COD of a wastewater sample.

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2.	Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-508-18.1	Conduct experiments as per standard methods of sampling and analysis.	2
BTCE-508-18.2	Demonstrate the expertise to characterize water and wastewater samples.	5
BTCE-508-18.3	Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.	5
BTCE-508-18.4	Record the experimental observations and interpret the analysis results.	4
BTCE-508-18.5	Use the analysis results for making informed decision about the potability of water and disposal of wastewater.	3

BTCE-508-18.6	Recognize the working of air pollution monitoring equipment and noise meter.	4

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2			1				2					
CO2	3	2			1				2					
CO3	3	1			1				2					
CO4	2	2	1		2				2				2	
CO5	2	2	2	1	2				2				1	
CO6	2	2			2				2				2	

BTCE-509-18: STRUCTURAL LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL LAB	**SEMESTER:** V
COURSE CODE: BTCE-509- 18	**CREDITS:** 1
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 0-0-2

SYLLABUS:

EXPERIMENT	DETAILS
I	Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
II	To determine the Flexural Rigidity of a given beam.
III	Deflection of a fixed beam and influence line for reactions.
IV	Deflection studies for a overhang beam and influence line for reactions.
V	Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
VI	Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams,

Total hours – 20

TEXT /REFERENCE BOOKS

1.	Dally J W, and Riley W F, "Experimental Stress Analysis", McGraw-Hill Inc. New York, 1991.
2.	Harrison H.B., "Structural Analysis and Design Vol.I and II", Pergamon Press, 1991

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-509-18.1	Verify theoretical formulas by conducting experiments.	4
BTCE-509-18.2	Predict the behaviour of statically determinate beams and trusses.	6
BTCE-509-18.3	Depict the behaviour of two hinged arch and three hinged arch structures.	4
BTCE-509-18.4	Demonstrate the influence lines for statically determinate and indeterminate beams.	2
BTCE-509-18.5	Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.	5
BTCE-509-18.6	Outline the deflected shapes of columns and struts with different end conditions.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2							1					
CO2	3	2	2						1					
CO3	3	2	2						1					
CO4	3	2	2	1					1					
CO5	3	2	1	2					1					
CO6	3	2	1	2					1					

INDEX
SCHEME: B. TECH 6TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE-601-18	Engineering Economics, Estimation & Costing	3-1-0	4	4
B	PECE-602A-18	Foundation Engineering	3-1-0	4	4
C	PECE-603D-18	Structural Analysis and Design	3-1-0	4	4
D	PECE-604B-18	Sustainable Construction Methods	3-1-0	4	4
E	BTES 401-18	Computer Organization & Architecture	3-0-0	3	3
F	BTEE-603D-18	Wind And Solar Energy Systems	3-0-0	3	3
G	BTMC101-18	Constitution of India	3-0-0	3	0
H	BMPD-601-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 22 Hours = 27

BTCE-601-18: ENGINEERING ECONOMICS, ESTIMATION & COSTING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: ENGINEERING ECONOMICS, ESTIMATION & COSTING	**SEMESTER:** VI
COURSE CODE: BTCE-601-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Principles of Economics** Demand/Supply – elasticity – Basic Macroeconomic Concepts (including GDP/GNP/NI/ Disposable Income), Aggregate demand and Supply (IS/LM), Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.	04
II	**Elements of Business/Managerial Economics** Cost & Cost Control -Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money.	06
III	**Estimation / Measurements for various items** Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.	08
IV	**Specifications** Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.	06
V	**Rate analysis**: Purpose, importance and necessity of the same, factors affecting, task work,	06

	daily output from different equipment/ productivity.	
VI	**Tender:** Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price build-up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.	08
VII	**Introduction to Acts:** Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2.	V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3.	Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
4.	M Chakravarty, Estimating, Costing Specifications & Valuation
5.	Joy P K, Handbook of Construction Management, Macmillan
6.	B.S. Patil, Building & Engineering Contracts
7.	Relevant Indian Standard Specifications.
8.	World Bank Approved Contract Documents.
9.	FIDIC Contract Conditions.
10.	Acts Related to Minimum Wages, Workmen’s Compensation, Contract, and Arbitration
11.	Typical PWD Rate Analysis documents.
12.	UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
13.	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

T/R	Book title suggested by faculty
1	M Chakravarty, Estimating, Costing Specifications & Valuation
2	Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

E- content used:
https://nptel.ac.in/courses/105103093

Additional topics:

