Scheme of Instructions & Syllabi of

Bachelor of Technology

2nd Year

(Civil Engineering)

(With effective from session 2021-22)

[Revised after the inclusion of Skill and Entrepreneurship courses effective from the session 2022-23]

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Study & Evaluation Scheme
B.Tech. (Civil Engineering)
(w.e.f. academic session 2022-23)
Year II, Semester- III

Sl. No.	Category	Course Code	Course Title/Subject	Hours Per Week			Evaluation Scheme			Credits
							CA	EE	Total	
				L	T	P				
THEORY										
1.	Engineering Science Courses	BCE301	Computer-aided Civil Engineering Drawing	1	0	0	10	15	25	1
2.	Engineering Science Courses	BCE302	Engineering Mechanics	3	1	0	30	70	100	4
3.	Engineering Science Courses	BCE303	Energy Science & Engineering	1	1	0	15	35	50	2
4.	Professional courses Core	BCE304	Concrete Technology	3	1	0	30	70	100	4
5.	Professional core courses	BCE305	Disaster Preparedness & Planning	2	1	0	25	50	75	3
6.	Humanities and Social Sciences including Management Courses	HAS301	Industrial Sociology	2	0	0	15	35	50	2
7.	Humanities and Social Sciences including Management Courses	HAS302	Introduction to Civil Engineering	2	0	0	15	35	50	2
8.	Engineering science Courses	MFG13	Product Design	4	0	0	30	70	100	4
PRACTICAL/DESIGN/DRAWING										
8.	Engineering Science Courses	BCE-351	Computer-aided Civil Engineering Drawing Lab	0	0	4	20	30	50	2
9.	Engineering Science Courses	BCE-354	Concrete Technology Lab	0	0	4	20	30	50	2
Total				**18**	**4**	**8**	**210**	**440**	**650**	**26**

L-Lecture, **T**- Tutorial , **P**- Practical , **CA**-Continuous Assessment, **EE** – End Semester Examination

Study & Evaluation Scheme
B.Tech. (Civil Engineering)
(w.e.f. academic session 2022-23)
Year II, Semester- IV

Sl. No.	Category	Course Code	Course Title/Subject	Hours Per Week			Evaluation Scheme			Credits
							CA	EE	Total	
				L	T	P				
THEORY										
1.	Professional courses Core	BCE401	Building Materials & Testing	1	1	0	15	35	50	2
2.	Professional courses Core	BCE402	Engineering Geology	2	0	0	15	35	50	2
3.	Basic Science courses	BAS401	Mathematics-III	3	1	0	30	70	100	4
4.	Professional courses Core	BCE403	Introduction to Fluid Mechanics	2	1	0	25	50	75	3
5.	Professional courses Core	BCE404	Introduction to Solid Mechanics	2	1	0	25	50	75	3
6.	Professional courses Core	BCE405	Surveying &Geomatics	2	1	0	25	50	75	3
7.	Humanities and Social Sciences including Management courses	HAS401	Civil Engineering - Societal & Global Impact	2	0	0	15	35	50	2
8	Mandatory (non-credit) Courses	BMC002	Organizational Behavior	3	0	0	-	-	-	0
PRACTICAL/DESIGN/DRAWING										
	Professional courses Core	BCE- 451	Building Materials & Testing Lab	0	0	2	10	15	25	1
9.	Professional courses Core	BCE- 453	Fluid Mechanics Lab	0	0	2	10	15	25	1
10.	Professional courses Core	BCE- 455	Surveying &Geomatics Lab	0	0	4	20	30	50	2
Total				**17**	**5**	**8**	**190**	**385**	**575**	**23**

L-Lecture, **T**- Tutorial , **P**- Practical , **CA**– Continuous Assessment , **EE**- End Semester Examination

BCE301	**Computer-aided Civil Engineering Drawing**	**1L:0T:0P**	**1 credits**

Pre-requisite: No Pre-requisite.

Course Objectives:

CO1	To understand the basic elements of engineering drawing.
CO2	To be able to prepare engineering drawings in 2D and 3D for different structures.
CO3	To understand and interpret engineering drawings.
CO4	To get familiar with the software's used for drafting.

Module 1:

INTRODUCTION; Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co- ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

Module 2:

SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards

MASONRY BONDS:English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall

Module 3:

BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing, Site plan, floor plan, elevation and section drawing of small residential buildings, Foundation plan,Roof drainage plans.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Develop Parametric design and the conventions of formal engineering drawing.
CO2	Communicate a design idea/concept graphically/visually.
CO3	Examine a design critically and with understanding of CAD
CO4	To interpret drawings, and to produce designs using a combination of 2D and 3D software.

Text/Reference Books:

1. Subhash C Sharma &Gurucharan Singh (2005), " Civil Engineering Drawing" , StandardPublishers
2. Ajeet Singh (2002), " Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- McGraw-Hill Company Limited, NewDelhi
3. Sham TickooSwapna D (2009), " AUTOCAD for Engineers and Designers" , Pearson Education,
4. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age

International Pvt.Ltd.,
5. Balagopal and Prabhu (1987), " BuildingDrawing and Detailing", Spades publishing KDR building,Calicut.
6. (Corresponding set of) CAD Software Theory and UserManuals.
7. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd NewAsian.
8. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria&Sons.

