The National Institute of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
Recognised by AICTE, New Delhi, Grant-in-Aid by Government of Karnataka,
Accredited by NAAC, New Delhi

BLOWN UP SYLLABUS

For 2023 Batch Students

II Year B.E. Department of Civil Engineering

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The National Institute of Engineering

Scheme of Teaching & Examination - 2022

Effective from the Academic year 2024-25

Department: Civil Engineering

B.E. 2023 Admitted Batch

Semester : III

Sl.No	Type of Course	Course Code	Course Title	Teaching Department (TD)	Question Paper setting Board (PSB)	Teaching Hrs/Week				Examination				Credits
						L	T	P	S	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	BCV301	Strength of Materials	CV	CV	3	0	0		3	50	50	100	**3**
2	IPCC	BCV302	Engineering Survey	CV	CV	3	0	2		3	50	50	100	**4**
3	PCC	BCV303	Engineering Geology	CV	CV	3	0	2		3	50	50	100	**4**
4	PCC	BCV304	Water Supply and Waste water Engineering	CV	CV	3	0	0		3	50	50	100	**3**
5	PCCL	BCV305	Computer Aided Building Planning and Drawing	CV	CV	0	0	2		3	50	50	100	**1**
6	ESC	BCV306x	ESC/ETC/PLC	CV	CV	3	0	0		3	50	50	100	**3**
7	UHV	BSCK307	Social Connect and Responsibility	CV	CV	0	0	2		1	100	_	100	**1**
8	AEC/SEC	BCV358x	Ability Enhancement Course/Skill Enhancement Course - III	CV	CV	If the course is a Theory 1	0	0		1 If the course is a Laboratory 2	50	50	100	**1**
9	MC	BNSK359	National Service Scheme (NSS)	NSS Coordinator		0	0	2		_	100	_	100	**0**
		BPEK359	Physical Education (PE) (Sports and Athletics)	PED										
		BYOK359	Yoga	Yoga Teacher										
										Total	**550**	**350**	**900**	**20**

Note:

1. **Department shall enter Teaching Department & Paper Setting Department as XX or Any other (To mention)**
2. **Each semester may have one course with tutorial.**
3. **Each semester shall have a minimum of one course with Integrated lab.**
4. **Department may have an Integrated Lab instead of a Tutorial. However the Maximum number of labs inclusive of Integrated lab(s) and Dedicated lab shall be 3.**
5. **Engineering Science Course (ESC/ ETC/ PLC) and Ability Enhancement course/ Skill Enhancement Course - III shall be referred to VTU Draft Scheme of Teaching & Examination 2022 specific to concerned department and the department may include 2 to 4 courses in each category (if required) in addition to the existing courses mentioned in VTU Draft Scheme of Teaching & Examination.**
6. **XX - Department name - CV/ ME/ EC/ EE/ CS**

Legend:

1	**Professional Core Course (PCC)**
2	**Integrated Professional Core Courses (IPCC)**
3	**Professional Core Course Laboratory (PCCL)**
4	**Engineering Science Course (ESC)**
5	**Emerging Technology Course (ETC)**
6	**Programming Language Course (PLC)**
7	**Universal Human Value Course (UHV)**
8	**Ability Enhancement Course (AEC) / Skill Enhancement Course (SEC)**
9	**Mandatory Course (Non-Credit) (MC)**
10	**Lecture (L)/ Tutorial (T)/ Practical (P)/ Skill Development Activity (S)**

The National Institute of Engineering

Scheme of Teaching & Examination - 2022

Effective from the Academic year 2024-25

Department: Civil Engineering

B.E. 2023 Admitted Batch

Semester : IV

Sl.No	Type of Course	Course Code	Course Title	Teaching Department (TD)	Question Paper setting Board (PSB)	Teaching Hrs/Week				Examination				Credits
						L	T	P	S	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	BCV401	Analysis of Structures	CV	CV	3	0	0		3	50	50	100	**3**
2	IPCC	BCV402	Fluid Mechanics and Hydraulics	CV	CV	3	0	2		3	50	50	100	**4**
3	PCC	BCV403	Transportation Engineering	CV	CV	3	0	2		3	50	50	100	**4**
4	PCCL	BCVL404	Building Materials Testing Lab	CV	CV	0	0	2		3	50	50	100	**1**
5	ESC	BCV405x	ESC/ ETC/ PLC	CV	CV	3	0	0		3	50	50	100	**3**
6	AEC/SEC	BCV456x	Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC) - IV	CV	CV	If the course is a Theory: 1	0	0		1	50	50	100	**1**
7	BSC	BBOK407	Biology for Engineers	CV	CV	3	0	0		3	50	50	100	**3**
8	UHV	BUHK408	Universal Human Values Course	CV	CV	1	0	0		1	50	50	100	**1**
9	MC	BNSK459	National Service Scheme (NSS)	NSS Coordinator		0	0	2		_	100	_	100	**0**
		BPEK459	Physical Education (PE) Sports & Athletics	PED										
		BYOK459	Yoga	Yoga Teacher										
										Total	**500**	**400**	**900**	**20**

Note:

1. Department shall enter Teaching Department & Paper Setting Department as XX or Any other (To mention)
2. Each semester may have one course with tutorial.
3. Each semester shall have a minimum of one course with Integrated lab.
4. Department may have an Integrated Lab instead of a Tutorial. However the Maximum number of labs inclusive of Integrated lab(s) and Dedicated lab shall be 3.
5. Engineering Science Course (ESC/ ETC/ PLC) and Ability Enhancement course/ Skill Enhancement Course - IV shall be refered to VTU Draft Scheme of Teaching & Examination 2022 specific to concerned department and the department may include 2 to 4 courses in each category (if required) in addition to the existing courses mentioned in VTU Draft Scheme of Teaching & Examination.
6. XX - Department name - CV/ ME/ EC/ EE/ CS

Legend:

1	Professional Core Course (PCC)
2	Integrated Professional Core Courses (IPCC)
3	Professional Core Course Laboratory (PCCL)
4	Engineering Science Course (ESC)
5	Emerging Technology Course (ETC)
6	Programming Language Course (PLC)
7	Universal Human Value Course (UHV)
8	Ability Enhancement Course (AEC) / Skill Enhancement Course (SEC)
9	Mandatory Course (Non-Credit) (MC)
10	Lecture (L)/ Tutorial (T)/ Practical (P)/ Skill Development Activity (S)

B.E. 2023 Admitted Batch				
III SEMESTER				
Engineering Science Courses-(ESC/ ETC/ PLC)				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BCV306A	Rural, Urban Planning and Architecture	3	0	0
BCV306B	Geospatial Techniques in Practice	3	0	0
BCV306C	Sustainable Design Concept for Building Service	3	0	0
BCV306D	Fire Safety in Buildings	3	0	0
BCV306E	Solid Waste Management	3	0	0

Ability Enhancement Course -III				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BCV358A	Data analytics with Excel -IBM	0	0	2
BCV358B	Smart Urban Infrastructure	1	0	0
BCV358C	Problem Solving with Python	0	0	2
BCV358D	Personality Development for Civil Engineers	1	0	0
BCV358E	Built Environment and ergonomics	1	0	0

B.E. 2023 Admitted Batch				
IV SEMESTER				
Engineering Science Courses-(ESC/ ETC/ PLC)				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BCV405A	Building Information Modelling in Civil Engineering	2	2	0
BCV405B	Construction Equipment, Plants and Machineries	3	0	0
BCV405C	Concrete Technique and Practices	2	2	0
BCV405D	Watershed Management	3	0	0

Ability Enhancement Course -III				
Code	**Course Title**	**Teaching Hrs/Week**		
		L	**T**	**P**
BCV456 A	Finance for Professionals	1	0	0
BCV456 B	GIS with Quantum GIS	1	0	0
BCV456 C	Electronic Waste Management – Issues and challenges	1	0	0
BCV456 D	Technical Writing skills	1	0	0

Code: BCV301 **Course: Strength of Materials**

Credits: 3 **L:T:P : 3:0:0**

SEE: 50 **CIE: 50**

SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	Knowledge of Engineering Mechanics
Learning objectives	1. Understand the concept of stress and strain for different materials and strength of structural elements. 2. Understand the development of internal forces and resistance mechanism for one dimensional and two-dimensional structural elements. 3. Analyse and understand different internal forces and stresses induced due to representative loads on structural elements. 4. Evaluate the behaviour of members under torsion.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	***Analyse*** the behaviour of various structural elements subjected to direct and shear stresses for one-dimensional and two-dimensional stress systems	Analyse
CO2	***Draw*** the bending moment and shear force at any section for statically determinate beams and **determine** deflection	Apply
CO3	***Compute*** stresses due to bending moment and shear force	Apply
CO4	***Analyse*** the behaviour of solid and hollow shafts subjected to pure torsion	Analyse

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2	2										1		3	1	
CO2	2	2										1		3	1	
CO3	3	2										1		3	1	
CO4	3	2										1		3	1	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

Sl. No	Modules	No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Simple Stresses and Strains:** Introduction, Properties of Materials, Stress, Strain, Hooke's law	02	NA	NA
1.2	Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of	02	NA	NA

	superposition			
1.3	Total elongation of tapering bars of circular and rectangular cross sections and Composite sections	03	NA	NA
1.4	Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants	03	NA	NA
Module – 2				
2.1	**Bending moment and shear force diagrams in beams:** Introduction to types of beams, supports and loadings. Definition of shear force and bending moment, sign conventions	02	NA	NA
2.2	Relationship between loading, shear force and bending moment, Shear force and bending moment equations	02	NA	NA
2.3	Development of Shear Force Diagram(SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load), Couple and their combinations	06	NA	NA
Module – 3				
3.1	**Bending and Shear Stresses in Beams:** Introduction, pure bending theory, Assumptions	02	NA	NA
3.2	Derivation of bending equation, modulus of rupture, section modulus, flexural rigidity	02	NA	NA
3.3	Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections	03	NA	NA
Module – 4				
4.1	**Torsion in Circular Shaft:** Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts	02	NA	NA
4.2	Torsional rigidity and polar modulus and power transmitted by a shaft	02	NA	NA
4.3	**Columns and Struts:** Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory	02	NA	NA
4.4	Rankine-Gordon's formula for columns	02	NA	NA
Module – 5				
5.1	**Compound Stresses:** Introduction, state of stress at a point, General two dimensional stress system	03	NA	NA
5.2	Principal stresses and principal planes	02	NA	NA
5.3	Mohr's circle of stresses	02	NA	NA
Total No. of Lecture Hours		**42**		
	Total No. of Tutorial Hours		***00***	
	Total No. of Practical Hours			**00**

Textbooks:

1. B.C Punmia Ashok Jain, Arun Jain, "**Strength of Materials**", Laxmi - 2018-22 Publications, 10th Edition-2018
2. R K Bansal, "**A Textbook of Strength of Materials**", 4th Edition, Laxmi Publications, 2010
3. S.S. Rattan "**Strength of Materials**" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).
4. Vazirani, V N, Ratwani M M. and S K Duggal "**Analysis of Structures Vol. I**", 17th Edition, Khanna Publishers, New Delhi
5. R.K. Rajput, "**Strength of materials**" S. Chand Publishing (6th Edition)
6. S S Bhavikatti, "**Strength of Materials**" Vikas Publishing (5th Edition)

7. B.S. Basavarajaiah, P. Mahadevappa "**Strength of Materials**" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010

Reference Books:

1. S.B. Jurnarkar and Dr. H.J. Shah, **"Mechanics of Structures Vol-I"** – Charotar Publishing house, 26th Edition - 2005
2. M.N. Shesha Prakash, G.S.Suresh, **"Text book of Mechanics of Materials"**, PHI, Learning Pvt. Ltd., New Delhi-2011.
3. P.N. Chandramouli **"Fundamentals of Strength Materials"** PHI Learning Pvt. Ltd., New Delhi – 2012.
4. Beer and Johnston, **"Mechanics of Materials"**- Tata McGraw Hill Publishing Company Limited, 3rd Edition – 2004.
5. L.S. Srinath, Prakash Desayi, N. Srinivas Murthy and S AnanthaRamu, **"Strength of Materials"**- Macmilan India Limited, 1st Edition - 1997.
6. I.B.Prasad, **"Strength of Materials"**- Khanna Publishers, 12th Edition - 2006.
7. B.C. Punmia, Ashok Jain and Jain, **"Mechanics of Materials"**- Laxmi Publications, 1st Edition - 2006.
8. Popov E.P and Todar A Balan, **"Engineering Mechanics of solids"** - Pearson/Prentice Hall, 2nd Edition - 2006.