Schedule of Rates- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Tutorials
Projects

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTCE-601- 18.1	Have an idea of basic principles and elements of economics in general.	2
BTCE-601- 18.2	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.	5
BTCE-601- 18.3	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.	2
BTCE-601- 18.4	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	5
BTCE-601- 18.5	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	2
BTCE-601- 18.6	Demonstrate the knowledge related to various rules and regulations applicable to construction industry.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2								

CO2		2				2					3			
CO3	2	2				2					2			
CO4	2	2				2					3			
CO5	2					2				2	3	1		
CO6	2					2				2	2	1		

Prepared by **Approved By**

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PECE-602A-18: FOUNDATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: FOUNDATION ENGINEERING	**SEMESTER:** VI
COURSE CODE: PECE-602A-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Soil Exploration** Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, - standard penetration test -static and dynamic cone penetration test, Bore Hole log for S.P.T. Geophysical exploration by seismic and resistivity methods **Stresses Distribution:** Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, Newmark's chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Pressure Bulb and Isobar. Related Numerical Problems	10
II	**Earth Pressure** Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and K_p for horizontal backfills. Rankine's theory both for active and passive	12

	earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfills. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).	
III	**Shallow Foundation** Type of shallow foundations, Depth and factors affecting it. Definitionof ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of Shear failures. Factors affecting bearing capacity. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration test. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by Plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code.	11
IV	**Pile Foundations** Types and function of pile - factors influencing the selection of pile - carrying capacity of single pile in cohesionless and cohesive soil by static formula. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile- dynamic formulae (Engineering News and Hileys) Types of pile driving hammers & their comparison. Limitations of pile driving formulae. Negative skin friction - Carrying capacity of Pile group - Pile load test Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Settlement of pile groups in sand, Negative skin friction. Related Numerical problems **Well foundations-**shapes, depth of well foundations, components, factors affecting well foundation design, Scour Depth, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.	11

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Soil Mechanics by Craig R.F., Chapman & Hall
2.	Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3.	Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
4.	Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
5.	Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
6.	Principle of Geotechnical Engineering by B.M.Das Cengage Publisher

7.	Basic and applied Soil Mechanics by Gopal Ranjan and A.S. R. Rao New Age International Publishers
8.	Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
9.	Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

T/R	Book title suggested by faculty
1	Soil Mech. & Foundation Engg, by K.R. Arora Standard *Publishers* Distributors
2	Problems in Soil mechanics and Foundation Engineering by B.P. Verma, Khanna Publishers

E- content used:
https://archive.nptel.ac.in/courses/105/105/105105176/

Additional topics:

Danish method of analysis of pile foundation, Equivalent point load method of load distribution.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-602A-18.1	Understand the methods of surface and subsoil exploration and to prepare investigation report.	2
PECE-602A-18.2	Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations.	5
PECE-602A-18.3	Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations	6
PECE-602A-18.4	Estimate the stresses in soils and bearing capacity of soil for shallow foundation.	3
PECE-602A-18.5	Design various types of shallow foundation and to estimate settlement.	6
PECE-602A-	Apply the concepts of deep foundation and solve problems	3

18.6	related with pile foundation.	

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2		2	2				1					
CO2	3	2	2	2	2				1				1	2
CO3	3	2		2	2				1					
CO4	3	2	2	1					1				1	
CO5	3	2	2	2	2				1				2	3
CO6	3	2	2	2	2				1				2	3

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PECE-603D-18: STRUCTURAL ANALYSIS AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: STRUCTURAL ANALYSIS AND DESIGN	**SEMESTER:** VI
COURSE CODE: PECE-603D-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Review of indeterminacy:** Static and kinematic indeterminacies of beams, rigid-jointed and pin-jointed plane frames.	04
II	**Analysis of indeterminate structures**: Analysis indeterminate beams and frames by Kani's method, Theorem of three moments and other approximate methods- Portal, Cantilever and Substitute frame method.	12