BCE302	Engineering Mechanics	3L:1T:0P	4 credits

Pre-requisite: Physics

Course Objectives:

CO1	To prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.
CO2	To provide working knowledge of statics with emphasis on force equilibrium and free body diagrams.
CO3	To provide an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems.
CO4	To develop an understanding of the mechanicalbehavior of materials under various load conditions.

Module 1:

Introduction to Engineering Mechanics*:*Force SystemsBasic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction.

Module 2:

Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines.

Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone.

Module 3:

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates; Relative and constraine motion; Newton's 2nd law (rectangular, path, and polar coordinates).Work-kinetic energy, power, potential energy.Impulse-momentum (linear, angular); Impact (Direct and oblique).

Module 4:

Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies;

Basic terminology, free and forced vibrations, resonance and its effects .Frequency and amplitude

of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, uses.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Use scalar and vector analytical techniques for analyzing forces in statically determinate structures
CO2	Confidently tackle equilibrium equations, moments and inertia problems.
CO3	Master calculator/computing basic skills to use to advantage in solving mechanics problems.
CO4	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.

Text/Reference Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, PrenticeHall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGrawHill
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, PearsonPress.
4. Andy Ruina and RudraPratap (2011), Introduction to Statics and Dynamics, Oxford UniversityPress
5. Shanes and Rao (2006), Engineering Mechanics, PearsonEducation,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's EngineeringMechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, LaxmiPublications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand &Co.
10. Tayal A.K. (2010), Engineering Mechanics, UmeshPublications.

BCE303	Energy Science & Engineering	1L:1T:0P	2 credits

Pre-requisite: Basic knowledge of sources of energy

Course Objectives:

CO1	To understand the scientific principles of energy sources.
CO2	To explore society's present needs and future energy demands.
CO3	To focus on alternatives,renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, hydro, nuclear etc.
CO4	To acquire knowledge for the design of efficient Civil Engineering projects.

Module 1:
Introduction to Energy Science*:* Scientific principles and historical interpretation to *place ener*gy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

Module 2
Energy Sources*:* Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiencybatteries)
Energy & Environment*:* Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy.

Module 3:
Engineering for Energy conservation: Concept of Green Building and Green Architecture;Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); *LEED ratings;* Identification of energy related enterprises that represent the breath of the industry and prioritizingthese as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption.

Course Outcomes: After the completion of this course the students will be able to:

CO1	List and generally explain the main sources of energy and their primary applications nationally and internationally
CO2	Have basic understanding of the energy sources and scientific concepts/principles behind them
CO3	Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
CO4	To quantify energy demands and make comparisons among energy uses, resources, and technologies.

Text/Reference Books:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford UniversityPress
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford UniversityPress
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living,Gaiam
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub,XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, RobertA. (2006) Energy and the Environment, 2nd Edition, JohnWiley
6. UNDP (2000), Energy and the Challenge of Sustainability, World Energyassessment
7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley PublishingCompany
8. Related papers published in internationaljournals

BCE304	Concrete Technology	3L:1T:0P	4 credits

Pre-requisite: Building Material

Course Objectives:

CO1	To understand in detail the characteristics of constituent of concrete.
CO2	To understand thedifferent types of concrete and there uses.
CO3	To design the concrete of required compressive strength.
CO4	To understand the properties and test conducted on fresh concrete

Module1:

Introduction:-Definition of concrete. Brief introduction to properties of concrete.Advantages of concrete.Use of concrete. Cements & Admixtures: Portland cement – chemical composition, Hydration of cement Setting of cement; Different grades of cement;

Aggregates:-Classification of aggregates according to source, size and shape. Characteristics of aggregatesparticle size and shape, surface texture; specific gravity of aggregate; bulk density, water absorption surface moisture, bulking of sand and deleterious materials in the aggregate. Grading of Aggregate:-Coarse aggregate, fine aggregate.

Module2:

Water Cement Ratio:-, Effect of various W/C ratios on the physical structure of hydrated cement, water cement ratio law and conditions under which the law is valid; internal moisture, temperature, age, and size of specimen. Definition of cube strength of concrete. Relations between water cement ratio and strength of concrete.

Workability: Definition of workability Segregation, Harshness. Factors affecting workability; water content, shape,.Measurement of workability slump test, compaction factor test.Recommended slumps for placement in various conditions.Vee-Bee Consistometer.

Special Concretes: Light weight aggregate concrete; Cellular concrete; No-fines concrete; High density concrete; Fibre-reinforced concrete (F.R.C.); Different types of fibres; Factors affecting properties of F.R.C.; Applications of F.R.C.; Polymer concrete – Types, Properties and Applications; High performance concrete; Self consolidating concrete.

Module 3:

Concrete Operations:- (i) Storing Cement:- (a) Storing of cement in the warehouse**.,** (b) Storing of cement at site, (c) Effect of storage on strength of cement.