Online Resources:

1. OER, Strength of Materials web course by IIT Roorkee https://nptel.ac.in/courses/112107146
2. OER, Strength of Materials video course by IIT Kharagpur https://nptel.ac.in/courses/105105108/

Code:	BCV302	**Course: Engineering Survey**
Credits:	**4**	**L:T:P 3:0:2**
SEE+SET:	**125 marks (reduced to 50)**	**CIE: 50 marks**
SEE Hours:	**3**	**Max. Marks:100**

Prerequisites if any	None
Learning objectives	1. Develop an understanding of the basic principles of surveying including the traditional measurements and modern techniques 2. Apply geometric and trigonometric principles to basic surveying calculations

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand and apply principles of surveying to arrive at solutions to field problems	Understand Apply
CO2	Utilize the concept of conventional surveying for data capturing and processing	Apply
CO3	Summarize the concepts of advanced surveying methods necessary for engineering practice	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2												3		
CO2		2			2									2		
CO3		2			3									2		

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Introduction** Definition, objectives, and importance of surveying. Primary divisions of surveying. Classification of surveys, principles of surveying.	3		
1.2	Maps, classification of maps, map scale, conventional symbols, topographic maps, map layout, Map numbering systems.	1		
1.3	Distance measurement using tapes, Taping on level ground and sloping ground. Ranging of lines, direct and indirect methods of ranging.	3		
	Module – 2			
2.1	**Measurement of directions and traverse surveying** Meridians, bearings, magnetic and true bearings, prismatic and surveyor's compasses, temporary adjustments.	2		
2.2	Concepts of declination, local attraction (simple numerical problems).	3		
2.3	Vernier theodolite, fundamental axes, temporary adjustments, measurement of horizontal and vertical angles (introduction only).	2		
2.4	Traverse, types, procedures, control establishment. Latitudes and departures, rectangular coordinates, Bowditch (compass) rule for traverse adjustment, area of a traverse.	3		
	Module – 3			
3.1	**Levelling, Area and Earthwork measurement** Basic terms and definitions, Methods of levelling, instruments, auto level, digital and laser levels.	1		

3.2	Booking and reduction of levels, plane of collimation and rise-fall methods, numerical problems.	2		
3.3	Contours: characteristics and uses.	2		
3.4	Measurement of area from offsets, mid ordinate rule, trapezoidal and Simpson's one third rule. Measurement of volumes, trapezoidal and prismoidal formula.	3		
	Module – 4			
4.1	**Introduction to Curve Surveying** Horizontal curves, elements of a simple curve, designation.	1		
4.2	Setting out simple curves by angular (Rankine's deflection angle method) method.	2		
4.3	Compound curves, Reverse curve between two parallel straights (introduction only, no numerical).	2		
4.4	Transition curves and Vertical curves (introduction only, no numerical)	2		
	Module – 5			
5.1	**Recent Advances in Surveying** Introduction to EDM, basic concepts, measurement of distance using phase difference. Total station, components, adjustments, uses of total station, measurement of coordinates and heights.	2		
5.2	Introduction to Global Positioning Systems and GNSS, segments of GPS, working principle and applications. GNSS Overview of components.	2		
5.3	Introduction to air borne laser terrain mapping systems.	1		
5.4	Introduction to Aerial Photogrammetry Definitions, advantages, applications. Geometry of vertical aerial photographs- scale, flight planning (no numerical). Surveying with Drone – Introduction, applications and advantages. Types of drones and sensors.	2		
	List of Experiments:			
1	Determination of distance between two inaccessible points using compass and accessories	-	-	2
2	**Auto level** (a) Determination of reduced levels of points using auto level (simple leveling) (b) Determination of reduced levels of points using auto level (differential leveling)			2
3	**Vernier theodolite** (a) Study of parts of a Vernier theodolite (b) Measurement of horizontal angle by repetition and reiteration methods			2
4	To conduct a closed theodolite traverse, adjusting of traverse and area calculation			2
5	**Total Station** Introduction to total station, components, temporary adjustments Horizontal and sloping distance measurement using total station Measurement of horizontal and vertical angles using total station.			2
6	Determination of heights of buildings/towers/power line (remote elevation measurement), determination of distance between two points(missing line measurement)			2
7	Orientation of total station using compass and measurement of magnetic bearings, Measurement of coordinates (N, E, Z) of various points from one instrument position.			2
8	Detailed survey of an area including creation of job file, selecting			4

	appropriate point codes, measurement of coordinates, downloading of data and preparation of contour map. (2 classes)			
9	Demonstration of GPS and Distomat instrument			2
Total No. of Lecture Hours		**39**		
		Total No. of Tutorial Hours		
			Total No. of Practical Hours	**20**

Self-learning topics identified: (Maximum of 5 topics)

1. Volumes from contours/DEMs.
2. Downloading topo sheet from SOI website
3. DGPS and its applications
4. Various types of GPS surveying

Textbooks:

1. K.R. Arora, **"Surveying Vol. 1"** Standard Book House, New Delhi. – 2019.
2. K.R. Arora, **"Surveying (Vol. 2 & 3)"** Standard Book House, New Delhi. – 2018.

Reference Books:

1. S.K. Roy, **"Fundamentals of Surveying"**, Prentice Hall of India New Delhi-2010.
2. James M. Anderson, Edward M. Mikhail, **"Introduction to Surveying"** Mc Graw Hill Book Company, NY. – 2009.
3. B.C. Punmia, Ashok K. Jain, Arun K. Jain, **"Surveying Vol.1 & 2"**, Laxmi Publications pvt. Ltd., New Delhi – 2016.
4. Manoj K Arora and R.C. Badjatia, **"Geomatics Engineering"** Nem Chand and Bros. Roorkee – 2011.

Online Resources:

1. Surveying OER by NPTEL
   https://nptel.ac.in/courses/105107122
2. GPS and GNSS OER by Penn State
   https://www.e-education.psu.edu/geog862/home.html
3. Geometry of Vertical Image OER by Penn State
   https://www.e-education.psu.edu/geog892/node/657
4. Surveying lab - Virtual Labs by Ministry of Education Under the National Mission on Education through ICT
   http://sl-iitr.vlabs.ac.in/

Code:	BCV303	**Course: Engineering Geology**	
Credits:	**4**	**L: T: P: 3:0:2**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	Not Required
Learning objectives	1. To inculcate the importance of earth's interior and application of Geology in civil engineering in Geo Hazard mitigation and management. 2. To provide knowledge on dynamic Geology and its importance in modifying the physical character of rocks which cause rocks suitable or unsuitable in different civil engineering projects such as dams, bridges, tunnels and highways.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Apply geological knowledge in different civil engineering practice.	Apply
CO2	Execute knowledge on durability and competence of foundation rocks, and will be able to use the best building materials.	Execute
CO3	Students will analyse the safety, stability, economy and life of the structures that they construct.	Analyse
CO4	Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems.	Solve

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3		1											3		
CO2		2					1							2		
CO3		2	2								2					2
CO4		1				1								2		

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Earth's internal structure and composition, internal dynamics and Plate tectonics, Earthquakes - types, causes, so-seismic lines, seismic zonation, seismic proof structures.	3		
1.2	Volcanic eruption - types, causes. Landslides-causes types, preventive measures.	3		
1.3	Tsunami – causes, consequences, mitigation.	2		
	Module – 2			
2.1	Earth Materials in Construction Minerals -Industrial, rock-forming and ore minerals. Physical properties, composition. Rocks Types, structure/Texture, mineral composition occurrence, properties.	3		
2.2	Decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture	3		
2.3	Dressing of stones, Requirement of good building stones.	1		
	Module – 3			
3.1	Earth Surface process and Resources Weathering, type, causes, soil in-situ, drifted soil, soil profile	3		
3.2	Soil mineralogy, types of soil, Soil Classification by Grain Size.	3		

3.3	Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks.	2		
	Module – 4			
4.1	**Surface and sub investigation for deep foundation** Dip and strike, and outcrop problems (numerical problem geometrical/ simple trigonometry based)	3		
4.2	Borehole data (and problems), Faults, folds, unconformity	3		
4.3	Joints, types, recognition and their significance in Civil engineering projects like tunnel project, dam project, Reservoir site	2		
	Module – 5			
5.1	Modern Tools and geophysical methods Rocks as aquifers, water-bearing properties igneous, sedimentary and metamorphic rocks	3		
5.2	Electrical Resistivity Method, Seismic Refraction Method (numerical problems)	3		
5.3	SASW and MASW tests	2		
	List of Experiments:			
1	Identification of common minerals based on Physical Properties	-	-	2
2	Identification of rocks used in building construction based on Physical properties			2
3	Solving Geological maps for suitability for aqua duct			2
4	Geological maps with inclined beds, suitability for tunnels/ Dams			2
5	Geological maps with folds, in tunnels/ Dams			2
6	Geological maps with unconformity, in tunnel/dam project			2
7	Geological maps with faults in Dams/tunnels project			2
8	One Day Nearest Field Visit Investigation.			2
	Total No. of Lecture Hours	***39***		
	Total No. of Tutorial Hours			
	Total No. of Practical Hours			**16**

Self-learning topics identified: (Maximum of 5 topics)

1. Soil-Structure
2. Plate Tectonics
3. Seismic Zones of India
4. Cyclones - Causes and Management.

Textbooks:

1. Engineering Geology, by Parthasarathy et al, Wiley publications
2. A textbook of Engineering Geology by Chenna Kesavulu, Mac Millan India Ltd 3. Principle of Engineering Geology, by K.M. Bangar, Standard publishers
4. Physical and Engineering Geology, by S.K. Garg, Khanna publishers
5. Principles of Engineering Geology, by KVGK Gokhale, BS Publications

Reference Books:

1. Introduction to Environmental Geology by Edward A Keller, Pearson publications.
2. Engineering Geology and Rock Mechanics B. P. Verma, Khanna publishers
3. Principles of Engineering Geology and Geotechnics, Krynine and Judd, CBS Publications

Online Resources:

- https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F https://www.youtube.com/watch?v=EBiLLJAxBuU&index=2&list=PLDF5162B475DD915F https://www.youtube.com/watch?v=sTY-ao4RZck&list=PLDF5162B475DD915F&index=3 https://nptel.ac.in/courses
- https://youtu.be/fvoYHzAhvVM
- https://youtu.be/aTVDiRtRook
- https://serc.carleton.edu/NAGTWorkshops/hazards/events/12262004.html?serc_source= recommendation
- https://serc.carleton.edu/NAGTWorkshops/coursedesign/goalsdb/14712.html
- https://www.earthsciweek.org/classroom-activities

Code:	BCV304	**Course: Water Supply & Wastewater Engineering**	
Credits:	**3**	**L: T:P: 3:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. Familiarize the concept of various water demand, population forecasting, the variation of water demand and to estimate water requirement for a community. 2. Analysis of physical and chemical characteristics of water and wastewater. 3. Understand and design of different unit operations and unit process involved in water and wastewater treatment process

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Estimate water demand for various purposes and analyse the characteristics of Water & Wastewater	Understand/Analyze
CO2	Design conventional water treatment units and understand conventional water supply distribution system	Understand /Apply
CO3	Understand and design of different unit operations and unit process involved in wastewater treatment process	Understand /Apply
CO4	Design of various low-cost Wastewater treatment units.	Understand /Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1			2										1		
CO2	1		3											1	3	
CO3	1		3											1	3	
CO4			3												3	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Introduction:** Water: Need for protected water supply, Demand of Water: Types of water demands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation.	1	0	0
1.2	Factors affecting per capita demand, Variations in demand of water, Peak factor. Design period and factors governing design period.	1	0	0
1.3	Methods of population forecasting and numerical problems.	3	0	0
1.4	**Collection of water and conveyance of raw water** Intake structures- types, Selection and location of intakes, Pumps – Types, Power of pumps	3	0	0
1.4	Physico chemical characteristics of water Sampling	2	0	0
	Module – 2			
2.1	**Water Treatment:** Objectives, Unit flow diagrams – Significance of each unit, Aeration process Limitations and types.	2	0	0
2.2	**Sedimentation -** Theory, settling tanks, types and design with numerical, Coagulation and flocculation, types of coagulants.	3	0	0
2.3	**Filtration:** Mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system, Numerical	3	0	0

2.4	**Disinfection:** Methods of disinfection with merits and demerits. Breakpoint chlorination, Softening: Lime soda and Zeolite process.	2	0	0
	Module – 3			
3.1	**Conveyance of treated water Distribution systems** Methods of distribution -Gravity system, Combined gravity and pumping system, Pumping system, Systems of supply – Intermittent, Continuous	2	0	0
3.2	Service reservoirs and their capacity determination, Types of layouts - Dead end system, Grid system, Radial system, Circular system,	3	0	0
3.3	**Wastewater: Introduction:** Need for sanitation, methods of sewage disposal, types of sewerage systems, Treatment of municipal waste water: Waste water characteristics sampling, significance and techniques, physical, chemical and biological characteristics, Numerical on BOD.	4	0	0
	Module – 4			
4.1	**Treatment Process**: Flow diagram for municipal waste water Treatment unit operations and process	1	0	0
4.2	Screens: types, disposal. Grit chamber, oil and grease removal. Primary and secondary settling tanks, numerical.	3	0	0
4.3	**Suspended growth system -** conventional activated sludge process and its modifications, numerical.	2	0	0
	Module – 5			
5.1	**Attached growth system –** Trickling filter, numerical on Trickling filters, bio-towers and rotating biological contactors	3	0	0
5.2	Principle of stabilization ponds, oxidation ditch.	2	0	0
5.3	Sludge digesters (aerobic and anaerobic), Equalization. Thickeners and drying beds.	2	0	0
	Total No. of Lecture Hours	42		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Self-learning topics identified: (Maximum of 5 topics)

1. Planning and execution of modern water supply schemes.
2. Wastage of water in the distribution system
3. Waterborne diseases and sanitation.
4. Reuse and Recycle of Wastewater
5. Eco Sanitation

Textbooks:

1. Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering" - Tata McGraHill, New York, Indian Edition, 2013
2. S. K. Garg, Environmental Engineering Volume-I, Water supply Engineering – M/s KhannaPublishers, New Delhi2010
3. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering,Laxmi Publications (P) Ltd., New Delhi2010.
4. B C Punmia, "Environmental Engineering volume-II", Laxmi Publications 2nd, 2016
5. S.K.Garg, "Environmental Engineering vol-II, Water supply Engineering", KhannaPublishers, – New Delhi, 28th edition and 2017

Reference Books:

1. Gray, N. F., "Water Technology", Elsevier Science & Technology Books.
2. Hammer and Hammer, "Water Technology", Butterworth Heinemann Publications 2009
3. CPHEEO "Manual on Water supply and treatment", Ministry of Urban Development, New Delhi -22.
4. Drinking water standards IS:10500-2012

Online Resources:

1. NPTEL course by Dr P Bose, IIT Kanpur titled "Water and Wastewater Engineering"
2. https://nptel.ac.in/courses/105107207 NPTEL MOOC course on "**Water and waste water treatment",** Prof.Bhanu Prakash Vellanki.