III	**Moving loads and influence lines:** Analysis of moving Loads for determinate beams, Influence lines for indeterminate beams, trusses and frames. Muller Breslau principle.	08
IV	**Design of Concrete structures:** **Columns with moments**: Design of short columns with uni-axial and bi-axial bending; Design of Long columns, use of design charts; **Foundations**: Isolated and combined footing for columns; **Staircases**, Introduction, types and design; **Retaining walls** - Cantilever and Counter-forte type retaining wall.	10
V	**Design of Steel Structures:** **Column bases:** Slab base, Gusseted base; **Beam-column connections:** bracket connections, seated and framed connections.; **Plate girders:** Elements of a plate girder, design of plate girder section, intermediate and bearing stiffeners, **Roof trusses:** Types, Design loads, design of members and joints.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2.	Intermediate structural analysis - C . K. Wang. McGraw Hill
3.	Structural analysis - S Ramamurtham
4.	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
5.	Limit state Design of Reinforced Concrete; Varghese P C; PHI Pvt. Ltd.
6.	Design of concrete structures, B C Punmia
7.	Limit state design of steel structures: S K Duggal, TMH
8.	Design of steel structures: N Subramanian, Oxford publications
9.	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

T/R	**Book title suggested by faculty**
1	Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2	Structural analysis - S Ramamurtham
3	Design of steel structures (by limit state method as per IS: 800-2007), S S Bhavikatti

E- content used:
https://nptel.ac.in/courses/105105166

Additional topics:

Connections: Riveted, bolted and welded connections for axial and eccentric loads, Comparison of working stress method, limit state method and ultimate load method.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Design problems as per codes

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-603D-18.1	To recognize the concept of structural systems, loads, supports and displacements.	2
PECE-603D-18.2	To understand and determine the indeterminacy of different types of structures.	2
PECE-603D-18.3	To calculate forces and moments in indeterminate structures due to static as well as moving loads.	5
PECE-603D-18.4	To develop and use the concept of influence line diagram for calculating different structural quantities in a statically determinate structure.	4
PECE-603D-18.5	To analyse and design concrete structures i.e., column subjected to moments, foundations, retaining walls, etc.	6
PECE-603D-18.6	To analyse and design the steel structures i.e., column bases, beam-column joints, plate girders and roof trusses.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO2	3	2	1	2										
CO3	3	2	1	2										
CO4	3	2	3	2									2	1
CO5	3	3	3	2	2				2				2	3
CO6	3	3	3	2	2				2				2	3

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PECE-604B-18: SUSTAINABLE CONSTRUCTION METHODS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SUSTAINABLE CONSTRUCTION METHODS	**SEMESTER:** VI
COURSE CODE: PECE-604B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION** Definitions- Various types - Pillars of Sustainability - Circle of Sustainability - Need - systems and their sustainability - Green Buildings -Difference between Green and Sustainability - Climate Change, Global warming - National and International policies and Regulations. Identification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.	06
II	**BUILDING CONSTRUCTION METHODS** Conventional vs modular construction methods, development, Engineering principles, benefits**,** Modular construction methods for repetitive works, Green Roofs, Cool Roofs, Passive House, Rammed Earth Brick**,** Passive Solar, Greywater Plumbing Systems, Solar Thermal Cladding, Solar Power, Water Efficiency Technologies, Sustainable Indoor Environment Technologies.	10
III	**PRECAST CONSTRUCTION METHODS** Modular construction methods for repetitive works; Precast concrete construction methods; Benefits , Sustainability in Concrete Mix Design, Greener, Faster and Sustainable Construction Practices Through Precast Solutions, Use of secondary cementitious material (SCM's) like GGBS, fly ash, ultra-fine GGBS in the production of the concrete, Basics of Slip forming for tall structures, Structural 3D Printing, Self-healing Concrete**,** Green Insulation, Sustainable Resource Sourcing, Environmental Sustainability Benefits From Precast Concrete.	10
IV	**CONSTRUCTION METHODS OF BRIDGES** Types of foundations and construction methods; Basics of Formwork and Staging; Proactive Maintenance**,** Prefabrication/Modular Construction, balance between environment and construction activities, reducing problems at site with minimal staging, increasing safety etc, Constructions are sustainable with reduced use of natural resources, Costs of	10

	Construction/Assembly and Transportation, Lifespan, Environmental Impact, harmful emissions during bridge construction, Reducing waste, solar panels to power LED lights to illuminate its deck, water-powered light system powered by the currents of the river, development that meets the needs of the present.	
V	**NEW CONSTRUCTION MATERIALS TECHNOLOGIES** Introduction to new construction materials & technologies, Synthetic Roof Underlayment, Electro chromic Glass, Biodegradable Materials, Reduction of water consumption, Impact on environment, Concepts of climate responsive building, Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process.	08