Batching:- (a) Batching of cement**.,** (b) Batching of aggregate: Batching by volume, using gauge box, selection of proper gauge box, Batching by weight-spring balances and by batching machines., (c) Measurement of water.

Mixing (a) Hand mixing **(b)** Machine mixing-types of mixer, capacities of mixers, choosing appropriate sizeof mixers, operation of mixers, mixing of water.

Compaction:

(a) Hand compaction. **(b)** Machine compaction-types of vibrators (internal screed vibrators and form vibrators) immersion vibrations. Suitability of concrete mixes.Finishing concrete slabs-screeding, floating, and trowelling.

Curing:- Object of curing, Method of curing, shading concrete works, covering surfaces with hesian, gunnybags, sprinkling of water, ponding method and membrane curing, steam curing. Recommended duration for Curing.

Module 4:

Proportioning for Ordinary Concrete: Object of mix design, Strength required for various grades as per IS456, Preliminary test, cube test.Proportioning for ordinary mix as prescribed by IS and its interpretation. Adjustment on site, Introduction of formwork

Quality Control at site:-Control tests on cement, aggregate water and concrete. Concept of quality control.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Define the characteristics of ingredients of concrete and their role in preparing the concrete.
CO2	Decide the type of concrete to be used as per the prevailing exposure condition.
CO3	Design the ratio of constituents of concrete to get required compressive strength.
CO4	Perform the test on concrete at site for quality control.

Text Books:-

1. Neville A.M.*, Concrete Technology*, Standard Publishers Distributors, Delhi.
2. Kulkarni P.D.*, Textbook of Concrete Technology*, New Age International Publishers, Delhi.
3. Santhakumar A.R.*, Concrete Technology*, Oxford University Press, Mumbai.

BCE-305	Disaster Preparedness & Planning	1L:1T:0P	2 credits

Pre-requisite: No Pre-requisite

Course Objectives:

CO1	To provide broad understanding about the basic concepts ofDisaster Management with preparedness as a Civil Engineer.
CO2	To Understand Definitions and Terminologies used in Disaster Management.
CO3	ToUnderstand Types and Categories of Disasters and there impacts.
CO4	To develop social responsibility as an engineer towards preparedness as well as mitigating the damages.

Module 1:

Introduction- Concepts and definitions: disaster, hazard, vulnerability, risksseverity,frequency and details, capacity, impact, prevention, mitigation.

Disasters- Disasters classification; natural disasters (floods, draught, cyclones,volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.);manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation,chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerabilityprofile of India, mountain and coastal areas, ecologicalfragility.

Module 2:

Disaster Impacts- Disaster impacts (environmental, physical, social, ecological,economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age,special needs); hazard locations; global and national disaster trends; climate change andurbandisasters.

Module 3:

Disaster Risk Reduction (DRR)- Disaster management cycle – its phases;prevention, mitigation, preparedness, relief and recovery; structural and non-structuralmeasures; risk analysis, vulnerability and capacity assessment; early warning systems, Postdisasterenvironmental response (water, sanitation, food safety, waste management, diseases control, security, communications); Roles and responsibilities of government, community,local institutions, NGOs and other stakeholders; Policies and legislation for disaster riskreduction, DRR programmes in India and the activities of National Disaster ManagementAuthority.

Module 4:

Disasters, Environment and Development- Factors affecting vulnerability such asimpact of developmental projects and environmental modifications (including of dams, landusechanges, urbanization etc.), sustainable and environmental friendly recovery;reconstruction and development methods.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Use the application of Disaster Concepts to Management.
CO2	Analyze Relationship between Development and Disasters.
CO3	To understand Categories of Disasters.
CO4	Realize the responsibilities to society.

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

HAS-301	**Industrial Sociology**	**2L:0T:0P**	**2 credits**

Pre-requisite: No Pre-requisite.

Course Objectives:

CO1	To provide an understanding of the ways in which the process of industrialization has shaped societies.
CO2	To Understand the influence of the wider societal context on the operations within their organizations.
CO3	To obtain sociological knowledge of core areas and substantive topics and the ability to think critically about them.
CO4	To understand the role of theory in the application of conceptual frameworks in the research process

Module 1:
Industrial Sociology:
Nature and Scope of Industrial Sociology-Development of Industrial Sociology.Rise and Development of Industry: Early Industrialism – Types of Productive Systems – The Manorial or Feudal system – The guild system – The domestic or putting-out system – and the factory system – Characteristics of the factory system –

Module 2:
Industrialization:
Causes and consequences of industrialization.
Industrialization in India.
Industrial Poling Resolutions – 1956.

Module 3:
Contemporary Issues:
Grievances and Grievance handling procedure. Industrial Disputes: courses, strikes & lockouts, Industrial Relations Machinery Bi-partite Tri-partite Agreement, Labour courts &Industrial Tribunals, Code of Discipline, Standing order.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Describe about the major social groups that function in society, including racial and ethnic groups.
CO2	Understand the development of industrial sociology.
CO3	Find the research area in the field of sociology
CO4	Realizethe contemporary issues in the field of industrial sociology.