Code:	BCV305	**Course:** Computer Aided Building Planning and Drawing	
Credits:	**3**	**L: T: P: 0:0:2**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks: 100**	

Pre requisites, if any	Building planning and drawing.
Learning objectives	Use AUTOCAD proficiently to develop plan, section and elevation from line diagrams for all Civil Engineering entities

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	**Course Outcomes**	**Bloom's level**
CO1	Obtain the skill set to prepare Computer Aided Engineering Drawings using an AUTOCAD software	Apply
CO2	Prepare plan and elevation of various Civil Engineering entities using AUTOCAD and develop working and submission drawings for building	Apply
CO3	Prepare the details of different building elements and its components	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1					2								To be identified for each branch by Course Instructor			
CO2				2	2											
CO3					2											

Mapping Strength: Stro ng– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
List of Experiments				
1	**Drawing Basics:** Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS:962	NA	NA	02
2	**Drawing Tools:** Lines Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet	NA	NA	02
3	**Using Text:** Single line text, Multiline text, Spelling, Edit text	NA	NA	02
4	Principles of planning, Planning regulations and building bye-laws, factors	NA	NA	02

	affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC.			
5	Prepare the centre line drawing for marking the single and double bedroom house	NA	NA	02
6	Draw a building plan for single bed room accommodation for a given site dimension using Local Building Bye Laws and regulations	NA	NA	02
7	Draw a building plan for double bed room accommodation for a given site dimension using Local Building Bye Laws and regulations	NA	NA	02
8	Prepare a complete sanction plan for the single and double bed room accommodation as per the bye law	NA	NA	02
9	Study the requirements to plan Residential Building, School building, Hospital Building and Offices	NA	NA	02
10	**Drawings of Different Building Elements:** a) Footing/ Foundation – Foundation dimension for Isolated, combined footing, Standard dimension and cross section of footing	NA	NA	02
11	b) Size stone Masonry – Size of single and double bond stone, Sections at wall foundation c) Brick Masonry – Size of standard Burnt Brick, Solid Cement Block, Hollow Cement block, Other bricks used in current practice	NA	NA	02
12	Drawing different types of staircases – Dog legged, Open well – plan and section	NA	NA	02
	Total No. of Tutorial Hours		**00**	
	Total No. of Practical Hours			**24**

Reference Books:

1. M. N. Shesha Prakash, G. S. Suresh, 2016, “Reference book on Computer Aided Design Laboratory”, Lakshmi Publications.

2. Roberts J T, “Introduction to AUTOCAD 2006” - , BPB publications.

3. George Omura, “Mastering AUTOCAD 2006”, BPB Publications.

4. Ramesh Bangia, “Learning AUTOCAD 2005”, Khanna Book Publishing Co.

5. Sham Tickoo, “Understanding AUTOCAD 2004 “A beginners Guide”, Wiley Dream tech India Pvt Ltd.

Code:	BCV306A	**Course: Rural, Urban Planning and Architecture**	
Credits:	**3**	**L: T: P: 3:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. To make the student understand about the past and present architecture of different parts of the world 2. Rural and urban planning and growth and circulation of patterns and effect of increase in urbanization

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Describe the fundamental principles of architecture and salient features of historic architecture	Understand
CO2	Discuss the town planning efforts in India and Europe during ancient and medieval periods	Understand
CO3	Summarize the principles of urban and rural planning and concepts of modern town planners.	Understand
CO4	Explain the principles of building planning and concepts of sustainable & energy efficient building planning.	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1													1		
CO2	1													1		
CO3			2												2	
CO4							3								3	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Introduction: Aim and importance of Architecture, Architecture as a fine art. Role of an architect and an engineer	4		
1.2	Qualities of Architecture, Factors in Architecture, Influence of external factors	4		
	Module – 2			
2.1	Characteristics of Pre-historic, Egyptian, Greek, Roman, Buddhist, Hindu, and Islamic a Architecture.	6		
2.2	Factors that have influence present day Modern Architecture, Aesthetic difference between the past and present Architecture.	2		
	Module – 3			
3.1	Human settlements, Rural and urban pattern of growth	2		
3.2	Indus Valley Civilization and town planning, Town planning during medieval period in Europe.	3		
3.3	Ancient Town Planning in India: Principles of town planning and circulation pattern with examples	3		
	Module – 4			
4.1	Industrialisation: Impact on town planning, Urbanisation causes, its effect on town and cities, remedial measures both in urban and rural planning	3		
4.2	Emerging concepts of cities, Smart City, Eco-City, Garden City, SEZ, Transit	5		

	Oriented Development (TOD), Sustainable urban development.			
Module – 5				
5.1	Planning principles, traditional concepts in building planning	2		
5.2	Organization of space, Architectural Graphics, Planning and design considerations for different building types, Anthropometrics, Site planning, Barrier-free design	3		
5.3	Building standards, building bye-laws, and functions of local authority, climate responsive design, energy efficient building planning, thermal comfort, solar architecture	3		
Total No. of Lecture Hours		40		
	Total No. of Tutorial Hours		**00**	
	Total No. of Practical Hours			**00**

Self-learning topics identified: (Maximum of 5 topics)

1. Architectural Styles
2. Applications of computers in architecture and planning
3. Affordable Housing and National Housing Policies

Textbooks:

1. History of Architecture – Fletcher
2. Urban pattern – Galliaon
3. Indian architecture – Vol. I & II – Perey Brown
4. Principle of town and country planning – Lewis Keeble
5. Urbanization and Urban Syatems in India, Ramachandran R, Oxford University Press, New Delhi.
6. Town planning – Rangwala, Charothar Publication

Reference Books:

1. K.S. Rame Gowda , “Town and Country Planning”, Prasaranga, Mysore University Press, Mysore
2. Bureau of Indian Standards, “National Building Code of India 2005”, New Delhi.
3. Hiraskar, “The Great ages of world architecture”, 18th edition, Dhanapath Rai Publishers, New Delhi.
4. Shah M.S., Kale C.M. and Patki K.Y. “Building Drawing”, Tata McGraw Hill Publishing Company, New Delhi.

Online Resources:

1. https://archive.nptel.ac.in/courses/124/107/124107158/
2. https://archive.nptel.ac.in/courses/124/107/124107001/

Code:	BCV306B	**Course: Geospatial Techniques in Practice**	
Credits:	**4 or 3**	**L:T:P 3:0:0**	
SEE:	**100 marks (reduced to 50)**	**CIE: 50 marks**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	Highschool Geography and Mathematics.
Learning objectives	1. Outline basic concepts of Geospatial data, GIS and maps 2. Summarize applications of Remote sensing and Geospatial data in relevant areas

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Describe concepts of Geospatial data, GIS, Geodesy and maps	Understand
CO2	Understand Geospatial data models and properties	Understand Apply
CO3	Demonstrate the utility of Remote sensing and applications of Geoinformatics in various domains.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3				2									3		
CO2	3				2									2		
CO3	2				2	2								2	2	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Concepts Geospatial data, Need and Geographic Information System** Geospatial data in day-to-day life, Evolution of location technology and importance of geography and maps.	2		
1.2	Need for spatial information, Terminologies, and logic.	2		
1.3	Definition of GIS, history and evolution of GIS, GIS Technology, functions, components, tools, capabilities.	2		
1.4	GIS data formats, data storage formats. GIS data acquisition, source – primary and secondary data, generation, display.	2		
	Module – 2			
2.1	**Concepts of Geodesy, Maps and Transformation** Shape of earth, Georeferencing systems (introduction only), Continuous and discrete georeferencing.	2		
2.2	Geodetic datums, representations of earth, coordinate reference systems, GCS and PCS.	2		
2.3	Map, map layout, features of a map, Topographic map, scale of a map.	2		
2.4	Geometric transformation, map projection and types (cylindrical, cone, azimuthal), Universal Transverse Mercator (UTM) projection, projection distortion, preserving map properties.	2		
	Module – 3			
3.1	**Vector, Raster Data Model and Analysis** Vector data: Nature and characteristics, data input.	2		

3.2	Vector data analysis, buffering, overlay, vector functions, spatial query, Attribute data manipulation.	2		
3.3	Raster data: Nature and elements, types, data structure and compression, quad tree data representation, data input, map transformations, resampling.	2		
3.4	Surface representation, DEMs. Raster versus vector. Raster data analysis, map calculator, reclassification, raster functions, terrain analysis (slope, aspect, hillshade)	2		
Module – 4				
4.1	**Introduction to Remote Sensing, Satellites and Sensors** Remote Sensing Technologies, Types of remote sensing, Sensors and its types.	2		
4.2	Remote sensing platforms, satellites and orbits, geostationary and sun synchronous satellites, Earth resource satellites – IRS mission, LANDSAT mission.	2		
4.3	3D scanning, Principles and the science behind photogrammetry.	2		
4.4	LiDAR, RADAR and SONAR. Introduction to Platforms and working.	2		
Module – 5				
5.1	**Applications of Geoinformatics** Land use/cover mapping, Agriculture, Construction, Urban and regional planning applications.	2		
5.2	Applications in water resources and management Catchment Area delineation, View shed Analysis.	3		
5.3	Environmental applications, Disaster management and Pandemic monitoring applications with a focus on spatial analysis, overlay analysis, cluster analysis, hotspot analysis.	3		
List of Experiments:				
Total No. of Lecture Hours		**40**		
	Total No. of Tutorial Hours			
	Total No. of Practical Hours			

Self-learning topics identified: (Maximum of 5 topics)

1. List of open source and commercial GIS software
2. Downloading topo sheet from SOI website
3. Applications of Bhuvan portal – Explore sector wise and state wise portal
4. List of EO Satellites – All missions.

Textbooks:

1. Chang, K. T. (2019). **"Introduction to geographic information systems",** 9th Edition, Boston: McGraw-Hill Higher Education.
2. Burrough, P. A., McDonnell, R., McDonnell, R. A., & Lloyd, C. D. (2015). **"Principles of geographical information systems"**, 3rd Edition, Oxford university press.
3. Lillesand, T., Kiefer, R. W., & Chipman, J. (2015). **"Remote sensing and image interpretation"**, 7th Edition, John Wiley & Sons.
4. Sabins, F. F. (2007). **"Remote sensing: principles and applications"**, 3rd Edition, Waveland Press.
5. Dong, P., & Chen, Q. (2017). **"LiDAR remote sensing and applications"**. CRC Press.

Reference Books:

1. Manoj K. Arora, R.C. Badjatia. (2011) **"Geomatics Engineering"**, Nemichand & Bros. Roorkee.
2. Aithal, B. H., & Ramachandra, T. V. (Eds.). (2020). **"Urban Growth Patterns in India: Spatial Analysis for Sustainable Development"**. CRC Press.

3. Panigrahi, N. (2009). **"Geographical information science"**. Universities press.
4. Reddy, M. A. (2012). **"Remote Sensing and Geographical Information Systems: An Introduction"**, 4th Edition, Book Syndicate.
5. DeMers, M. N. (2008). **"Fundamentals of geographic information systems"**, 4th Edition, John Wiley & Sons.

Online Resources:

1. Geographic Information Systems OER by NPTEL - https://nptel.ac.in/courses/105107206
2. Remote Sensing, by Dr. D. Nagesh Kumar, IISc Bangalore, OER by NPTEL - https://nptel.ac.in/courses/105108077
3. Microwave Remote Sensing in Hydrology OER by NPTEL - https://archive.nptel.ac.in/courses/105/101/105101213/
4. Remote Sensing and GIS Applications, Lec22, OER by NPTEL https://archive.nptel.ac.in/courses/105/103/105103193/

Code:	BCV306C	**Course: Sustainable Design Concept for Building Services**	
Credits:	**3**	**L:T:P :0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. To facilitate learners to understand sustainable building designs and its parameters such as energy and water efficiency, Comfort in buildings, and waste management. 2. To expose the learners to shading systems, thermal and visual comfort, and also to impart fundamental knowledge on Life cycle assessment and Green ratings and certifications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Comprehend sustainable design, climatology, shading system and analyze heat transfer mechanism in buildings.	Analyze
CO2	Assess the design considerations and parameters for thermal comfort, visual comfort, indoor air quality and acoustics	Apply
CO3	Develop solutions for energy efficiency, water efficiency and waste management in buildings	Analyze
CO4	Adopt green project management methodology and evaluate building life cycle assessment	Evaluate
CO5	Implement green practices during construction and operation phase of the buildings for achieving green rating	Analyze

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1		1	2	1		2	3								3	
CO2			3		1										2	
CO3			3	2											2	
CO4											1				1	
CO5						2	2									1

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

	Detailed Syllabus	No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1: Introduction to Sustainability and Climatology				
1.1	Overview of Sustainability – Global energy scenario, carbon footprint and climate action, Net zero in carbon offsetting,	1	0	0
1.2	Water neutral, Sustainable construction and resource management.	1	0	0
1.3	Green buildings - Selection of site – preservation and planning, Influence of climate on buildings,	1	0	0
1.4	Basics of climatology, Earth – Sun relationship,	2	0	0
1.5	Solar angles and sun path diagram, Design of shading systems.	3	0	0
Module – 2: Comfort in Buildings				
2.1	Thermal comfort – Basics of Thermodynamics, Convection/radiation heat transfer, heat gain through various elements of a building,	2	0	0
2.2	Thermal comfort models and case studies	2	0	0
2.3	Acoustics – Building acoustics, measures, defects and prevention of sound transmission	2		
2.4	Indoor Air Quality – Effects, design consideration and integrated approach for IAQ management	1		
2.5	Visual comfort – Enhancement strategies for Daylighting and Artificial lighting.	1		
Module – 3: Energy, water efficiency and waste management in buildings				
3.1	Energy efficiency – Energy efficiency in building envelope and energy efficient HVAC and Lighting as per Energy conservation building code (ECBC) 2017,	1	0	0

3.2	Energy simulation,	1	0	0
3.3	Energy management system – Renewable energy and Energy Audit.	2	0	0
3.4	Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse and Water efficient landscape system.	2	0	0
3.5	Waste management – Types of waste and its treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, healthcare facilities.	2	0	0
Module – 4: Life Cycle Assessment of Buildings and Green project management				
4.1	Materials – Green product certifications, features of sustainable building materials and sustainable alternatives for structural, envelope and finishing materials.	2	0	0
4.2	Low carbon cement, Zero emission bricks and lean construction practices.	3	0	0
4.3	Life cycle assessment and its types – Modelling and Analysis, Greenhouse gas emission. Different phases of Green building project management	3	0	0
Module – 5: Sustainable rating systems				
5.1	Green building rating systems- LEED, BREEAM and others,	2	0	0
5.2	Indian Green building rating systems – IGBC & GRIHA.	2	0	0
5.3	IGBC criteria for certification –site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits.	4	0	0
Total No. of Lecture Hours		40		
Total No. of Tutorial Hours			**0**	
Total No. of Practical Hours				**0**

Self-learning topics identified: (Maximum of 5 topics)

1. UN-Sustainable Development Goals (SDGs)
2. Rainwater harvesting system design
3. Energy in Building Materials & Building (Embodied Energy & Operational Energy)
4. BEE India Flagship Programmes
5. Secondary materials (RSM) in the construction industry

Textbooks:

1. G Harihara Iyer, (2022) "Green Building Fundamentals", Notion Press.
2. Dr. Adv. Harshul Savla, (2021), "Green Building: Principles & Practices", Notion Press
3. Allen, D. T. and David R. Shonnard, “Sustainability Engineering: Concepts, Design and Case Studies”, PEARSON, 2015
4. Jagadish, K. S., Venkatarama Reddy, B.V., and NanjundaRao, K.S., ―Alternative building material & Technologies‖, 2nd Edition, NewAge International Publishers, 2017. (ISBN: 9789385923876)

Reference Books:

1. Jagadish, K. S., ―Sustainable Building Technologies‖, I K International Publishing House Pvt Ltd, 2019. (ISBN: 9789386768209)
2. Hall, M.R. ed., 2010, Materials for energy efficiency and thermal comfort in buildings, Elsevier.
3. Medved, S., Domjan, S. and Arkar, C., 2019, Sustainable Technologies for Nearly Zero Energy Buildings, Springer International Publishing.
4. Mili Majumdar, “Energy-efficient buildings in India”, The Energy and Resources Institute (TERI), 2009
5. LEED Manuals
6. IGBC Green new building rating system - version 3.0 - Abridged reference guide
7. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019
8. National Building Code – 2016, Volume 1&2, Bureau of Indian Standards

9. Energy Conservation Building Code – 2017, (with amendments up to 2020) Users' Manual, Bureau of Energy Efficiency, 2017, New Delhi
10. Guidelines on Environmental Management Of Construction & Demolition (C & D) Wastes, March 2017, Central Pollution Control Board, Ministry of Environment, Forests & Climate Change, New Delhi.
11. Shivakumar, A.R., 2005, Amruthavarshini-A guide for rainwater harvesting. Karnataka State Council of Science and Technology (KSCST), Indian Institute of Science (IISc), Bangalore, India.