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Margaret Robertson, Sustainability Principles and Practice, Routledge, 2014
2.	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
3.	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
4.	Stephen M. Stephen, Stephen M. Wheeler, Climate Change and Social Ecology: A New Perspective on the Climate Challenge, Routledge, 2012.
5.	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

T/R	Book title suggested by faculty
1	Martin A. A. Abraham, Sustainability Science and Engineering: Defining Principles, Elsevier Science, 2005
2	Tony Clayton, Nicholas J. Radcliffe, Anthony M. H. Clayton, Sustainability: A Systems Approach, Routledge, 1996
3	Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011

E- content used:
https://nptel.ac.in/courses/105102195

Additional topics:

Case studies: Shanghai Tower, China; Bank of America, New York; The Crystal, London, United Kingdom; Council House 2, Melbourne.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Case studies
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-604B-18.1	Create new engineering materials to improve the performance of infrastructure	6
PECE-604B-18.2	Characterize and mitigate natural and man-made hazards	4
PECE-604B-18.3	Understanding various sustainable building construction methods and precast construction methods	2
PECE-604B-18.4	Improve fundamental knowledge of the inter-relationships between the built environment and natural systems.	6
PECE-604B-18.5	Understanding sustainable construction methods for bridges and analysing their economic viability.	4
PECE-604B-18.6	Develop the technological innovations needed to safeguard, improve, and economize infrastructure	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	2				2				3	
CO2	3	2	2										2	
CO3	2	2					3							
CO4	2	2	2				3		2				2	1
CO5	2	2					3							
CO6	2	2	3	2	3		2		2			2	3	2

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BTES 401-18: COMPUTER ORGANIZATION & ARCHITECTURE

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: COMPUTER ORGANIZATION & ARCHITECTURE	**SEMESTER:** VI
COURSE CODE: BTES 401-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of 8085 processor. Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	12
II	**Introduction to x86 architecture:** CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions, I/O device interfaces – SCII, USB	10
III	**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	12
IV	**Memory Organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	"Computer Organization and Architecture", Moris Mano.
2.	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition

	by David A. Patterson and John L. Hennessy, Elsevier.
3.	"Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
4.	"Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
5.	"Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
6.	"Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

T/R	Book title suggested by faculty
1	"Computer Organization and Design: The Hardware/Software Interface", 5th Edition
2	by David A. Patterson and John L. Hennessy, Elsevier.

E- content used:
https://nptel.ac.in/courses/108102112

Additional topics:

Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTES 401-18.1	Understand functional block diagram of microprocessor;	2
BTES 401-18.2	Apply instruction set for writing assembly language programs.	3
BTES 401-18.3	Design a memory module and analyze its operation by interfacing with the CPU.	6
BTES 401-18.4	Classify hardwired and microprogrammed control units	4
BTES 401-18.5	Understand the concept of pipelining and its performance	2

	metrics.	
BTES 401-18.6	Demonstrate the basic knowledge of I/O devices and interfacing of I/O devices with computer.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				1				1		1			
CO2	2	1			1				1		1		1	
CO3	3	2	3	2	1				2		2		2	2
CO4	2				1				1		1		1	
CO5	2				1				1		1			
CO6	2				1				1		1		1	

Prepared by **Approved By**

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BTEE-603D-18: WIND AND SOLAR ENERGY SYSTEMS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: WIND AND SOLAR ENERGY SYSTEMS	**SEMESTER:** VI
COURSE CODE: BTEE-603D-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power cumulative	08

	distribution functions.	
II	**Wind generator topologies:** Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.	08
III	**The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.	08
IV	**Solar energy Technologies -** Solar photovoltaic Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.	10
V	**Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2.	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3.	S. P. Sukhatme, Solar Energy: Principles of Thermal Collection & Storage, McGraw Hill, 1984.
4.	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.
5.	G. N. Tiwari and M. K. Ghosal, Renewable Energy Applications, Narosa Publications, 2004.
6.	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley & Sons, 1991.

T/R	**Book title suggested by faculty**
1	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
2	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.

3	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.