References:
1. Gisbert Pascal, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.

2. Schneider Engno v., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. Mamoriac.b. And Mamoria s., Dynamics of Industrial Relations in India.
4. Sinhag.p. and p.r.n. Sinha, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.

HAS-302	Introduction to Civil Engineering	2L:0T:0P	2 credits

Pre-requisites: Some knowledge of various disciplines of Civil Engineering

Course Objectives:

CO1	To give overview of the content to be covered in journey of Civil Engineering
CO2	To understand the diverse application and scope of Civil Engineering.
CO3	To encourage the students to pursue a career in one of the domains of Civil Engineering.
CO4	To expose the students to the various avenues available for doing creative and innovative work.

Module 1:

Basic Understanding: What isCivil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for acareer.

History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civilengineers.

Overview of National Planning for Construction and Infrastructure Development; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructureworks.

Fundamentals of Architecture & Town Planning: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smartcities

Module 2:

Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced &Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolitionwastes

Basics of Construction Management &ContractsManagement: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems, Advent of Lean Construction, Importance ofContracts Management.

Environmental Engineering&Sustainability:Water treatment systems, Effluent treatment systems, Solid waste management, Sustainability inConstruction;

Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations, basics of rock mechanics &tunneling.

Hydraulics, Hydrology &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi- purpose reservoirprojects.

Module 3:

Ocean Engineering: Basics of Wave and Current Systems, Sediment transport systems; Ports &Harbours and other marinestructures.

Power Plant Structures: Chimneys, Natural & Induced Draught Colling towers, coal handling

systems, ash handling systems,nuclear containment structures, hydro power projects.
Structural Engineering: Types of buildings; tall structures, various types of bridges, Water retaining structures;, Other structural systems; Experimental Stress Analysis,Wind tunnelstudies.
Surveying &Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS,LIDAR.

Module 4:
Traffic &Transportation Engineering: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials, design, construction and management; Case studies andexamples.
Repairs & Rehabilitation of Structures: Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non- Destructive testing systems; Use of carbon fibre wrapping and carbon composites inrepairs.
Industrial lectures: Case studies of large civil engineering projects by industry professionals, covering comprehensive planning tocommissioning;
Basics of Professionalism: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems inConstruction.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Understand to what constitutes Civil Engineering.
CO2	Identify the various areas available to pursue and specialize within the overall field of Civil Engineering.
CO3	Think and plan of doing creative and innovativework.
CO4	Highlight the possibilities for taking up entrepreneurial activities in thisfield.

Text/Reference Books:

1. Patil, B.S.(1974), Legal Aspects of Building and EngineeringContract.
2. The National Building Code, BIS,(2017)
3. RERA Act,(2017)
4. MeenaRao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern BookCo.
7. Dutt (1994), Indian Contract Act, Eastern LawHouse.
8. Anson W.R.(1979), Law of Contract, Oxford UniversityPress.
9. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case lawon.
10. UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
11. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern BookCo.
12. Wadhera (2004), Intellectual Property Rights, Universal Law PublishingCo.
13. P. S. Narayan (2000), Intellectual Property Rights, GogiaLawAgency
14. T. Ramappa(2010), Intellectual Property Rights Law in India, Asia LawHouse
15. Bare text (2005), Right to InformationAct
16. O.P. Malhotra, Law of Industrial Disputes, N.M. TripathiPublishers

17. K.M. Desai(1946), The Industrial Employment (Standing Orders)Act
18. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia PublishingHouse
19. Vee, Charles &Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss. 2, pp 117-127, MCB UPLtd
20. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study andApplication

PRACTICAL/DESIGN/DRAWING

BCE351	**Computer-aided Civil Engineering Drawing**	**0L:0T:4P**	**2 credits**

List of Drawing Experiments:

1-Buildings with load bearing walls including details of doorsand windows.
2-Taking standard drawings of a typical two storeyed building including all MEP, joinery, rebars, finishing and other details and writing out adescriptionof the Facility in about 500 -700 words.
3-RCC framed structures
4-Reinforcement drawings for typical slabs, beams, columns and spread footings.
5-Industrial buildings - North light roof structures – Trusses
6-Perspective view of one and two storey buildings

BCE354	**CONCRETE TECHNOLOGY LAB**	**0L:0T:2P**	**1 credits**

List of Practicals:

1-To determine Consistancy of cement
2-To determine the fineness of cement
3-To determine the workability concrete
4-Abrassion test of aggregate
5-To determine flakiness index and elongation index of coarse aggregate (ISI:2386-pt.1-1963)
6-Determination of specific gravity and water absorption of aggregates (IS:2386 Part-III-1963) (for aggregates 40mm to 10mm)
7-To determine the flexural strength of concrete
8-To test cube strength of concrete with varying water cement ratio.

BCE-401	Building Material & Testing	1L:1T:0P	2 credits

Pre-requisite: Concrete technology

Course Objectives:

CO1	Selecting appropriate material for construction of buildings.
CO2	Designing and testing the material either in laboratory or in the field before their actual use at the site.
CO3	Identifying the methods for defect and preservation of timber.
CO4	Demonstrating the manufacturing of clay bricks in kiln, work at site for shallow foundation, beams ad columns at nearby site.