Online Resources:

1. E-learning content on L&T EduTech Platform
2. https://archive.nptel.ac.in/courses/105/102/105102175/ (Energy Efficiency, Acoustics and daylighting in Building)
3. https://lntedutech.com/sustainable-design-of-buildings/ (Sustainable Design of Buildings)
4. https://www.coursera.org/learn/intro-to-acoustics (Introduction to Acoustics)

Code: BCV306D **Course: Fire Safety in Building**

Credits: 3 **L: T: P: 3:0:0**

SEE: 50 **CIE: 50**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	NA
Learning objectives	1. To understand the fire safety requirements in planning buildings and urban infrastructure 2. To gain knowledge of HVAC system design and condition assessment of building elements.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the importance of fire safety feature in building and civil infrastructure	Understand
CO2	Develop thorough understanding of sprinklers and HVAC system in buildings	Apply
CO3	Obtain knowledge to assess building elements under distressed conditions	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2		2										3	1	
CO2	3	2	2											3	1	
CO3	3	2	2	1		1						1		3	-	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Fire safety**: Objectives - Life safety, Property protection and Environmental protection.	01		
1.2	Urban planning, escape and refuge, internal planning, detection and suppression	02		
1.3	Introduction to lift design, design of lift system,	01		
1.4	Different cases, simulation, arrangements and escalators	02		
1.5	Expected stop and floor of reversal, Numerical work.	02		
	Module – 2			
2.1	**Design of Detection Systems:** Detection System Design, Types of Detectors, Manual	02		
2.2	Heat Detectors, Fixed Temperature Detectors, Smoke Detectors,	02		
2.3	Detection Calculation Methodologies and Numerical on detection design	02		
2.4	Suppression System Design and Numerical on suppression system design	02		
	Module – 3			
3.1	Design of sprinklers systems: Types of Sprinkler Systems, Pressure Requirements of the Most Remote Sprinkler, Pressure Losses Through Piping, Fittings, and Valves	02		
3.2	Use of Velocity Pressures, Elevation Losses, Loops and Grids	02		
3.3	Water Supply Calculations: Determination of Available Supply Curve, Pump Selection and Testing, Tank Sizing	02		
	Performance Calculations: Sprinkler Response as a Detector, Dry System Water Delivery Time	02		
	Module – 4			
4.1	**Introduction to HVAC:** governing equations to HVAC process, numerical problem on HVAC system,	01		
4.2	Psychometric chart, equation-based approach Electrical systems: design of	02		

	electrical systems, intelligent building.			
4.3	Life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance,	02		
4.4	Periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, lamp replacement, building inspection, planned and Ad-hoc maintenance	03		
Module – 5				
5.1	Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey	02		
5.2	Effect of corrosion and alkali aggregate reaction, sampling and choice of test location Non-destructive testing	02		
5.3	Core strength test, carbonation and chloride measurement, electrical method of progress measurement	02		
5.4	Repair, rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results	02		
	Total No. of Lecture Hours	40		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Textbooks:

1. Andrew H. Buchanan, **"Structural Design for Fire Safety"** John Wiley & Sons. Ltd, 2001.
2. G.C. Barney, Elevator technology - John Wiley & Sons. Ltd, 1986.
3. Hurley, Morgan J., and Eric R. Rosenbaum. Performance-Based Fire Safety Design. CRC Press, 2019.
4. SFPE Handbook of Fire Protection Engineering. Springer, 2016.
5. Faye C. McQuiston and Jerald D. Parker, "Heating Ventilating and Air Conditioning Analysis and Design", John Wiley & Sons Inc, 2004.
6. Croome, J.D. & Roberts, B. M, "AIR CONDITIONING AND VENTILATION OF BUILDINGS, VOL-1", Pergamon press.

Reference Books:

1. Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989.
2. T.T.LIE, "Structural fire protection", American Society of Civil Engineers.

Online Resources:

1. Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi

Code: BCV306E **Course: Solid Waste Management**
Credits: 3 **L: T:P: 3:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	1. To familiarize the concept of segregation, collection, transportation, recycling and disposal of municipal solid waste. 2. To study different technologies to process solid waste and various disposal system. 3. To study the energy recovery systems from solid waste management

Course Outcomes:
On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Recognize different elements of solid waste management from generation to disposal.	Understand
CO2	Analyse different processing technologies	Understand/Analyze
CO3	Design a suitable solid waste treatment system	Understand /Apply
CO4	Describe a disposal system and incineration techniques	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1						2	3								2	
CO2							3	1							2	
CO3			3				2								2	
CO4							2								2	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Sources:** Sources of Solid waste, Types of solid waste, Physical and Chemical composition of municipal solid waste. Generation rate, Numerical Problems.	4	0	0
1.2	**Collection:** Collection of solid waste- services and systems, equipment	3	0	0
1.3	**Transportation:** Need of transfer operation, transfer station, transport means and methods, route optimization, component separation (manual and mechanical methods).	3	0	0
	Module – 2			
2.1	**Processing techniques**: Purpose of processing, Chemical volume reduction (incineration) – Process description, 3T's, principal components in the design of municipal incinerators,	4	0	0
2.2	**Air pollution control**, Mechanical volume reduction (compaction), Mechanical size reduction (shredding),	3	0	0
2.3	Solid waste management 2000 rules with, 2016 amendments	3	0	0
	Module – 3			
3.1	**Composting:** Aerobic and anaerobic method - process description, Methods of composing-Indore and Bangalore processes, design consideration, Mechanical composting, Vermicomposting, factors affecting composting Numerical Problems.	4	0	0
3.2	**Sanitary land filling**: Definition, advantages and disadvantages, site selection, methods, reaction occurring in landfill- Gas and Leachate movement, Control of	4	0	0

	gas and leachate movement, Design of sanitary landfill. Numerical Problems			
Module – 4				
4.1	**Sources, collection, treatment and disposal of:** - Biomedical waste, E-waste, Hazardous waste and construction waste.	7	0	0
5.1	Incineration -3Ts factor affecting incineration, types of incinerations,	4	0	0
5.2	Pyrolysis, Energy recovery technique from solid waste management	3	0	0
	Total No. of Lecture Hours	42		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Self-learning topics identified:

1. Scope and importance of Solid Waste Management.
2. Geo Synthetic Fabrics in Sanitary Landfills.
3. Route Optimization Techniques
4. Environmental Significance of recycle and reuse

Text Book

1. Tchobanoglous G, Theissen H, and EIiassen R.(1991)., **"Solid Waste Engineering -Principles and Management Issues",** McGraw Hill, New York.

Reference Books

1. Peavy, Rowe and Tchobanoglous (1985), **"Environmental Engineering",** McGraw Hill Co. 4th Edition.
2. CPHEEO, "**Manual on Municipal Solid waste management'**, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.

Online Resources:

1. NPTEL course by Prof. Ajay Kalamdhad, IIT Guwahati titled "Municipal Solid Waste Management"
2. NPTEL MOOC course on "Integrated Waste Management for a Smart City" by Prof. Brajesh Kumar Dubey IIT Kharagpur

Course Code: BSCK307

Credits: 0

CIE: 100 Marks

SEE: -

Course Name: Social Connect & Responsibilities (Non-Credit Mandatory Course)
L:T:P - 1:0:0
Max. Marks: 100

Prerequisites if any	Nil
Learning objectives	• To make students understand and appreciate the important societal/ environmental issues like conservation/ sustainability/ waste management and the like and inculcate ethical responsibility towards thesame. • Provide a formal platform for students to communicate and connect to their surroundings and enable them to have a responsible connection withsociety.

Course Outcomes:
On the successful completion of the course, the student will be able to

COs		**Bloom's level**
CO1	Understand social responsibility	Understand
CO2	Practice sustainability and creativity	Apply
CO3	Demonstrate planning and organizational skills	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	1	3	1	1	-	2		To be identified for each branch by Course Instructor		
CO2	-	-	-	-	-	2	1	3	2	2	-	2				
CO3	-	-	-	-	-	2	1	3	3	3	-	1				

S – Strong (3) M – Medium (2) L – Low (1)

Course Structure

Module – I:		**No. of Lecture Hours**	**No. of Tutorial Hours**	**No.of Practical Hours**
1.1	Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.E. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature	01	0	0 4
O R				
1.1	Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsmen, photo blog and documentary on evolution and practice of various craft forms.	01	0	0 4
Module – II				
2.1	Organic farming and waste management: usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.	01	0	0 4
OR				

2.2	Food Walk; City's culinary practices, food lore, and indigenous materials of the region used in cooking.	01	0	04
Module – III				
3.1	Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices	01	0	04
	Total No. of Hours	**15**		

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. **Share the experience of Social Connect**: Exhibit the talent like playing instruments, singing, one-actplay, art-painting, and fine art.

Pedagogy:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion and acourse project.
Applying and synthesizing information from these sources to define the social problem to address and tryto arrive at the solution through the course project, of your group.
Social immersion with NGOs/social sections will be a key part of the course.

Guideline for Assessment Process: Continuous Internal Evaluation (CIE)

After completion of the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learnt in the social connect period. The report should be signed by the mentor.
The course shall be evaluated on the basis of the following criteria and/or other relevant criteria pertainingto the activity completed / based on the rubrics approved by the DC.

Code:	BCV358A	**Course: Data analytics with EXCEL**	
Credits:	**1**	**L:T:P 0:0:2**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. Understand the use of Spreadsheet for data collection and analysis 2. Evaluate the equations using Excel functions and learn the data quality and consistency

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Prepare the data sets and perform the analysis	Understand
CO2	Analyse and perform repetitive calculations using several functions	Analyze
CO3	Design and apply solutions to verify the data sets	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2			2						1		To be identified for each branch by Course Instructor			
CO2	2	2			2						1					
CO3	2	2			2						1					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	List of Experiments:			
1	Introduction to Data Analysis Using Spreadsheets: Fundamentals of spreadsheet applications, Excel interface, and learn how to navigate around a worksheet and workbook.	NA	NA	04
2	Using Excel Spreadsheets: Perform basic spreadsheet tasks, such as viewing, entering, and editing data, and moving, copying and filling data. Learn about the fundamentals of formulas and learn about the most common functions used by a data analyst. Finally, you will learn how to reference data in formulas	NA	NA	04
3	Cleaning & Wrangling Data Using Spreadsheets: Importance of data quality, how to import file data into Excel, fundamentals of data privacy, remove duplicate and inaccurate data, and how to remove empty rows in your data	NA	NA	04
4	How to deal with inconsistencies in your data and how to use the Flash Fill and Text to Columns features to help you manipulate and standardize your	NA	NA	04
5	Analyzing Data Using Spreadsheets: Fundamentals of analyzing data using a spreadsheet and learn how to filter and sort data. Learn how to use some of the most useful functions for a data analyst	NA	NA	04
6	How to use the VLOOKUP and HLOOKUP reference functions. In addition, learn how to create pivot tables in Excel, and use several pivot table features	NA	NA	04
7	Final Project: In this final module, you will be introduced to a hands-on lab where you will complete a graded assignment for cleaning and preparing data, and then analyzing data using an Excel spreadsheet	NA	NA	02
	Total No. of Lectu			NA
	Total No. of Tutorial Hours			**NA**
	Total No. of Practical Hours			**26**

Reference Books:

1. Microsoft Excel 2019 Data Analysis and Business Modeling (Business Skills) 6th Edition, Wayne Winston, Microsoft Press; 6th edition (April 15, 2019)
2. Data Analysis Using SQL and Excel 2nd Edition, Gordon S. Linoff, Wiley; 2nd edition (December 14, 2015)

Online Resources:

1. https://www.coursera.org/learn/excel-basics-data-analysis-ibm

Code:	BCV358B	**Course: Smart Urban Infrastructure**	
Credits:	**1**	**L:T:P 1:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**1**	**Max. Marks:100**	

Prerequisites if any	NA
Learning objectives	1. Knowing about Urban Infrastructure, Smart Cities & their Management 2. Understand the feasible Transport and Energy Smart Urban Infrastructure and Services

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the concept of smart city, urban infrastructure.	Understand
CO2	Play the role of a civil engineer in providing smart infrastructure	Apply
CO3	Analyse efficient transport, energy system for smart cities.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3													3		
CO2	3					3										
CO3	3	3					3								3	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to smart city, Basic concept of developing smart city, Global standards to create smart city.	1	-	-
1.2	Different conceptual approaches to Smart Cities and discussing the pros and cons of each approach.	1	-	-
1.3	Smart urban Infrastructure: List of infrastructure facilities, advantages and disadvantages.	1	-	-
	Module – 2			
2.1	Smart Urban Energy Systems: Introduction to Smart Energy Systems, Government policy and technology.	1	-	-
2.2	Energy sector to explore some of the most important managerial considerations in the transition phase and operation of Smart Urban Energy Systems.	2	-	-
	Module – 3			
3.1	Smart Transportation Technologies: Introduction to smart transportation system, Mode of transport systems for smart city, data collection to arrive at best transport facility.	1	-	-
3.2	Significant opportunities and threads for legacy urban transportation systems.	1	-	-
3.3	Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems	1	-	-
	Module – 4			
4.1	Towards Smart Cities: Important factors in the transition phase of legacy cities to Smart cities	2	-	-
4.2	Managerial implications of transition phase.	1	-	-
	Module – 5			
5.1	Towards Smart Cities: Management of Smart Cities calls for different approaches from conventional urban management approaches.	2	-	-
5.2	The role of city government in the network of actors who play an important role in management of Smart Cities.	1	-	-
	Total No. of Lecture Hou	15		-
	Total No. of Tutorial Hours		**-**	**-**
	Total No. of Practical Hours			**-**

Self-learning topics identified: (Maximum of 5 topics)
1. Smart cities policies by Govt. of India.
2. Role of civil engineer's for future infrastructure demands.