E- content used:
https://nptel.ac.in/courses/103103206

Additional topics:

Non-concentrating solar collectors, Parabolic solar collectors, Turbulence in Wakes and Wind Farms, Turbulence in Complex Terrain.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Demonstrations
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
BTEE-603D-18.1	Understand the global energy scenario and the consequent growth of the power generation from renewable energy sources.	2
BTEE-603D-18.2	Understand the basic physics of wind and solar power generation.	2
BTEE-603D-18.3	Apply the knowledge of electrical machines to generate electrical power from wind	3
BTEE-603D-18.4	Understand and analyse the solar photo-voltaic technology for energy generation	4
BTEE-603D-18.5	Understand the power electronic interfaces for wind and solar generation.	2
BTEE-603D-18.6	Understand the issues related to the grid-integration of solar and wind energy systems.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1		2		1		1	2							
CO2	2				1		2							
CO3	3		2		2		2						2	2
CO4	3	2	2	2	2		2						2	
CO5	3				2		2							

CO6	2					1	2						1	

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INDEX
SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2021

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	PECE -701B-18	Airport Planning and Design	3-1-0	4	4
B	OECE-701-18	Metro Systems and Engineering	3-0-0	3	3
C	PECE -701B-18	Solid And Hazardous Waste Management	3-1-0	4	4
D	PECE-703F-18	Urban Hydrology and Hydraulics	3-1-0	4	4
E	HSMC -255	Professional Practice, Law & Ethics	2-0-0	2	2
F		Project	0-0-8	8	7
G	BTMC701-18	Management- I (Organizational Behavior)	2-0-0	2	0

Total Credits = 24 Hours: 27

SCHEME: B. TECH 7TH/8TH SEMESTER
(Civil Engineering)

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCE801-18	Training (one semester)	-	-	16

PECE -701B-18: AIRPORT PLANNING AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: AIRPORT PLANNING AND DESIGN	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Airport Engineering:** Components of airport: Classifications of obstructions, Imaginary surfaces, Approach zone and turning zone. Runway orientation, basic runway length, corrections for elevation, temperature & gradient, airport classification.	10
II	**Runway & Taxiway Design:** Wind-rose diagram, Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons,	12
III	**Structural design** of runway pavements LCN/PCN method of rigid pavement design, different LCN/PCN of aircrafts using runway. Pavement Evaluation for runway & taxiway, design of overlay, Terminal area, building area, parking area, apron, hanger typical airport layouts.	12
IV	**Design of flexible and rigid runways** as per FAA procedure, Specifications for the different layers of runway and taxiway pavements, Pavement management systems for runway pavements. Benkelman Beam method for maintenance.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2.	Rangwala, Airport Engineering, Charotar Publishing House (2019).
3.	Horenjeff Robert, Airport Engineering, McGraw Hill International Publisher (2010).

T/R	Book title suggested by faculty
1	Khanna, Arora & Jain, Airport Planning and Design, Nem Chand & Brothers, Roorkee (1999).
2	Rangwala, Airport Engineering, Charotar Publishing House (2019).

E- content used:
http://128.173.204.63/courses/cee4674/ce_4674.html

Additional topics:

Visual and navigation aids, Instrument and Visual Flight Rules, Aircraft characteristics.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understand the detail concepts of the airport engineering.	2
PECE -701B-18.2	Estimate the geometric design characteristics of taxiways and runway	5
PECE -701B-18.3	Suggest the runway orientation and the runway length as per FAA & ICAO guidelines.	5
PECE -701B-18.4	Understanding the pavement evaluation techniques and design the overlay for runways and taxiways.	2
PECE -701B-18.5	Specify the guidelines and procedure for the design of flexible and rigid pavement for runways.	6
PECE -701B-18.6	Conceptualise Pavement management system for maintenance	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3		2	1					1					2
CO3	3		3	2					1					3
CO4	3	2	2	2					1					2
CO5	3	2	2	2					1					2

CO6	3		2	`								1	

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OECE-701-18: METRO SYSTEMS AND ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: METRO SYSTEMS AND ENGINEERING	**SEMESTER:** VII/VIII
COURSE CODE: OECE-701-18	**CREDITS:** 3
COURSE TYPE: OPEN ELECTIVE	**CONTACT HOURS:** 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Metro systems** Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.	04
II	**Planning and Development** Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;	06
III	**Traffic Management Systems** Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems- permanent way. Facilities Management Module	08
IV	**Signalling Systems** Introduction to Signalling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	06
V	**Electrical Systems** OHE, Traction Power; Substations-TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air	06

	mechanics.	
VI	**Mechanical Systems** Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators	06

Total hours – 36

TEXT /REFERENCE BOOKS

1.	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2.	"Metropolitan Railways: Rapid Transit in America (Railroads Past and Present)",Middleton, Indiana University Press 2013.
3.	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