Module 1: Classification and properties of Engineering Materials: Stones: Properties of stones, classification of rocks, sources of stones, quarrying of stones, tests for stones **Bricks**: Manufacturing process of clay bricks, classification of clay bricks, Properties of clay bricks, Composition of brick earth, **Tiles:** Properties, types and uses, **Lime**: Properties of lime, Classifications and uses of limes.
Cement: Chemical composition, Properties of good cement, Uses and tests of cement
Cement Concrete: Properties, Constituents of concrete, their properties, tests on concrete
Timber: Classification and identification of timber, Fundamental Engineering Properties of timber, Seasoning of timber, Defects in timber. **Asphalt**: Properties and uses of Bitumen and Tar

Module 2:Ferrous metals: Desirable properties of cast iron and reinforcing steel.**Non-Ferrous Metals:** Brief discussion on properties and uses of Aluminum**Glass:** Ingredients, properties types and use in construction**Gypsum:** properties and uses of gypsum.Damp proofing: Causes and effects of damp proofing, methods of damp prevention, Termite treatment in buildings: termite and its treatment

Module3:Doors,WindowsandRoofs: Locationandsizeofdoors,typesofdoorsandWindows, size specifications for windows. Roof and itstype.**Ventilation and Air conditioning**: its purposes and necessityMaterial Engineering, Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material(brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests;

Course Outcomes: After the completion of this course the students will be able to:

CO1	Describe the properties of engineering material.
CO2	Understand the fracture mechanism of different materials.
CO3	Conduct test on specimen to determine the engineering properties.
CO4	Select the best suitable material after analyzing the test results.

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, FifthEdition
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineeringapplications
4. KyriakosKomvopoulos (2011), Mechanical Testing of Engineering Materials,Cognella

5. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall InternationalEdition
6. AmericanSocietyforTestingandMaterials(ASTM),AnnualBookofASTMStandards(post 2000).
7. Related papers published in internationaljournals.

BCE-402	Engineering Geology	2L:0T:0P	2 credits

Pre-requisite: No Pre-requisite.

Course Objectives:

CO1	To focus on the core activities of engineering geologists.
CO2	To understand the engineering properties of rock and unconsolidated materials.
CO3	Characterization and geologic hazard identification and mitigation
CO4	Characterization of geologic sites, rocks and minerals for civil work projects.

Module 1:

Introduction-Branches of geology useful to civil engineering, scope of geologicalstudies in various civil engineering projects. Mineralogy-Mineral,Origin and composition.Physical properties of minerals, susceptibility of minerals toalteration, basic of optical mineralogy.Rock forming minerals, megascopicidentification of common primary &secondaryminerals.

Module 2:

Petrology-Rock forming processes. Their origin, structure, Texture and classification of igneous, sedimentary and metamorphic rocks and their suitability as engg.materials.

Stratification, Lamination bedding. Outcrop-its relation to topography, dip and strike of bed, overlap, outlier and inlier.

Rock deformation: Folds, Faults, joints unconformity and their classification, causes and relation to engg. Behaviour of rock masses.

Module3:

Earthquake, its causes, classification, seismic zones of India and Geological consideration for construction of building, projects in seismic areas.

Landslides, its causes, classification and preventive measures.

Underground water, Origin, Aquifer, Aquicludes, Artesian Wells, underground provinces of India and its role as geological hazard.

Module 4:

Building StonesEngg, Properties of rocks, Alkali aggregate reaction, Grouting, Puzzolonaic materials.

Geological investigations for site selection of Dams and reservoirs tunnels, bridges and Highways.Principles of Geophysical explorations methods for subsurface structures.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Understand site characterization and how to collect, analyze, and report geologic data using standards in engineering practice.
CO2	Understand the fundamentals of the engineering properties of Earth materials.
CO3	Understand the geologic hazard and adopt preventive measures.
CO4	Understand the mechanics of soil and consider the appropriate material to prevent problems like settlement and liquefaction.

Text/Reference Books:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria&
2. Sons.
3. Text Book of Engineering Geology, N. ChennaKesavulu, 2ndEdition (2009),
4. Macmillan PublishersIndia.
5. PrabinSingh :Engg. and General Geology, Katson Publishing House.
6. Blyth F.G.M. : A Geology for Engineers, Arnold, London.
7. D.S. Arora : Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
8. F G Bell : Funamentals of Engineering Geology , B S Publication

BAS401	MATHEMATICS-III	3L:1T:0P	4 credits

Pre-requisite: Mathematics-II

Course Objectives:

CO1	To understand the method of solving algebraic, transcendental equations.
CO2	Learn to determine the approximate value of the derivative & definite integral for a given data using numerical techniques
CO3	To expand the given periodic function defined in the given range in terms of sine and cosine multiple of terms as a Fourier series.
CO4	Know how root finding techniques can be used to solve practical engineering problems.