Textbooks:
1. Infrastructure for Smart Cities, Dr. R P Rathaliya, Shree Hari Publications, 2021

Reference Books:
1. Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna, Springer, ISBN-13 978-9811674099, 2022

Online Resources:
1. https://www.coursera.org/learn/smart-cities

Code: BCV358D **Course: Personality Development for Civil Engineers**
Credits: 1 **L: T:P 1:0:0**
SEE: 50 **CIE: 50**
SEE Hours: NA **Max. Marks: 100**

Prerequisites if any	NA
Learning objectives	1. To offer placement focused guidance across interview best practices, formal communication. 2. To give learners a comprehensive understanding of job skills and knowledge that are essential for adapting to changes in workplace.

Course Outcomes:
On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	To understand the importance of personality development, etiquette and time management in successful career building	Understand
CO2	To understand the skill of presentation, team work and develop leadership skills for successful career	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1						2		2	3	2		2		-	-	2
CO2						2			3	2		2		-	-	2

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Personality Development, Etiquette and Time Management**: Development: Emotional Intelligence – Self Awareness – Self Management	01	-	-
1.2	Personal SWOT – Manners & Etiquette – Positive Attitude	01	-	-
1.3	Confidence building Interpersonal Skills - Interpersonal & Intrapersonal skills	01	-	-
1.4	Critical Thinking & Problem Solving: Core Skills – Uses & Importance of Critical Thinking – Principles of Critical Thinking	01	-	-
1.5	Time Management: Managing your time – Time wasters – Analysing your Strengths and weakness – Goal Setting – Why Goal Setting is important - SMART Goals – Types of Goals Business	01	-	-
1.6	Etiquette: Types of Etiquette – Importance of Etiquette – Meeting Etiquette – Office Etiquette – Phone and email Etiquette – Work Place Etiquette	01	-	-
	Module – 2			
2.1	**Presentation and Teamwork:** Presentation Skills: 4P's of Presentation – Communicating with Credibility – Audience analysis and Building Rapport	01	-	-
2.2	Usage of Figures, diagrams & Charts – Presenting with Confidence – body Language in Presentation	01	-	-
2.3	Teamwork: What is a Team - Stages of a Team – Benefits of Team work & Collaboration – Group vs Team – Types of Teams – Roles of the Team	01	-	-
	Module – 3			
3.1	**Group Discussion and Leadership skills:** Group Discussion:	02	-	-

	Types of GD – Attitude & being Proactive – Time management & how to stick to it – Importance of Listening - Do's & Don'ts			
3.2	Leadership Skills: What makes an effective Leader – Relationship Building – Leader vs Boss – Decision Making Skills – Innovation & Motivation	01	-	-
3.3	Creativity & Innovation: What is Creativity – What is Innovation – Difference between Creativity & Innovation	01	-	-
Total No. of Lecture Hours		13		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			

Textbooks:

1. Personality Development And Soft Skills, Barun K Mitra, 2nd edition, Oxford University Press, 2016
2. Power of Positive thinking, Norman Vincent Peale, ISBN-13 978-0091906382, RHUK, 2016
3. Magic of thinking Big, David J Schwartz, ISBN-13 978-1785040474, Vermilion, 2016

Online Resources:

NPTEL - https://onlinecourses.nptel.ac.in/noc22_mg39/preview

Code: BCV358E **Course: Built Environment & Ergonomics**

Credits: 1 **L: T:P: 1:0:0**

SEE: 50% **CIE: 50%**

SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	
Learning objectives	4. To understand the importance of building orientation while designing stage. 5. To explore the role and capacity of sound in all its variations and to enhance aural experience in built environment- within and without. 6. Students will be able to correlate the understanding of this subject with their day to day activities and will be aware of concepts related to increase in the human and system efficiency.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Develop skills in the area of Energy Efficient Design of Buildings.	Create
CO2	Evaluate characteristics of building openings according to its orientation.	Evaluate
CO3	Understand the theory of sound generation, propagation, and reception within the building.	Understand
CO4	Apply and Analyze Ergonomic concepts in everyday life and in various interior design projects.	Analyze & Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1			3			2	3								2	
CO2							3								2	
CO3							2								2	
CO4							2	1							2	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Orientation and Thermal comfort topics:** Comfortable Built Environment: Orientation of Buildings Climate & weather, Basic climatic zones: hot & arid, hot / warm & humid, cold Climatic factors: solar radiation & temperature, clouds, relative humidity, prevailing wind; measuring instruments and SI units Features of dwellings in tropics: aspects of day lighting, plantation of trees. Understanding sun-path diagram (solar chart), apparent movement of the sun, solar angles, Shadow angles, solar shading masks.	2	0	0
1.2	**Means of Thermal Control:** Natural Ventilation Principle of nature ventilation in buildings Cross-ventilation, position of openings, size of openings, control of openings: sashes, canopies, louvers wind shadow, humidity control: wind scoop.	1	0	0
	Module – 2			
2.1	**Lighting:** Principles of day lighting, daylight factor, glare, prediction techniques, measurement and analysis of daylight, design strategies for day lighting. Day lighting Sources of light of a point inside a building: skylight, externally reflected light, internally reflected light, direct sunlight, working plane Daylight factor, components of daylight factor: skylight (SC), internally reflected light (IRC) and externally reflected light (ERC), daylight penetration.	2	0	0
2.2	**Artificial Lighting:** Need, Light sources and ballast systems, Luminaries and light distribution, lighting controls, building level controls and integration with daylight, use of instruments to measure lighting levels.	1	0	0
	Module – 3			
3.1	**Acoustics:** Terminologies, measurement and transmission, noise, reverberation time, passive and active noise control, design strategies for classroom, auditorium and	1	0	0

	amphitheatre acoustics.			
3.2	**Room Acoustics:** Reflection - Nature of reflection from plane, convex and concave surfaces, diffraction, Absorption, Echoes, focusing of sound, dead spots, flutter echo. Room resonances, Reverberation - reverberation time (RT) calculation using Sabine's and Eyring's formulae. Effect of RT on speech and music.	1	0	0
3.3	**Acoustical Materials:** Porous materials, panel absorbers, membrane absorbers, acoustical plasters, diffusers, cavity or Helmholtz resonators. Role of functional absorbers, Adjustable acoustics and variable sound absorbers. Acoustical correction and retrofits to existing spaces.	1		
	Module – 4			
4.1	**Landscape planning:** Introduction and History of Landscape Architecture. Introduction to landscape Architecture and Role of Landscape design in built environment. Increasing awareness of ecological variables in landscape design Site Studies and Site Planning: Principles of site Planning and Land use, review of definition applied in typical landscape development situations, Site survey and appraisal, understanding different site characteristics, topography, vegetation, Hydrology, Access, Surrounding etc.	2	0	0
	Module – 5			
5.1	**Ergonomics:** Overview, objective, and application. Human Factors and its fundamer task comfort. Anthropometry - Human body, various postures, and movements, meas techniques; Biomechanics and its applications. Human sensory systems and its types. its types; selection, and execution of responses. Human error and risk perception.	1	0	0
5.2	**Application of Ergonomics in Residential spaces:** Furniture used in residential spaces and their dimensions. Space requirements and allocation in living rooms, bedrooms, Dining rooms. Ergonomics in wash rooms: Various fixtures used in washrooms. Dimensions of various fixtures. Space requirements in Toilets, powder rooms, bathrooms. Ergonomics in Kitchens: Ergonomic triangle.	2	0	0
5.3	**Ergonomics in Work Space Design:** Public spaces Space requirements in office spaces: reception areas, work centers, conference rooms. Space requirements in Restaurants, Space requirements for public washrooms with universal access.	1		
	Total No. of Lecture Hours	15		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Self-learning topics identified:

1. Building exterior and interior lighting.
2. Landscape design

Text Book

1. Arvind Kishan, Baker & Szokolay, Climate Responsive Architecture, Tata McGraw Hill, 2002.
2. Bridger. R. S., "Introduction to Ergonomics" Mc. GrawHall Inc, New York, 1995.
3. Lakhwinder Pal Singh, "Work Study and Ergonomics." Cambridge University Press, Noida, 2016.
4. Architectural Acoustics Illustrated; Michael Ermann; John Wiley & Sons, 2015.
5. Donald Watson and Kenneth Labs; Climatic Building Design - Energy-Efficient Building Principles and Practice; McGraw-Hill Book Company, 1983.
6. McKay. W.B (2005), Building construction series, Orient Longman.

Reference Books

1. Noise Control in Buildings: Fundamental and Application, Mahavir Singh, Narosa Publishing House, 2014.
2. Vigran, T. E. (2008). Building Acoustics. 1st Ed. Taylor & Francis.
3. Koenigsberger, Manual of Tropical Housing & Buildings (Part-II), Orient Longman, Bombay, 1996.

Code:	BCV401	**Course: Analysis of Structures**
Credits:	**3**	**L:T:P 3:0:0**
SEE:	**50**	**CIE: 50**
SEE Hours:	**3**	**Max. Marks:100**

Prerequisites if any	Mechanics of solids, Strength of materials
Learning objectives	1. Understand the Different Forms of Structural Systems. 2. Determine the Strain Energy and Slope and Deflection of Beams, Trusses and Frames. 3. Analyse arches and cable structures. 4. Analyse different types of beams and frames using slope deflection method. 5. Analyse different types of beams and frames using moment distribution method.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Identify the different forms of structural systems and analyse the trusses.	Understand
CO2	Evaluate the slope and deflections in beams, frames and trusses by using moment area method and energy principle.	Apply
CO3	Analyse and determine the stress resultants inarches and cables.	Analyze
CO4	Analyse the indeterminate structures and construct BMD AND SFD using slope deflection methods.	Analyze
CO5	Analyse the indeterminate structures and construct BMD AND SFD using Moment Distribution Method.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3		3											3		
CO2	2	2	3											2		
CO3	3		3											3		
CO4	3		3											3		
CO5	3		3											3		

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Structural forms, Conditions of equilibrium, Compatibility conditions,	1		
1.2	Degree of freedom, Linear and nonlinear analysis,	1		
1.3	Static and kinematic indeterminacies of structural systems,	2		
1.4	Types of trusses, Assumptions in analysis,	1		
1.5	Analysis of determinate trusses by method of joints and method of sections.	2		
	Module – 2			
2.1	Derivation, Mohr's theorems, sign convention	1		
2.2	Application of moment area method to determinate prismatic beams varying cross section	1		
2.3	Use of moment diagram by parts.	1		
2.4	Principle of virtual displacements,	1		
2.5	Principle of virtual forces	1		
2.6	Strain energy and complimentary energy,	2		
2.7	Strain energy due to axial force, bending, shear and torsion (No numerical).	3		
2.8	Castigliano's theorems, application of castigliano's theorems to calculate deflection of beams, trusses and frames (No numerical on unit load method	4		
	Module – 3			
3.1	Three hinged parabolic arches with supports at the same and different	1		

	levels.			
3.2	Determination of normal thrust, radial shear and bending moment.	1		
3.3	Analysis of cables under point loads and UDL	2		
3.4	Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables.	2		
Module – 4				
4.1	Introduction, sign convention	1		
4.2	Development of slope deflection equation	1		
4.3	Analysis of continuous beams including settlement of supports;	2		
4.4	Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3	2		
Module – 5				
5.1	Introduction, Definition of terms	1		
5.2	Development of method	1		
5.3	Analysis of continuous beams with support yielding,	2		
5.4	Analysis of orthogonal rigid plane frames including sway frames wi indeterminacy up to 3	2		
	Total No. of Lecture H	39		
	Total No. of Tutorial Hours			
	Total No. of Practical Hours			

Self-learning topics identified: (Maximum of 5 topics)

1. Analysis of fixed beams by three moment equation method
2. Concept of Kani's method of analysis for beams and frames
3. Concept of two hinged arched using consistent deformation method.

Textbooks:

1. Reddy, C.S., Basic Structural Analysis, 3 rd. ed., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.
2. Hibbeler, R.C., Structural Analysis, 9 th edition., Pearson publications., New Delhi, 2012.

Reference Books:

1. Thandavamoorthy, T.S., Structural Analysis, 6 th edition., Oxford University press., New Delhi,2015
2. L S Negi and R S Jangid, "Structural Analysis", Tata McGraw-Hill Publishing Company Ltd.
3. D S Prakash Rao, "Structural Analysis: A Unified Approach", Universities Press 4

Online Resources:

1. https://nptel.ac.in/courses/105105166
2. https://nptel.ac.in/courses/105105109

Code:	BCV402	**Course: Fluid Mechanics and Hydraulics**	
Credits:	**4**	**L:T:P:S 3:0:2:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	-
Learning objectives	1. Understand the Fundamentals of properties of fluids, fluid pressure measurement and hydrostatic law 2. Learn the Principles of kinematics, hydrodynamics and its applications

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the fundamental properties of fluids and solve problems on fluid pressure and Hydrostatistics.	Understand
CO2	Apply the principles of kinematics, dynamics of fluid flow and also compute the discharge through pipes, notches and weirs.	Apply
CO3	Design the turbines and open channels of different sections and to estimate the energy loss in hydraulic jump.	Apply Analyze
CO4	Able to interpret the experimental results of discharge, efficiency based on the test conducted in the laboratory,	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3		2											3	2	
CO2	3		2											3		
CO3	3		2											3		
CO4	3								2					3	2	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Hydrostatistics: Fluids and their properties – Density, Specific Gravity, Viscosity	1	0	0
1.2	Surface tension, capillarity and compressibility	1	0	0
1.3	Pascal's law and Hydrostatic law	1	0	0
1.4	Fluid pressure measurement using simple and differential manometers	1	0	0
1.5	Total pressure and center of pressure on horizontal surfaces	1	0	0
1.6	Total pressure and center of pressure on vertical surfaces	1	0	0
1.7	Total pressure and center of pressure on inclined surfaces	1	0	0
1.8	Total pressure and center of pressure on curved surfaces	1	0	0
	Module – 2			
2.1	**Kinematics and Hydrodynamics:** Introduction - Types of flow	1	0	0
2.2	Continuity equation in Cartesian coordinates	1	0	0
2.3	Velocity potential	1	0	0
2.4	Stream function	1	0	0
2.5	Flow nets	1	0	0
2.6	Dynamics - Euler's equation of motion, Bernoulli's equation	1	0	0
2.7	Application - Venturimeter, Orifice meter, Pitot tube	2	0	0
	Module – 3			
3.1	**Flow Measurement and Design of Pipes:** Classification of orifice and mouthpiece	1	0	0
3.2	Hydraulic coefficients	1	0	0
3.3	Discharge over rectangular, triangular and Cipoletti notch	2	0	0
3.4	Flow through pipes- major and minor losses	1	0	0