T/R	Book title suggested by faculty
1	"Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris Burch Palala Press 2018.
2	"World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

E- content used:
https://coursecontent.indusuni.ac.in/wp-content/uploads/sites/8/2020/05/METRO-SYSTEMS-AND-ENGINEERING_CV0425_OE-5_UNIT-1.pdf

Additional topics:

Case studies: Baltimore Metro Subway Link, Moscow Metro, Kyoto Municipal Subway, Delhi Metro Rapid Metro Express.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects study
Presentations

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
OECE-701-18.1	Understand overview of metro systems.	2
OECE-701-18.2	Analyse vehicle dynamics and structure; tunnel ventilation	4

	systems; electrical systems.	
OECE-701-18.3	Understanding electronic signalling systems and automatic fare collection.	2
OECE-701-18.4	Understand the basics of construction planning & management.	2
OECE-701-18.5	Evaluate the construction quality & safety systems	5
OECE-701-18.6	Acquiring the knowledge of mechanical systems in context of metro systems engineering.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3	3		2	3								1	
CO3	3													
CO4	2										3			
CO5	2	2		1										
CO6	3													

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PECE -701B-18: SOLID AND HAZARDOUS WASTE MANAGEMENT

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: SOLID AND HAZARDOUS WASTE MANAGEMENT	**SEMESTER:** VII/VIII
COURSE CODE: PECE -701B-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction:** Definition of solid wastes and hazardous wastes, Nuisance potential and extent of solid waste problems, Objectives and scope of integrated solid waste management. **Collection, Storage and Transportation of Wastes:** Types of collection systems and their components, Concept of waste segregation at source and recycling and reuse of wastes.	08
II	**Solid Waste Processing and Treatment:** Waste processing – processing technologies –biological and chemical conversion technologies–Composting-thermal conversion technologies-energy recovery.	12
III	**Hazardous Waste Treatment and Disposal:** Biological and chemical treatment of hazardous wastes; Solidification and stabilization of wastes; Incineration for the treatment and disposal of hazardous wastes; Land farming; Landfill disposal of hazardous waste; Bioremediation of hazardous waste disposal sites.	12
IV	**Sanitary Landfills:** Design, development, operation and closure of landfills, Management of leachate and landfill gases, environmental monitoring of landfill sites.	06
V	**Legal Requirements:** Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, fly ash, etc.	06

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press
2.	Vesilind, P.A., Solid Waste Engineering, Thomson Learning Inc.
3.	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill
4.	Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engg.", McGraw Hill
5.	CPHEEO, *Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization*, Government of India

T/R	Book title suggested by faculty
1	Tchobanoglous, G. Vigil, S.A. and Theisen. H., Integrated Solid Waste Management: Engine erring Principles and Management Issues, McGraw Hill

2	Pichtel, J., Waste Management Practices–Municipal, Hazardous and Industrial, CRC Press

E- content used:
https://nptel.ac.in/courses/120108005

Additional topics:

Resource Conservation and Recovery Act, Health and Safety at Work Act, Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments and Reauthorization Act.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Classroom discussion
Case studies

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE -701B-18.1	Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.	2
PECE -701B-18.2	Knowledge of waste processing technologies and various waste treatment methods	2
PECE -701B-18.3	Become aware of Environment and health impacts solid waste mismanagement.	2
PECE -701B-18.4	Understand engineering, financial and technical options for waste management.	2
PECE -701B-18.5	Plan, design, manage and operate sanitary landfills for effective waste management.	6
PECE -701B-18.6	Knowledge of legal, institutional and financial aspects of management of solid wastes	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2				2									
CO3							2							
CO4	2						2				3			
CO5	3	2	3	1	2		2				2		2	3
CO6						2	2				2			

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PECE-703F-18: URBAN HYDROLOGY AND HYDRAULICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: URBAN HYDROLOGY AND HYDRAULICS	**SEMESTER:** VII/VIII
COURSE CODE: PECE-703F-18	**CREDITS:** 4
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction-** Trends of Urbanization and Industrialization, Urban water supply demand forecast, urban hydrological cycle.	08
II	**Urban water Management-** Rain water harvesting, managed aquifer recharge, effect of water management practices on urban water infrastructure, hydrology and ground water regime, mapping of water supply and sewage networks. **Urban water Infrastructure-** water supply, sanitation, sewerage and wastewater conveyance infrastructures, Water supply and sewerage network hydraulics, Structural safety and mitigating plans against natural and human caused threats.	14
III	**Urban Storm water-** Master drainage plans, Estimation of urban stormwater quantity, Wastewater collection systems, Design of storm sewer network systems, Storage facilities. Interaction between urban drainage and solid waste management, Stormwater Management, Operation and maintenance of urban drainage system.	12
IV	**Sustainable Design-** Sustainable urban designs, Methodologies for assessing sustainability of urban water infrastructures, Emerging sustainable materials and design procedures for water supply and sewerage pipelines, determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts.	10