MODULE I

Differential Equations

Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solutions of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Series Solutions and Special Functions Series solutions of ODE of 2nd order with variable coefficients with special emphasis to differential equations of Legendre, and Bessel Legendre polynomials, Bessels functions and their properties.

MODULE II

Partial Differential Equations

Introduction of partial differential equations, Linear partial differential equations with constant coefficients of 2nd order and their classifications - parabolic, elliptic and hyperbolic with illustrative examples.

Applications of Partial Differential Equations

Method of separation of variables for solving partial differential equations, Wave and Heat equations in one dimension. Laplace equation.

MODULE III

Laplace Transform

Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step function. Laplace transform of periodic functions, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Function of Complex variable

Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(Cos\,\theta.Sin\theta)d\theta$ *and* $\int_{-\infty}^{+\infty} f(x)dx$

Course Outcomes: After the completion of this course the students will be able to:

CO1	Apply the Set theory and Relation concepts
CO2	Apply the Functions and define the recursive functions.
CO3	Apply Laplace transform to different applications
CO4	Relate mathematical problems to the engineering applications.

Text Books:-

1. H.K.Dass, Higher Engineering Mathematics, S.Chand Publications.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005

Reference Books:-

1. R.K.Jain & S.R.K.Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.
2. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
3. C.Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd. 2003
5. Peter V. O'Neil, Advanced Engineering Mathematics, Thomson (Cengage) Learning, 2007.

BCE-403	Introduction to Fluid Mechanics	2L:1T:0P	3 credits

Pre-requisite: Introduction to Civil Engineering

Course Objectives:

CO1	To introduce the concepts of fluid mechanics useful in CivilEngineering applications.
CO2	To understand the principles of fluid statics, kinematics and dynamics.
CO3	To analyse engineering problems involving fluids.
CO4	To build a good fundamental background for intensive courses covering hydraulics, hydraulic machinery and hydrology.

Module 1:

Basic Concepts and Definitions – Distinction between a fluid and a solid;Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation ofviscosity with temperature, Newton law of viscosity; vapour pressure, boiling point,cavitation; surface tension, capillarity, Bulk modulus of elasticity,compressibility.

Module 2:

Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variationwith temperature, density and altitude. Piezometer, U-Tube Manometer, Single ColumnManometer, U-Tube Differential Manometer.Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy andstability of floatingbodies.

Module 3:

Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniformand non-uniform flow; laminar and turbulent flow; rotational and irrotational flow;compressible and incompressible flow; ideal and real fluid flow; one, two and threedimensional flows; Stream line, path line, streak line and stream tube; stream function,velocity potential function. One-, two- and three -dimensional continuity equations inCartesian coordinates.

Module 4:

Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation;Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli'sequation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted byfluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, WeberNumber and Euler Number.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Understand definitions of the basic terms used in fluid mechanics.
CO2	Understand the broad principles of fluid statics, kinematics and dynamics.
CO3	Apply the continuity, momentum and energy principles in various problems involving fluid.
CO4	Apply dimensional analysis.

Text/Reference Books:

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC,New York,USA.
2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi,India.

3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: PearsonPrentice Hall,2004
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics ofSolids. 2nd ed. New York, NY: McGraw Hill,1979
5. Laboratory Manual of Testing Materials - William KendrickHall
6. Mechanics of Materials - Ferdinand P. Beer, E. RusselJhonston Jr., John T.DEwolf– TMH 2002.
7. Strength of Materials by R. Subramanian, Oxford University Press, NewDelhi.

BCE-404	Introduction to Solid Mechanics	2L:1T:0P	3 credits

Pre-requisite: EngineeringMechanics

Course Objectives:

CO1	To understand the engineering properties of different materials.
CO2	To introduce to continuum mechanics and material modeling of engineering materials based on first energy principles.
CO3	To understand the various types of beams and loading.
CO4	To understand the analytical methods for determining the strength, stiffness and other engineering properties.

Module1:

Simple Stresses and Strains- Concept of stress and strain,Elasticity and plasticity – Types of stresses and strains, Hooke'slaw– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain,Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them –Barsofvaryingsection–compositebars– Temperaturestresses.StrainEnergy–Resilience– Gradual, sudden, impact and shock loadings – simple applications.

Module 2:

Compound Stresses and Strains- Two dimensional system, stress at a point on aplane, principal stresses and principal planes, Mohr circle of stress. Relationship between elastic constants.

Bending moment and Shear Force Diagrams for cantilevers, simply supported and fixed beamswith or without overhangs. Calculation of maximum BM and SF and the point of contraflexure under concentrated loads, uniformly distributed loads over the whole span or part ofspan, combination of concentrated loads (two or three) and uniformly distributed loads,uniformly varying loads, application of moments.

Module 3:

Flexural Stresses-Theory of simple bending – Assumptions – Derivation ofbending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses –Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections.

Slope and deflection- Relationship between moment, slope and deflection,Moment area method, Macaulay's method.Use of these methods to calculate slope anddeflection for determinant beams.