3.5	Pipes in series and parallel, equivalent pipe	2	0	0
3.6	Concept of water hammer and surge tanks	1	0	0
	Module – 4			
4.1	**Open channel hydraulics:** Classification of flow	1	0	0
4.2	Most economical channel sections-rectangular, triangular, trapezoidal, circular	2	0	0
4.3	Uniform flow	1	0	0
4.4	Specific energy-rectangular channels	1	0	0
4.5	Non-uniform flow	1	0	0
4.6	Hydraulic jump-equation and applications	1	0	0
4.7	GVF equation-types.	1	0	0
	Module – 5			
5.1	**Turbines and Pumps:** Momentum equation, impact of jet on stationary and moving curved vanes	2	0	0
5.2	Turbines-types, Pelton wheel-working proportions, velocity triangles	2	0	0
5.3	Francis turbine- working proportions, velocity triangles	2	0	0
5.4	Centrifugal pumps-work done, efficiency, multi-stage pumps	2	0	0
	List of Experiments:			
1	Verification of Bernoulli's equation and Calibration of Venturimeter / Orifice meter	-	-	1
2	Determination of hydraulic coefficients of small vertical orifice	-	-	1
3	Calibration of triangular notch and determination of Cd for Cipoletti notch	-	-	1
4	Determination of major losses in pipes	-	-	1
5	Determination of Cd for ogee/broad crested weir	-	-	1
6	Determination of efficiency of jet on flat and curved vanes	-	-	1
7	Determination of Cd of Venturiflume	-	-	1
8	Demo of determination of efficiency of centrifugal pump	-	-	1
9	Demo of determination of efficiency of Francis/Kaplan turbine	-	-	1
10	Demo of determination of efficiency of Pelton wheel	-	-	1
	Total No. of Lecture H	**40**		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**10**

Textbooks:

1. C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, " Fluid Mechanics and Machinery", Oxford University Publication, 2010.
2. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi

Reference Books:

1. P.N. Chandramouli, "Applied Hydraulic Engineering" Yee Dee Publishing, Chennai - 600058
2. P.N. Modi and S.M. Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House, New Delhi.
3. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGraw-Hill, New Delhi.
4. Victor L. Streeter, Benjamin Wile E and Keith W. Bedford- Fluid Mechanics, Tata McGraw Hill publishing Co Ltd, New Delhi
5. J.F. Douglas. M. Gastric, John Warfield, Lynne Jack – Fluid Mechanics, Pearson, Fifth edition.

Online Resources:

1. NPTEL YouTube video: NOC Jan 2020: Hydraulic Engineering – Prof Md. Saud Afzal – YouTube
2. NPTEL YouTube video: https://youtu.be/fa0zHI6nLU

Code:	BCV403	**Course: TRANSPORTATION ENGINEERING**	
Credits:	**4**	**L:T:P 3:0:2**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	NA
Learning objectives	1. Gain knowledge of different modes of transportation systems and to learn the concepts on Highway Engineering and its design. 2. Gain knowledge about various components of a permanent way and an airport with design

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand principles and components of highway engineering, railways and airport	Understand
CO2	Apply the concepts of transportation for design of various components for highways, railways and airways.	Apply
CO3	Able to interpret the experimental results of highway materials based on laboratory tests and design the pavement as per IRC guidelines.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3													3		
CO2	3		3												3	
CO3	1		3											3		

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Highway Engineering: Introduction, Different Modes of Transportation, M R Jayakar Committee recommendations, Road Classifications and Road Patterns.	2	-	-
1.2	Highway Alignment: Factors affecting highway alignment, Engineering surveys for alignment.	3	-	-
1.3	Highway Geometric Design: Factors affecting geometric design of roads, Cross Sectional Elements, Sight distances, Horizontal alignment-superelevation, Extra widening, Vertical alignment–gradients (Problems)	4	-	-
	Module – 2			
2.1	Highway Materials and Pavements: Desirable properties of aggregates, soil subg Bitumen, Application of bituminous emulsion, Bituminous Mixes	3	-	-
2.2	Pavement Design: Factors Controlling design of highway pavements, Pavement types, component of pavements and their functions, design of flexible and rigid pavement (IRC Method).	4	-	-
2.3	Highway Drainage: Significance and requirements, Surface drainage system and sub surface drainage system, Types of cross drainage structures.	3	-	-
	Module – 3			
3.1	Traffic Engineering: Objectives and scope of Traffic Engineering. Traffic Characteristics: Road user characteristics, vehicular characteristics, Reaction time of driver and PIEV theory.	3	-	-
3.2	Types of traffic engineering studies-volume, spot speed, speed and delay, parking, accident, origin & destination, objectives of studies and data collection, method of study, analysis.	2	-	-
3.3	Traffic signs, Signal design by IRC method; Types of intersections.	1	-	-
	Module – 4			
4.1	Railway Engineering: Permanent way and its requirements, Gauges and types, Typical cross sections single and double-line BG track.	2	-	-
4.2	Rails-Functions requirements types and defects of rails. Sleepers and Ballast:	2	-	-

	Functions, requirements.			
4.3	Calculation of quantity of materials required for laying a track, Points & crossings, speed calculations as per Indian railways.	3	-	-
Module – 5				
5.1	Airport Engineering: Layout of an airport with component parts and functions, Si Selection for airport, Aircraft characteristics, Airport classification.	2	-	-
5.2	Runway orientation using wind rose diagram. Basic runway length-Corrections a examples, Runway geometrics.	3	-	-
5.3	Taxiway-Factors affecting the layout - geometrics of taxiway, Design of exit taxi with examples.	3	-	-
List of Experiments:				
1	Tests on Coarse Aggregates a. Crushing Strength Test b. Los Angeles abrasion test c. Impact test d. Shape tests (combined index and angularity number)	-	-	3
2	Tests on Bituminous Materials a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test e. Viscosity test by tar viscometer f. Flash and fire point test	-	-	3
3	Tests on Fine aggregates and Soil a. Sieve analysis of sand b. Bulking of Sand c. CBR Test on soil	-	-	1
4	Design of flexible pavement as per IRC 37-2018	-	-	1
5	Design of Rigid pavement as per IRC 58-2015	-	-	1
6	Bituminous Mix Design by Marshall Method (Demonstration only)	-	-	1
	Total No. of Lecture H	40	-	-
	Total No. of Tutorial Hours		**-**	**-**
	Total No. of Practical Hours			**10**

Self-learning topics identified: (Maximum of 5 topics)

1. Transition curve, summit and valley curves for highways.
2. Coning of wheels and tilting of rails
3. Comparison between Runway and Highway

Textbooks:

1. S K Khanna and C E G Justo, “Highway Engineering”, Nem Chand Bros, Roorkee
2. “A Text Book of Railway Engineering" by S C Saxena and S P Arora
3. “Airport Planning and Design” by Khanna Arora and Jain, Nem Chand Bros, Roorke
4. S K Khanna, C E G Justo and A Veeraragavan, “Highway Materials Testing Laboratory Manual”, Nem Chand Bros, Roorkee.

Reference Books:

1. Agarawal M.M, “Indian Railway Track”, Jaico Publications Mumbai, 2018.
2. Mundery J.S, “Railway Track Engineering”, Tata McGraw Hill Publishers, 2017.
3. Horonjeff, “Planning & Design of Airport”, McGraw Hill Publications, 5th Edition.

Online Resources:

1. https://nptel.ac.in/courses/105101087
2. https://nptel.ac.in/courses/105107123
2. https://www.aai.aero/

Code:	BCVL404	**Course: Building Materials Testing Lab**	
Credits:	**1**	**L:T:P 0:0:2**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**2**	**Max. Marks:100**	

Prerequisites if any	NA
Learning objectives	1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials. 2. Ability to function on multi-disciplinary teams in the area of materials testing.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Analyze the physical characteristics, and behavior of common building materials.	Analyze
CO2	Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion for steel	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	1		2	3										To be identified for each branch by Course Instructor			
CO2	1		2	3													

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	List of Experiments:			
1	Tests on Bricks, Tiles (Weight & Dimensionality, Water Absorption, Strength)	-	-	1
2	Compression test on mild steel, cast iron and wood.	-	-	1
3	Tension test on mild steel and HYSD bars	-	-	1
4	Torsion test on mild steel circular sections.	-	-	1
5	Bending Test on Wood Under two-point loading.	-	-	1
6	Shear Test on Mild steel- single and double shear.	-	-	1
7	Impact test on Mild Steel (Charpy & Izod).	-	-	1
8	Hardness tests on ferrous and non-ferrous metals- Brinell's, Rockwell and Vicker's.	-	-	1
9	Demonstration of Strain gauges and Strain indicators.	-	-	1
	Total No. of Lectur	-	-	-
	Total No. of Tutorial Hours		-	-
	Total No. of Practical Hours			**09**

Self-learning topics identified: (Maximum of 5 topics)

1. Use of Virtual lab

Reference Books:

1. Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition – McGraw Hill Book Co. New Delhi.
2. M L Gambhir and Neha Jamwal, "Building and construction materials-Testing and quality control", McGraw Hill education (India)Pvt. Ltd.,2014.
3. Fenner, "Mechanical Testing of Materials", George Newnes Ltd. London.
4. Holes K A, "Experimental Strength of Materials", English Universities Press Ltd. London.
5. Suryanarayana A K, "Testing of Metallic Materials", Prentice Hall of India Pvt. Ltd. New Delhi.
6. Kukreja C B, Kishore K. and Ravi Chawla "Material Testing Laboratory Manual", Standard Publishers & Distributors1996.
7. Relevant latest IS Codes.

Online Resources:

1. https://sm-nitk.vlabs.ac.in/Introduction.html
2. https://archive.nptel.ac.in/courses/105/105/105105108/

Code:	BCV456A	**Course: Finance for Professionals**	
Credits:	**3**	**L:T:P 1:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**1**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. Understand organizational financial performance and Comprehend financial acumen and tools to optimize outcomes

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Introduction to economics, Economic policies, Role of monetary policy in managing the economy	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1										3					3

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Introduction to economics, Economic policies, Role of monetary policy in managing the economy	2		
	Module – 2			
2.1	Finance Vocabulary and Financial Statements: Unique role of finance, Accounting, finance & auditing, Capital vs. revenue, Capital vs. revenue example, Sources & uses of funds, Sources & uses of funds example	3		
	Module – 3			
3.1	Financial Statement: Finance metrics & financial statement analysis, Finance metrics & financial statement analysis example, understanding liquidity, understanding liquidity example, Funds flow analysis, Example of funds flow analysis, Cash flow analysis, Example of cash flow analysis.	3		
	Module – 4			
4.1	Time Value of Money: Time value of money, understanding time value of money, understanding financial functions, Applications of time value of money, Cost of capital, Cost of capital example.	3		
	Module – 5			
5.1	Personal Finance: Financial Instrument, Approaches to investing, Ratios for investment, Portfolio management principles, Example of portfolio, forming a portfolio	3		
	Total No. of Lectur	15		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Self-learning topics identified: (Maximum of 5 topics)

1. Tools & techniques of Financial Planning &Forecasting

Textbooks:

1. Financial Management: Theory & Practice | 11th Edition by Prasanna Chandra
2. International Financial Reporting Standards (Bangalore Univ)

Reference Books:

1. Brealey and Myers," Principles of Corporate Finance", 11th Edition, McGraw Hill Education Publishers
2. Pandey I.M., "Financial Management", 11th Edition, Vikas Publishers.
3. Khan, M.Y. and Jain, P.K., "Financial Management", 7th Edition, McGraw-Hill Education Publishers

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_mg31/

Code:	BCV456B	**Course: GIS with Quantum GIS**	
Credits:	**1**	**L: T: P 1:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	Highschool Geography and Mathematics Engineering Survey, Geospatial Technology
Learning objectives	1. Outline and examine the basic properties of Geospatial data

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand handling, managing, manipulating and creating Geospatial data	Understand
CO2	Analyse spatial datasets using suitable software	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3				2									3		
CO2	3				2									2		

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

List of Experiments/Demonstration/Hands on Exercise:				
1	Introduction to Satellite data, data downloading tutorials from USGS, Bhuvan and other portals	-	-	1
2	Importing raster, vector and csv data to QGIS and inspecting dataset with identify feature and attribute table Metadata viewing Zoom in/out, zoom to extents/selected features, pan Selection of features			1
3	Downloading topo sheet from SOI website and Geo referencing			1
4	Creating features in terms of points, line and polygons Feature editing Adding attributes			1
5	Manipulation of attribute information Adding geometry as attribute Creating map subsets			1
6	Vector functions – Join, splitting, merging, dissolve, clip, difference, Spatial query			2
7	Raster functions – Terrain analysis, conversion, contour, preparation, Raster calculator Interpolation Clipping using extent and layer			2
8	Introduction to Google earth (GE) Digitizing in Google earth Generation and extraction of contours from GE Importing data to QGIS			2
	Total No. of Lecture Hours			
	Total No. of Tutorial Hours			
	Total No. of Practical Hours			**12**

Self-learning topics identified: (Maximum of 5 topics)

1. Open Street Map data
2. Explore Google Earth Engine

Textbooks:

1. Madry, S. (2021). **Introduction to QGIS: Open source geographic information system**.
2. Islam, S. (2018). **Hands-on geospatial analysis with R and QGIS**.

Online Resources:

1. QGIS Training Manual, https://docs.qgis.org/3.28/en/docs/training_manual/index.html
2. QGIS Tutorial for Beginners, https://opensourceoptions.com/blog/qgis-tutorial-for-beginners/
3. QGIS Tutorials and Tips, https://www.qgistutorials.com/en/

Code:	BCV456C	**Course:**	Electronic Waste Management - Issues and Challenges
Credits:	**1**	**L:T:P**	**2:0:0**
SEE:	**50**	**CIE:**	**50**
SEE Hours:	**1**	**Max. Marks:**	**100**

Prerequisites if any	Chemistry, Environmental Science, Technology and Electronics, Waste Management
Learning objectives	1 Will be well-equipped to understand, assess, and 2. Will be able to contribute to the responsible management of electronic waste while considering its environmental, social, and economic implications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the concept of electronic waste and its significance in the modern world.	Understand
CO2	Identify the key challenges and issues associated with electronic waste management and analyse the environmental consequences of improper e-waste disposal.	Apply
CO3	Examine global and regional regulations and policies related to e-waste management and Develop strategies for promoting recycling, raising awareness, and enforcing e-waste regulations and Evaluate the role of manufacturers in designing electronic products for easier recycling.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1			1								1	1			3	
CO2						3								2		
CO3								2				2				1

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	Introduction to Electronic Waste Management	1	-	-
1.2	Electronic Waste Generation and Composition	1	-	-
1.3	Environmental and Health Impacts of E-Waste	1	-	
Module – 2				
2.1	Composition and Toxic Substances in Electronics- Components of electronic	1	-	-
2.2	Hazardous materials (lead, mercury, cadmium, etc.) and their effects, Risk a and exposure pathways	1	-	-
Module – 3				
3.1	Challenges in E-Waste Management - Inadequate recycling infrastructure - Informal recycling practices and their impact - Technological obsolescence and rapid innovation	1	-	-
3.2	E-waste's contribution to pollution and resource depletion - Life cycle assessment of electronic products	1	-	-
3.3	Circular economy and sustainable resource management	1	-	-
Module – 4				
4.1	E-Waste Collection, Segregation, and Storage	1	-	-
4.2	Recycling Technologies for E-Waste (Mechanical, Chemical, Thermal, etc.), Hazardous Waste Handling and Disposal	1	-	-
4.3	E-Waste Recycling Process and Methods, Recovery of Valuable Materials (Metals, Plastics, etc.) from E-Waste	1	-	-
	E-waste awareness campaigns and community engagement, E-Waste Management Best Practices and Case Studies	1	-	-
Module – 5 Regulatory Framework and Policies				
5.1	Develop an understanding of extended producer responsibility (EPR) and its electronic waste management, Global and regional e-waste regulations	1	-	-
5.2	Basel Convention and other international agreements	1	-	-

5.3	Enforcement mechanisms and challenges, Emerging technologies in e-waste recycling, E-waste-to-energy approaches, Circular design and sustainable electronics manufacturing	1	-	-
	Total No. of Lectu	14	-	-
	Total No. of Tutorial Hours			
	Total No. of Practical Hours			

Self-learning topics identified:
1. Emerging technologies in e-waste recycling
2. E-waste-to-energy approaches
3. Circular design and sustainable electronics manufacturing
4. Eco-design principles for electronics
5. Public Awareness and Education about E-Waste

Textbooks:
1. “E-Waste Management: From Waste to Resource” by R. K. Rathore and H. N. Chanakya, TERI Press, 2019
2. “E-Waste in India: An Emerging Crisis” by Sangeeta Sharma, Cambridge Scholars Publishing, 2019 3.
3. “E-Waste Management: Research, Technology, and Applications” , Majeti Narasimha Vara Prasad, CRC Press, 2016

Reference Books:
1. “Electronic Waste Management and Treatment Technology” by Rezaul Begg, R. M. Sarcar, and R. V. R. Singh, Springer, 2018
2. “E-Waste Management: From Waste to Resource” by Florin-Constantin Mihai, Academic Press, 2018

Online Resources:
1. NPTEL : https://youtu.be/EJeTOUSmkBE
2. NPTEL : https://youtu.be/_r5rHyMHKEg
3. NPTEL: https://youtu.be/eaFEOExZz84

Code:	BCV456D	**Course: Technical Writing Skills**	
Credits:	**1**	**L:T:P 1:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**1**	**Max. Marks:100**	

Prerequisites if any	NA
Learning objectives	1. Achieve better technical writing and Presentation skills for employment. 2. Develop adequate knowledge of paragraph writing and precise writing techniques

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Effectively communicate in technical matters.	Apply
CO2	Practice preparation of gist, abstract and notes from a technical article.	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1						2				3		1		To be identified for each branch by Course Instructor			
CO2		3								3		1					

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Technical Report Writing:** Introduction to Technical writing process	1	-	-
1.2	Understanding of writing process	1	-	-
1.3	Introduction to various Technical Report writing.	1	-	-
	Module – 2			
2.1	**Art of condensation and Paragraph Writing:** Introduction and importance	1	-	-
2.2	Types and principles of condensation.	1	-	-
2.3	Importance of paragraph writing, Features and its construction styles.	1	-	-
	Module – 3			
3.1	**Business Report Writing:** Introduction	1	-	-
3.2	Definition and Salient features of Business reports. Significance and types of report writing. (Formal and Informal).	1	-	-
3.3	Resume building and Types of resumes. (Samples of resumes)	1	-	-
	Module – 4			
4.1	**Technical Articles and Proposals:** Nature and significance,	1	-	-
4.2	Types of technical Articles Journal articles and conference papers. Elements of technical articles.	1	-	-
4.3	Introduction to technical proposal writing, Purpose, importance, structure and types of technical proposals.	1	-	-
	Module – 5			
5.1	**Social media posts and Blog Writing:** Ethics and practices of social media posts	1	-	-
5.2	Principles and fundamentals, Guiding principles for composition of articles, some common pitfalls.	1	-	-
5.3	Maintaining common etiquette. Blogs and Blog writings strategies.	1	-	-
	Total No. of Lecture Hours	15	-	-
	Total No. of Tutorial Hours		-	
	Total No. of Practical Hours			-

Self-learning topics identified: (Maximum of 5 topics)

1. Read Technical Columns in Newspapers
2. Read research articles

Textbooks:

1. Sanjay Kumar and Pushpalata, ‘Communication Skills’, Oxford University Press. 2018.
2. M. Ashraf Rizvi, ‘Effective Technical Communication’, McGraw Hill, 2018.
3. William Strunk JR and E.B. White, ‘The Elements of Style’, Fourth Edition, Pearson, 2000

Reference Books:

1. Gajendra Singh Chauhan and et.al. ‘Technical Communication’, Cengage Publication, 2018.
2. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford University Press, 2018.

Online Resources:

1. https://developers.google.com/tech-writing/announcements
2. https://www.classcentral.com/course/technical-writing-7117.

Code:	BCV405A	**Course: Building Information Modelling in Civil Engineering**	
Credits:	**3**	**L :T :P 2:2:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks: 100**	

Prerequisites if any	Use of AutoCAD Tool; Building Planning & Drawing
Learning objectives	1. Understand the concept of Building Information Modelling, & Create the workflow followed in industry during creation of BIM 3D model which includes 2. Building the discipline-based model and create the federated models & Design the process of creating the 4D & 5D BIM model

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Interpret the basic principles of BIM evolution and concept of BIM in lifecycle of project	Analyze
CO2	Understand the workflows of Design authoring followed in industry during creation of 3D model	Apply
CO3	Analyze the engineering analysis and the process followed in industry to check and resolve clashes	Analyze
CO4	Evaluate the integration of schedule and cost in 3D model using 4D and 5D BIM	Evaluate
CO5	Illustrate the various emerging trends of BIM & concept of digital twin	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1			2	2									3	1	
CO2		2	2		3										2	
CO3			2	2	3										2	
CO4				2	3										2	
CO5					2	2								1	1	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

	Detailed Syllabus	No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Evolution of Engineering, Introduction to BIM Concepts and Design Authoring: Evolution of Engineering from 2D drawings to BIM Model, Isometric View, Limitation of Isometric views and concept of 3D-Modeling,	1	2	
1.2	Building Information Modelling – Introduction & Process, Design Authoring – Concepts and workflow,	1		
1.3	Fundamentals of Discipline Based Modelling, Introduction to stages of BIM Modelling process as per ISO 19650,	1		
1.4	Federated model- concepts and demonstrations, workflow of design coordination,	1		
1.5	Engineering Analysis – Concept and types of analysis, Process and workflow of Design Review in BIM.	1	2	
	Module – 2			
2.1	Visualization and Interference/Clash check: Views in BIM Model, Visualization Modes, Walkthrough of the Model, Fly through the model,	1	2	
2.2	Layers & Properties, Concept of viewpoints, Sectioning and Visualization through Tablet and Mobile, Concept of BIM Kiosk & BIM Rooms,	1	2	
2.3	Visualization through Augment Reality (AR), Virtual Reality (VR) & Mixed Reality (MR)	1	2	
2.4	Clash Check – Types, Clash avoidance process, Clash Detection Process, Clash Detection Priority Matrix and Report generation, Clash Detection Rules, Report, Grouping, Clash Detection Process – Demo.	1	3	
	Module – 3			

3.1	Documentation & CDE & Level of Development: Documentation and CDE (Common Data Environment) -2D drawings generation from BIM Model,	1		
3.2	Computer Network types, Concept of Cloud Computing, Concept and Application of CDE: Traditional Information Sharing, Definition, Reference, and Concept, Setting up the workflow and process for CDE-File naming convention,	2		
3.3	Roles and Responsibilities, Request for Information and Review Process Concept of LOD (Level of Development), preparation of LOD matrix and Progression matrix Definition of LOD, Level of Detail and Information,	2		
3.4	LOD- Wall foundation, Precast Structural Inverted T-Beam, Domestic Water Piping, Plumbing Fixture, Packaged Generator Assembly, LOD-Chart, Matrix and Model Progression Matrix	2		
	Module – 4			
4.1	4D / Field BIM & Its Applications: Introduction to 4D / Field BIM: Concept of 4D, Introduction to construction sequence and project schedule,	1	2	
4.2	Project scheduling using Gantt Chart and its limitation, 4D BIM Modeling Project demo and workflow, Synchronization of 4D BIM Model with project schedule,	1	2	
4.3	Reviewing project progress w.r.t planned dates and actual dates, Generation of Reports	1	1	
4.4	Application of Field BIM/ 4D BIM: Understanding concept and usage of BIM in field for coordination- 3D Coordination and Visual Communication, Site utilization planning and Construction analysis, Application of wearables in coordination.	2	2	
4.5	3D Control and planning Other Applications of Field BIM/ 4D BIM: Concept and usages of BIM in field for safety, disaster and risk analysis, digital fabrication and scan to BIM, Existing Condition Modeling, Phase Planning, As-built/ Record Models	2	1	
	Module – 5			
5.1	5D BIM, AIM & Beyond BIM - Emerging Trends: 5D BIM: Introduction concepts of 5D BIM, Quantity take off with UoM, Concept of QTO with UoM, 5D BIM with UoM with cost, Quantity take off exercise, Demo of Quantity take off: Understanding QTO for Wall, Plaster & Tile, BIM Maturity LOD and General Practice of QTO, Cost Breakup structures,	1	2	
5.2	5D BIM and cost control AIM: Introduction to Asset Information Model (AIM), COBie structures and Asset Information Deliverables, Space Attributes and Asset Attributes- Examples with data, Asset requirement Discipline wise Infrastructure System, Classification code and Information Exchange, Information Exchange with Facility Management	1	3	
5.3	Beyond BIM: Emerging Trends- Concepts of Industrialisation, IoT, Big Data, Data Analytics and their applications in BIM: Industrialisation of Construction through BIM- DfMA, IoT in BIM, BIM and Big data, Data Analytics using AI & ML	1		
5.4	Future scope of BIM Applications: Smart Infrastructure and the need for connected infrastructure,	1		
5.5	Digital twins- Concepts and benefits, National Digital Twin or a City level Digital Twin in a Smart City, Fundamental requirements for the success of a Digital Twin and its uses, Digital Twin applications in diverse industries.	1		
	Total No. of Lecture Hours	**28**		
	Total No. of Tutorial Hours		**26**	
	Total No. of Practical Hours			

Self-learning topics identified: (Maximum of 5 topics)

1. 3D-Modeling in AutoCAD
2. Understanding the ISO 19650 Standard
3. Level of Detail and Information in Project
4. Components of the building services
5. Basics of AI & ML

Textbooks:

1. ISO 19650 - Building Information Modelling (BIM)
2. Eastman, C., Teicholz, P., Sacks, R., & Liston, K., "BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors", 2nd Edition, John Wiley & Sons, Inc. 2011.

Reference Books:

1. Duell, R., Hathorn, T, and Hathorn, T.R., "Autodesk Revit Architecture 2015 Essentials", Wiley and Sons, Inc., 2016.
2. Hardin, B., & McCool, D., "BIM and construction management: proven tools, methods, and workflows", 2015
3. Karen Kensek, and Douglas Noble, "Building Information Modeling: BIM in Current and Future Practice", 1stEdition, Wiley, 2014.
4. Stefan Mordue, Paul Swaddle, and David Philp, "Building Information Modeling For Dummies", 1st edition, John Wiley & Sons, 2015.

Online Resources:

1. E-learning content on L&T EduTech Platform https://lntedutech.com/building-information-modeling/ (Building Information Modelling in Architecture, Engineering and Construction)
2. https://www.coursera.org/learn/bim-fundamentals (BIM Fundamentals for Engineers)
3. https://www.coursera.org/learn/bim-application (BIM Application for Engineers)
4. https://onlinecourses.nptel.ac.in/noc22_ce49/preview (Introduction to Lean Construction)

Code:	BCV405B	**Course:** Construction Equipment, Plants and Machinery	
Credits:	**3**	**L:T:P 3:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. Evaluate equipment and techniques required during construction 2. Comprehend mechanization and digitalization in construction

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	To provide insight on the different functions and operations of different equipment and techniques during construction	Understand
CO2	To impart knowledge on the various maintenance and safety to be considered during construction	Understand
CO3	To acquire knowledge on the life cycle of a construction equipment	Understand

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1				3							2			3	
CO2						2						2				2
CO3	1				3							2			3	

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	Basics and Hydraulics of Construction Equipment: Introduction to Construction Equipment, Functions, Operations of Construction Equipment.	3		
1.2	Concreting, Earth Moving, Road Making and Quarry/Mining Equipment.	3		
1.3	Operations of a Batching Plant - Introduction and Components of Concrete Pump & Placer- Concrete Pipeline, Laying and Cleaning	3		
	Module – 2			
2.1	Bulldozer- Classification and Components- Classification, Components and Attachments of Excavator- Backhoe Loader- Classification & components	3		
2.2	Introduction and classification to Hot mix Plant Process of Asphalt Paver-PQC Classification & Components	3		
2.3	Motor Grader Classification & Components- Horizontal Movement Vehicles Quarry/Mining	3		
	Module – 3			
3.1	Equipment Life Cycle Management: Life Cycle of an Equipment- Equipment Performance Parameters	3		
3.2	Introduction to Maintenance- Types of Maintenance	3		
3.3	Maintenance Practices	1		
	Module – 4			
4.1	Tunneling Equipment / Piling Equipment: Introduction to Tunnel Boring Machines- Details and Operation of a Hard-Rock	3		
4.2	TBM Details of Earth Pressure Balance (EPB) TBM- Details and operation of Slurry	3		
4.3	TBM & Components- Hydraulic Grabs- Piling Rig	3		
	Module – 5			
5.1	Mechanization and Digitalization in Construction and Safety in Construction Equipment: Importance of Digital Analytics- Digital Solution in Construction Importance of Mechanization	3		
5.2	Introduction to 3D Concrete Printer	1		

5.3	Importance of Safety- Various PPE & Purpose- Safety of Men & Machines at Work	2		
	Total No. of Lecture Hours	40		
	Total No. of Tutorial Hours		**0**	
	Total No. of Practical Hours			**0**

Self-learning topics identified: (Maximum of 5 topics)

1. Components of a Hydraulic System
2. Railway Track Construction
3. Operation of Mechanized Equipment

Textbooks:

1. Velumani. P, “Construction Techniques and Practices”, SIA Publishers & Distributers Pvt Ltd, 2020.
2. Dr. Manoranjan Samal, “Advanced Construction Techniques and Equipment” S.K. Kataria & Sons
3. S.C.Sharma, “Construction Equipment and management” E-Book .2019

Reference Books:

1. Day, D. A., & Benjamin, N. B. H. (1991). “Construction equipment guide” (2nd ed.). John Wiley & Sons.
2. Nunnally, S. W. (2011). “Construction methods and management” (8th ed.). Prentice Hall.