Total hours – 44

TEXT /REFERENCE BOOKS

1.	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2.	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.
3.	Hall, M.J., (1984), *"Urban Hydrology*", Elsevier Applied Science Publishers.
4.	Mays, L.W., Hydraulic Design Handbook, McGraw-Hill, 1999

T/R	Book title suggested by faculty
1	Geiger, W.F., Marsalek, J. Zudima and Rawls, G.J (1987), *"Manual on Drainage in Urban Areas", 2 Volumes,* UNESCO, Paris.
2	Wanielista, M.P., and Yousef, Y.A. (1993), *"Storm water Management"* John Wiley and Sons, Inc., New York.

E- content used:
https://nptel.ac.in/courses/105104029

Additional topics:

Urban Runoff hydrology, Urban Runoff pollution, Stormwater best management practices.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Inquiry guided instruction
Tutorials

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)
PECE-703F-18.1	Build understanding of hydrological aspects of water resources.	2
PECE-703F-18.2	Develop competence to propose effective convergence and design features of water supply projects.	6
PECE-703F-18.3	Outline the principles of engineered systems for aeration in wastewater treatment.	6
PECE-703F-18.4	Recommend principles of need-based activities such as pumps, mixers related to water.	6

PECE-703F-18.5	Illustrate the application of pipe flow and open channel flow in water distribution networks and sewers.	2
PECE-703F-18.6	Formulate the effective use of surface and ground water sources.	6

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3	2	3	2	2								2	3
CO3	2													
CO4	3	2	3	2	2							2	2	3
CO5	3	2		2	1									
CO6	2		2										2	

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HSMC -255: PROFESSIONAL PRACTICE, LAW & ETHICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE:** B. TECH (CIVIL ENGINEERING)
COURSE: PROFESSIONAL PRACTICE, LAW & ETHICS	**SEMESTER:** VII/VIII
COURSE CODE: HSMC -255	**CREDITS:** 2
COURSE TYPE: PROFESSIONAL CORE	**CONTACT HOURS:** 2-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NA	**LAB COURSE NAME:** NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Professional Ethics** – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.	04

II	***General Principles of Contracts Management: Indian Contract Act, 1972 and amendments*** covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms.	05
III	***Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:*** Arbitration –meaning, scope and types – distinction between laws of 1940 and 1996;UNCITRAL model law –Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat.	05
IV	**Engagement *of Labour and Labour & other construction-related Laws:*** Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	04
V	***Law relating to Intellectual property:*** Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;	06

Total hours – 24

TEXT /REFERENCE BOOKS

1.	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2.	The National Building Code, BIS, 2017
3.	RERA Act, 2017
4.	Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5.	Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6.	Anson W.R. (1979), Law of Contract, Oxford University Press
7.	Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
8.	Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
9.	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
10.	O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

T/R	Book title suggested by faculty
1	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974
2	T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

E- content used:
https://nptel.ac.in/courses/110105097

Additional topics:

Accounts-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Formal method of teaching
Projects
Class room discussions

COURSE OUTCOMES

S.NO	DESCRIPTION	Bloom's Level (B.L)

HSMC -255.1	Understanding basic purpose of profession, professional ethics and various moral and social issues.	2
HSMC -255.2	Awareness of professional rights and responsibilities of an Engineer, safety and risk benefit analysis of an Engineer	2
HSMC -255.3	Understanding professional ethical values and contemporary issues	6
HSMC -255.4	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels	2
HSMC -255.5	Awareness of Law relating to Intellectual property	2
HSMC -255.6	Excelling in competitive and challenging environment to contribute to industrial growth.	2

CO MAPPING WITH PO/PSO

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1						2		3		1				
CO2						2		3		1				
CO3						2		3						
CO4						2		3						
CO5						2		3						
CO6						2	2	3	2	3	2			

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