Module 4:

Torsion- Derivation of torsion equation and its assumptions. Applications of theequation of the hollow and solid circular shafts, torsional rigidity, Combined torsion andbending of circular shafts, principal stress and maximum shear stresses under combinedloading of bending and torsion. Analysis of close-coiled-helical springs.

Thin Cylinders and Spheres- Derivation of formulae and calculations of hoopstress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Describe the various engineering properties of a material.
CO2	Analyse the effect of different loading on different type of beam.
CO3	Analyse various situations involving structural members subjected to combined stresses.
CO4	Solve for stresses and deflections of beams under unsymmetrical loading.

Text/Reference Books:

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC,New York,USA.
2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi,India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: PearsonPrentice Hall,2004
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics ofSolids. 2nd ed. New York, NY: McGraw Hill,1979
5. Laboratory Manual of Testing Materials - William KendrickHall
6. Mechanics of Materials - Ferdinand P. Beer, E. RusselJhonston Jr., John T.DEwolf– TMH 2002.
7. Strength of Materials by R. Subramanian, Oxford University Press, NewDelhi

BCE-405	Surveying and Geomatics	2L:1T:0P	3 credits

Pre-requisite: Basic geometry & trigonometry

Course Objectives:

CO1	Describe the function of surveying in civil engineering construction
CO2	Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision.
CO3	Operate a total station to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system,
CO4	Perform traverse calculations; determine latitudes, departures, and coordinates of control points and balancing errors in a traverse.

Module 1:

Introduction to Surveying: Principles, Linear, angular and graphicalmethods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling, Planetable surveying, Principles of levelling- booking and reducing levels; differential, reciprocalleveling, profile levelling and cross sectioning. Auto Level, Errors in leveling, contouring: Characteristics, methods, uses; areas and volumes.Numerical on Chain surveying, compass surveying and levelling.

Theodolite survey: Instruments, Measurement ofhorizontal and vertical angle.

Module 2:

Curves: Elements of simple and compound curves – Method of settingout– Elements of Reverse curve - Transition curve – length of curve – Elements of transitioncurve - Vertical curves.

Modern Field Survey Systems: Principle of Electronic DistanceMeasurement, Types of EDM instruments, Total Station – Parts of aTotal Station – Accessories –Advantages and Applications. Introduction of aerial photographs.Global PositioningSystems- Segments, GPS measurements, errors and biases, Surveying with GPS.

Module 3:

Plane table surveying: Principles, Accessories of Plane table, orientation, Procedure of setting up Plane table over a station, Methods of plane tabling, Procedure of Plane table traversing & advantages and disadvantages of Plane table surveying.

Remote Sensing: Introduction – Remote sensing dataacquisition: platforms and sensors; visual image interpretation; digital imageprocessing.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Describe the basic principles of surveying.
CO2	Conduct a survey for a given area and minimize the error by applying suitable corrections.
CO3	Measure the distance, vertical and horizontals angles using advanced surveying instruments.
CO4	Relate the knowledge on Surveying to the new frontiers of science likeHydrographic surveying, Global Positioning System, Photogrammetry and Remote Sensing.

Text/Reference Books:

1 Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GISand Remote Sensing, Pearson India,2006.
2 Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros,2011
3 Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International,2010
4 Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited,2002.
5 Anji Reddy, M., Remote sensing and Geographical information system, B.S Publications,2001.
6 Arora, K.R., Surveying, Vol-I, II and III, Standard Book House,2015.

HAS-401	Civil Engineering- Societal & Global Impact	2L:0T:0P	2 credits

Pre-requisite: Environment studies

Course Objectives:

CO1	To analyze the effect of growth in the past and prepare accordingly for future.
CO2	To understand the significance of Civil Engineering and the impact it has on the Society and at global levels.
CO3	Awareness of the impact of Civil Engineering for the various specific fields of human endeavor
CO4	To ensure the need to think innovatively in order to contribute towards Sustainability.

Module 1:

Introduction to Course and Overview; Understanding the past to look into thefuture: Pre-industrial revolution days, Agricultural revolution, first and second industrialrevolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations;Present day world and future projections,; Global warming, its impact and possible causes; Evaluating futurerequirements for various resources; GIS and applications for monitoring systems;

Module 2:

Understanding the importance of Civil Engineering in shaping and impacting theworld; The ancient and modern Marvels and Wonders in the field of Civil Engineering;Future Vision for CivilEngineering.

Module 3:

Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions;Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals,Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energygeneration (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal,Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground andunderground cabling); Awareness of various Codes & Standards governing Infrastructuredevelopment; Innovations and methodologies for ensuringSustainability.

Module 4:

Environment- Traditional & futuristic methods; Solid waste management, Waterpurification, Wastewater treatment &Recycling, Hazardous waste treatment; Flood control(Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution;Global warming phenomena and Pollution Mitigation measures, Stationarity and nonstationarity;Environmental Metrics & Monitoring; Other Sustainability measures;Innovations and methodologies for ensuringSustainability.