Online Resources:

1. E-learning content on L&T EduTech Platform https://lntedutech.com/
2. https://onlinecourses.nptel.ac.in/noc21_ce21/

Code:	BCV405C	**Course: Concrete Techniques and Practices**	
Credits:	**3**	**L:T:P 2:2:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks:100**	

Prerequisites if any	
Learning objectives	1. To present the basics of concrete and different materials used and to impart knowledge on materials used in concrete, relevant Indian standard codes, and practical aspects on concreting activities at projects 2. To explain the importance of making good quality concrete to build durable structures and to introduce the design of concrete mixes from the Industrial experiences at Sites and optimization of higher grades of Concrete.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Evaluate the properties of concrete by conducting test on cement, aggregate and concrete (with & without admixtures) for using the data for Mix design procedures	Apply
CO2	Understand to Select and proportionate different materials used in a concrete mix including admixtures	Understand
CO3	Design a concrete mix as per requirement of construction project	Analyze
CO4	Apply the best practices in concrete construction from industry's requirement, thumb rules, mitigation of concreting issues at Sites	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2											To be identified for each branch by Course Instructor			
CO2	2															
CO3	2	2	2													
CO4	2	2														

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	Introduction to concrete, overview of materials- cement, low carbon cement, coarse aggregate and fine aggregate, and mineral admixture	2		NA
1.2	Fly ash, GGBS, micro silica / silica fume, metakaolin / rice husk ash, composite cement, and ultrafine materials	2	2	NA
1.3	Lab test - fineness of fly ash, recycled aggregate	1	2	NA
Module – 2				
2.1	Water and chemical admixture: source, requirements, limits and testing	1		NA
2.2	Blending of aggregate -: Blending of fine and coarse aggregate	2	2	NA
2.3	Gradation for optimization and practical aspects	2	2	NA
Module – 3				
3.1	Mix design - Volumetric mix design, mix design by absolute volume method, worked out practical examples based on industries experience at project sites over several decades	2	4	NA
3.2	Higher grades of concrete, high performance concrete	2		NA
3.3	Test on concrete: workability of concrete, flexural and compressive strength tests	2	2	NA
Module – 4				
4.1	Production of concrete-: batching plant, calibration, mixing and transportation of concrete handling of concrete at construction	2	2	NA
4.2	Ready-mix concrete, pumping, placing of concrete with boom placers, levelling, vibration and compaction	2	2	NA

4.3	Cold joints, finishing and curing and protection of concrete	1		NA
Module – 5				
5.1	Special types of concrete: self-compacting concrete, mass concrete, dry lean c geopolymer concrete, pavement quality concrete	2	2	NA
5.2	Fiber reinforced concrete, composite concrete, lightweight concrete, ferrocement, shotcreteing, guniting, grouting, challenges faced at sites	2	2	NA
5.3	Plastic shrinkage cracks, plastic settlement, honeycomb, bug holes, cover to concrete, do's and don’ts in concrete construction, site shoot, introduction on 3D printing	1		NA
Total No. of Lecture Hours				
Total No. of Tutorial Hours				
Total No. of Practical Hours				

Textbooks:

1. Concrete Technology by M. S. Shetty, S Chand, New Delhi-110055.
2. Concrete Technology by M. L. Gambhir, Tata McGraw-Hill.
3. IS 456, IS 269, IS 516, IS 1786, IS 1893, IS 12269, IS 9103, IS 8112

Online Resources:

1. E-learning content on L&T EduTech Platform

Code:	BCV405D	**Course: Watershed Management**	
Credits:	**4 or 3**	**L:T:P 3:0:0**	
SEE:	**50**	**CIE: 50**	
SEE Hours:	**3**	**Max. Marks: 100**	

Prerequisites if any	
Learning objectives	1. To understand Watershed Hydrology for estimating water demand and to learn, water conservation methods. 2. To understand application of Remote Sensing and GIS for watershed management

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Discuss surface and ground water resources system and, human influences.	Understand
CO2	Integrate water resources system in arid and semi-arid regions and explain watershed aquifer for management.	Understand
CO3	Analyse water resources related issues for conservation and synthesize augmentation of water resources.	Analyze
CO4	Apply modern tools in Designing integrated watershed management system.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	1	3										
CO3		3	2									
CO4	2				3							

PSO1	PSO2	PSO3	PSO4
To be identified for each branch by Course Instructor			

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
	Module – 1			
1.1	**Principles of Watershed Management**: Basics concepts, hydrology and water availability, surface water	2		-
1.2	Ground water, conjunctive use	2		-
1.3	Human influences in the water resources system.	2		-
	Module – 2			
2.1	**Water resources systems**: Integrated water resources system, river basins-morphometric analysis of watersheds for watershed management	2		-
2.2	Watershed management practices in arid and semi-arid regions	2		-
2.3	Watershed management through wells, management of water supply	2		-
2.4	Short term and long-term strategic planning.	2		-
	Module – 3			
3.1	**Conservation of Water**: Perspective on recycle and reuse, wastewater reclamation, social aspects of watershed management and community participation	2		-
3.2	private sector participation, institutional issues, socio-economy	2		-
3.3	Integrated development, water legislation and implementations, case studies.	2		-
3.4	Rainwater management, conservation, storage and effective utilization of rainwater	2		-
3.5	Structures for rainwater harvesting, roof catchments system, Check dams, aquifer storage.	2		-
	Module – 4			
4.1	**Sustainable Watershed Approach:** Sustainable integrated watershed management, natural resources management	4		-
4.2	Agricultural practices, integrated farming	2		-

4.3	Farming, soil erosion and conservation.	2		-
	Module – 5			
5.1	**Applications of RS and GIS in Watershed management:** Role of decision system in watershed management	4		-
5.2	Watershed characteristics of coastal regions	2		-
5.3	Coastal aquifer tor management, uniqueness of coastal water resources.	2		-
Total No. of Lecture Hours		**40**		-

Textbooks:

1. Singh Vir, Raj., "Watershed Planning and Management", Yash Publishing House, Bikaner.3rd Revised Edition, 2016.
2. Murthy, J. V. S., "Watershed Management in India", New Age Publishers, New Delhi. 2nd Edition, 2017.

Reference Books:

"Decision Support System for Integrated Watershed Management", Colorad State University. 2012.

2. Tideman, E. M., "Watershed Management", Omega Scientific Publishers, New Delhi, 2002

Online Resources:

1. https://www.youtube.com/watch?v=wkPu4LwRKro
2. https://www.youtube.com/watch?v=YuV5IOF3nIM

Course Code: BBOK407 **Course: Biology for Engineers**
Credits: 2 **L: T: P: S: 2:0:0:0**
CIE: 50 Marks **SEE: 50 Marks**
SEE Hours: 2 **Max. Marks: 100**

Prerequisites if any	Basic Knowledge of Biology at intermediate level
Learning objectives	1. Understand evolution of life forms and their diversity in environment. 2. To understand building blocks of living organisms and their basic functions. 3. Knowledge of engineering biology as applied to Civil Engineering.

Course Outcomes:

On successful completion of the course, the student will be able to:

COs	Course Outcomes	Bloom's level
CO1	Will be able to explain functional elements of living organisms and their significance in environment.	Understand & Apply
CO2	Will be able to elucidate basic metabolic and catabolic activities with growth kinetics of microorganisms.	Understand & Apply
CO3	Will be able to apply the concepts of biology in solving Civil Engineering problems including wastewater treatment.	Understand & Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1		2												2		
CO2			2					2							2	
CO3									3							

3 – Strong 2 – Medium 1 – Low

Course Structure

	Module 1: Introduction	**No. of Lecture Hours**	**No. of Tutorial Hours**	**Self-Learning Hours**
1.1	Functional Elements of Biology, Scope and relevance of biology inEngineering,	1	0	0
1.2	Importance of biology including its potential applications in the environment,	1	0	0
1.3	Origin of life, Evolution of Life forms biological classification, Cell as afundamental Unit of Life	1	0	0
1.4	RNA and DNA Laws of Inheritance, Gene Interactions,	1	0	0
1.5	Multiple Alleles – Hardy Weinberg Principle, Genetic Disorders	1	0	0
1.6	Introduction to Biotechnology and Bio-Informatics.	1	0	0
	Module 2: Basics of biology as applied to Civil Engineering			
2.1	Chemical Composition of living forms, Carbohydrates, Proteins andLipids, Bio-Enzymes	2	0	0

2.2	Metabolic and Catabolic Activities, Photosynthesis and Respiration.	1	0	0
2.3	Fermentation (aerobic and anaerobic decomposition),	1	0	0
2.4	Microorganisms, Growth Kinetics,	2	0	0
2.5	Culture Media, Immunology and Immunity, Stem Cells	2	0	0
2.6	Biomagnification and Bio Safety in the Field of Public Health Engineering	2	0	0
	Module 3: Applications of Biology in Civil Engineering			
3.1	Biological treatment of Municipal Sewage, Biological treatment ofwastewater from small communities	1	0	0
3.2	DEWATS, Concept of Constructed Wetlands, Self-Purification of Streams	2	0	0
3.3	Composting of Bio-degradable waste, Aerobic and Anaerobic Methods,Vermicomposting	2	0	0
3.4	Bio-remediation, Role of Biology in mitigating Pollution	2	0	0
3.5	Building Construction and Pest Control	2	0	0
3.6	Bio-Concrete, Biosensors	1	0	0
Total No. of Lecture Hours		**26**	0	
	Total No. of Tutorial Hours		0	0
	Total No. of Self learning Hours			0

Text Books:

1. Biology for Engineers- As per Latest AICTE Curriculum, Wiley Publications, 2018.

Reference Books:

1. Campbell, NA and Reece JB, Biology, International edition, 7th edition
2. Karp, G, Cell and Molecular Biology: Concepts and Experiments, 7th edition, Wiley,New York.
3. Suraishkumar GK, Biology for Engineers, Oxford University Press, New Delhi (2019)

Online Resources:

https://youtu.be/xGOmFwRqcZc

https://youtu.be/qmK9CF3k4sc

Course Code: BUHK408
Credits: 1
SEE: - 50

Course Name: Universal Human Values and Professional Ethics
L: T: P - 1:0:0
CIE: 50 Marks

Prerequisites if any	Nil
Learning objectives	1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings. 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with nature

Course Outcomes:
On the successful completion of the course, the student will be able to

COs		**Bloom's level**
CO1	To understand the core aspirations of all human beings	Understand
CO2	To gain the universal human values and movement towards value-based living in a natural way	Apply
CO3	To fulfilling the human behavior and mutually enriching interaction with nature	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	1	2	3	3	1	2				
CO2	-	-	-	-	-	3	2	2	3	3	1	2				
CO3	-	-	-	-	-	3	2	2	3	3	1	2				

S – Strong (3) M – Medium (2) L – Low (1)

Course Structure

Module – 1: Introduction - Need, Basic Guidelines, Content and Process for Value Education		**No. of Lecture Hours**	**No. of Tutorial Hours**
1.1	Understanding the need, basic guidelines, content and process for Value Education	1	Nil
1.2	Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration	1	Nil
1.3	Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority	1	Nil
1.4	Method to fulfill the above human aspirations: understanding and living in harmony at various levels . Practice session	2	Nil
Module – 2: Understanding Harmony in Myself, Family, Society and Human Relationship			
2.1	Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha	1	Nil
2.2	Understanding Harmony in the family – the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-	1	Nil

	tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship		
2.3	Understanding the meaning of Vishwas and Samman; Difference between intention and competence; respect and differentiation ; Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals	1	Nil
2.4	Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family! Practice session	2	Nil
Module – 3: **Understanding Harmony in the Nature, Existence and Implications of the all Holistic on Professional Ethics**			
3.1	Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature	1	Nil
3.2	Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space.	1	Nil
3.3	Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify and develop appropriate technologies and management patterns for above production systems.	1	Nil
3.4	Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations. Practice session	2	Nil
	Total No. of Lecture Hours	15	
	Total No. of Tutorial Hours		Nil

Guidelines and Content for Practice Sessions

Practice Session 1:

Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

Expected outcome: The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

Practice Sessions 2:

1. a. Observe that any physical facility you use, follows the given sequence with time: Necessary & tasteful→ unnecessary & tasteful → unnecessary & tasteless → intolerable b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body.

Expected outcome:

1. The students are able to see that all physical facilities they use are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

2. The students are able to see that activities like understanding, desire, thought and selection are the activities of 'I' only, the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing througbody.es, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body

Practice Session 3:

Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

1a. Do I want to make myself happy?

2a. Do I want to make others happy?

3a. Does the other want to make him happy?

4a. Does the other want to make me happy?
What is the answer? Intention (Natural Acceptance)
1b. Am I able to make myself always happy?
2b. Am I able to make others happy?
3b. Is the other able to make him always happy?
4b. Is the other able to make me always happy?
What is the answer? Competence
Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others' intention & competence.

Expected outcome:

The students are able to see that the first four questions are related to our Natural Acceptance i.e. Intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a bad person.

Textbooks:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2.

References:

1. IIT Delhi, Modern Technology – the Untold Story