Module 5:

Built environment – Facilities management, Climate control; Energy efficientbuilt environments and LEED ratings, Recycling, Temperature/ Sound control in builtenvironment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment,Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures &Heritage structures; Innovations and methodologies for ensuringSustainability.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Access the impact which Civil Engineering projects have on the Society at large and on the global arena and using resources efficiently and effectively.
CO2	Explore the potentials of Civil Engineering for Employment creation and its Contribution to economic development.
CO3	Understand the extent of infrastructure required and use clean energy for sustainable development.
CO4	Apply professional and responsible judgment and take a leadership role.

Text/Reference Books:

1. ŽigaTurk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in:Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for anEarthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering,Vol. 32. Springer,Dordrecht
2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social,Economical and Working Environment, 120th ASEE Annual Conference andExposition
3. NAE Grand Challenges for Engineering (2006), Engineering for the DevelopingWorld, The Bridge, Vol 34, No.2, Summer2004.
4. Allen M. (2008) Cleansing the city. Ohio University Press. AthensOhio.
5. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). LondonTideway Tunnels Programme – Thames Tunnel Project Needs Report – Potentialsource control and SUDS applications: Land use and retrofitoptions
6. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx
7. Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface WaterManagement and Urban Green Infrastructure.Review of Current Knowledge.Foundation for Water ResearchFR/R0014
8. Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainableparadigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. P129-130
9. Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainabilitywith application to urban water systems. J. Water Resources Planning andManagement. ASCE. Vol. 134, No. 3,May.
10. Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICEEngineering Sustainability 163. June Issue ES2 p61-63
11. Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional AgencyEntrapment: An Agenda for Urban Water Research. Water Resources Management.Vol.23, No.4.European Water Resources Association (EWRA) ISSN0920-4741.

MCE-401	Organizational Behavior	3L:0T:0P	0 credits

Pre-requisite: No Pre-requisite.

Course Objectives:

CO1	To help the students to develop cognizance of the importance of human behavior.
CO2	To enable students to describe how people behave under different conditions and understand why people behave as they do.
CO3	To provide the students to analyse specific strategic human resources demands for future action.
CO4	To enable students to synthesize related information and evaluate options for the most logical and optimal solution.

Module 1:

Introduction to organizational behavior – Definition of OB – various disciplines Acontributing to OB – Harwthrone Experiment - Foundation of individual behavior – Need And importance of organizational behavior – Nature And Scope – Framework of organizational behavior
Personality – Types – Factors Affecting Personality – Perception – Importance – Factors influencing Perception – Learning - Types of Learning Styles – The Learning Process

Module 2:

Organization structure, Formation, Groups in organizations, Influence, Group dynamics, Group decision making techniques, Team building, Communication, Control, Johari Window
Leadership styles, Behavioral Theories, Fiedler model, LMX theory and Path Goal theory, Leaders vs Managers, Sources of power, Power centers, Power and Politics.

Module 3:

Organizational culture and climate, Factors affecting organizational climate, Importance, Job satisfaction, Determinants, Measurements, Influence on behavior, Stress, Work Stressors, Prevention and Management of stress, Balancing work and Life, Kurt Lewin's– three step model, methods for implementing organizational change.

Course Outcomes: After the completion of this course the students will be able to:

CO1	Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.
CO2	Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
CO3	Analyze the complexities associated with management of the group behavior in the organization
CO4	Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

Text/Reference Books:

1. Stephen Robbins, Organisational Behavior, Prentice Hall of India
2. UdaiPareek, Understanding Organisational Behavior, Oxford University Press
3. L.M.Prasad, Organisational Behavior, Sultan Chand & Sons
4. Fred Luthans, Organisational Behavior, McGraw Hill Book Co.

PRACTICAL/DESIGN/DRAWING

BCE-453	Fluid Mechanics Lab	0L:0T:2P	1 credits

Lab Experiments

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter, venturimeter, and bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
6. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
7. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
8. Verification of meta-centric height

BCE-455	**Surveying and Geomatics Lab**	**0L:0T:4P**	**2 credits**

List of Practicals:

1. Study of different types of topographical maps and to prepare conventional symbols chart.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using dumpy/Auto level.
4. To perform fly levelling with a Auto /tilting level.
5. To study parts of a vernier / Electronic theodolite and practice for taking angle measurements.
6. To measure vertical angle of given points by Electronic theodolite.
7. To measure horizontal angle between two objects by repetition method with three repetitions.
8. To perform the field procedure of chain surveying.
9. To determine the elevation of chimney top by trigonometrical levelling by taking observations in single vertical plane.
10. To set out a simple circular curve by Rankin's method
11. To perform the methods of Radiation, Intersection & Traversing in plane table surveying

BCE-451	**Building Material & Testing Lab**	**0L:0T:2P**	**1 credits**

List of Practicals:

I. Cement (Two turns only)

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatelier's apparatus.
5. Soundness of cement.

II. Coarse Aggregate (Two turns only)

1. Crushing value of aggregate
2. Impact value of aggregate
3. Water absorption of aggregate
4. Sieve Analysis of Aggregate
5. Specific gravity & bulk density
6. Grading of aggregates.

III Fine Aggregate: (one turn only)

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks:

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence