Study Scheme & Syllabus of

B.Voc.

(Building Construction and Technology)

Batch 2025 onwards

By

Board of Study CIVIL AND ENVIRONMENTAL SCIENCE

Department of Academics

IKG Punjab Technical University

Study Scheme for B Voc. (Building Construction and Technology)

Bridge courses for candidates with NSQF certification in other trades or NSQF non-certified candidates: Category-2 and 3

Level-4

S. No.	Course Code	Course Title	Marks			Credits		
			Int	Ext	Total	Th.	Pra.	Total
1	BVBG001	Building Construction and Technology	100	---	100	4	2	6
2	BVBG002	Bridge Workshop	100	---	100	0	6	6
3	BVBG003	Information Technology Workshop	100	---	100	2	4	6
4	BVBG004	Basic Engineering Drawing	100	---	100	2	4	6
5	BVBG005	Engineering Drawing with AutoCAD	100	---	100	2	4	6
6	EMC -101	Entrepreneurship Setup and Launch**	**100**		**100**	**0**	**4**	**2**
			500	**---**	**500**	**10**	**20**	**32**

- The students are advised to complete the bridge course along with regular course(s). The credits earned are of qualifying nature and should be completed for obtaining Diploma/Advanced Diploma / B.Voc. Degree, as a pre-requisite. The evaluation of bridge course will be done at institute level (internal) only. After completion of the bridge courses NSQF LEVEL-4 certification may be done through the respective agencies/sector skill council involved.
- Category-2 students to take Level-4 course on Building construction and technology, and Engineering Drawing with Autocad which they have not studied during their vocational course.
- Category-3 students to take all the courses for completing the requirements of level- 4 certification.

** The department of Higher Education and Languages, Government of Punjab endeavor to AI-powdered entrepreneurship learning platform on the said course. The Institute /Campus shall appoint an assistant professor as faculty coordinator.

Study Scheme for B Voc. (Building Construction and Technology)

Regular courses for all categories of candidates

Semester- 1 / Level-5

S. No.	Course Code	Course Title	Hours per week			Marks			Credits
			L	T	P	Int	Ext	Total	
1	BVBCT-101-20	Applied Physics	3	0	0	**40**	60	100	3
2	BVBCT-102-20	Applied Mathematics	3	0	0	**40**	60	100	3
3	BVBCT-103-20	Applied Chemistry	3	0	0	**40**	60	100	3
4	BVBCT-104-20	Communication Skills	3	0	0	**40**	60	100	3
5	BVBCT-105-20	Applied Physics Lab	0	0	3	**60**	40	100	1.5
6	BVBCT-106-20	Applied Chemistry Lab	0	0	3	**60**	40	100	1.5
7	BVBCT-107-20	Communication Lab	0	0	3	**60**	40	100	1.5
8	BVBCT-108-20	Civil Workshop Training	0	0	3	**60**	40	100	1.5
9	BVBCT-109-20	On Site Training*	180 hrs			--	200	200	12
			12	**0**	**12**	**420**	**680**	**1000**	**30**

*The students are advised to undergo 180 hrs training in house/ industry/ Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) during the progress of the semester on week-ends or winter Vacation and submit a training report on completion of training.

Semester- 2 / Level-5

S. No.	Course Code	Course Title	Hours per week			Marks			Credits
			L	**T**	**P**	**Int**	**Ext**	**Total**	
1	BVBCT-201-20	Building Planning and design	3	0	0	**40**	60	100	3
2	BVBCT-202-20	Estimating & Costing	3	0	0	**40**	60	100	3
3	BVBCT-203-20	Construction materials and Technology	3	0	0	**40**	60	100	3
4	BVBCT-204-20	Construction planning, machines and equipment	3	0	0	**40**	60	100	3
5	BVBCT-205-20	Building drawing Lab.	0	0	4	**60**	40	100	2
6	BVBCT-206-20	Estimating and costing Lab.	0	0	4	**60**	40	100	2
7	BVBCT-207-20	Construction materials Lab.	0	0	4	**60**	40	100	2
8	BVBCT-208-20	Sector skill training*	6 weeks			---	200	200	12
			12	**0**	**12**	**340**	**560**	**900**	**30**

*Students will undergo 6 weeks training at Industry/Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) pertaining to any one Level-4/5 Quality Packs (QP) prescribed by Construction skill development council of India (CSDC) and submit a training report on completion of training.

Semester- 3

S. No.	Course Code	Course Title	Hours per week			Marks			Credits
			L	T	P	Int	Ext	Total	
1	BVBCT-301-20	Applied Mechanics	3	0	0	**40**	60	100	3
2	BVBCT-302-20	Surveying-I	3	0	0	**40**	60	100	3
3	BVBCT-303-20	Building Construction	3	0	0	**40**	60	100	3
4	BVBCT-304-20	Human Values and Professional Ethics	3	0	0	**40**	60	100	3
5	BVBCT-305-20	Applied Mechanics Lab	0	0	4	**60**	40	100	2
6	BVBCT-306-20	Surveying-I Lab	0	0	4	**60**	40	100	2
7	BVBCT-307-20	Building Construction Drawing	0	0	4	**60**	40	100	2
9	BVBCT-308-20	On Site Training*	180 hrs			--	200	200	12
			12	**0**	**12**	**420**	**680**	**1000**	**30**

*The students are advised to undergo 180 hrs training in house/ industry/ Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) during the progress of the semester on week-ends or winter Vacation and submit a training report on completion of training.

Semester- 4

S. No.	Course Code	Course Title	Hours per week			Marks			Credits
			L	T	P	Int	Ext	Total	
1	BVBCT-401-20	Water Supply & Waste Water Engineering	3	0	0	**40**	60	100	3
2	BVBCT-402-20	Surveying-II	3	0	0	**40**	60	100	3
3	BVBCT-403-20	Strength of Material	3	0	0	**40**	60	100	3
4	BVBCT-404-20	Soil Mechanics	3	0	0	**40**	60	100	3
5	BVBCT-405-20	Survey-II Lab	0	0	4	**60**	40	100	2
6	BVBCT-406-20	Strength of Material Lab	0	0	4	**60**	40	100	2
7	BVBCT-407-20	Water Supply & Waste Water Engineering Drawing Lab	0	0	4	**60**	40	100	2
9	BVBCT-408-20	Sector skill Training*	6 weeks			--	200	200	12
			12	**0**	**12**	**420**	**680**	**1000**	**30**

*Students will undergo 6 weeks training at Industry/Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) pertaining to any Quality Packs (QP) prescribed by Construction skill development council of India (CSDC) and submit a training report on completion of training.

Semester- 5

S. No.	Course Code	Course Title	Hours per week			Marks			Credits
			L	T	P	Int	Ext	Total	
1	BVBCT-501-20	Irrigation Engineering	3	0	0	**40**	60	100	3
2	BVBCT-502-20	Structural Engineering-I	3	0	0	**40**	60	100	3
3	BVBCT-503-20	Highway Engineering	3	0	0	**40**	60	100	3
4	BVBCT-504-20	Geotechnical Engineering	3	0	0	**40**	60	100	3
5	BVBCT-505-20	Geotechnical Engg. Lab	0	0	3	**60**	40	100	1.5
6	BVBCT-506-20	Material Testing Lab-I	0	0	3	**60**	40	100	1.5
7	BVBCT-507-20	Computer Aided Structural Drawing Lab	0	0	3	**60**	40	100	1.5
8	BVBCT-509-20	Sector skill Training*	180 hrs			--	200	200	12
			12	**0**	**12**	**340**	**560**	**900**	**30**

*The students are advised to undergo 180 hrs training in house/ industry/ Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) during the progress of the semester on week-ends or winter Vacation and submit a training report on completion of training.

Semester- 6

S. No.	Course Code	Course Title	Hours per week			Marks			Credits
			L	T	P	Int	Ext	Total	
1	BVBCT-601-20	Sustainable construction methods	3	0	0	**40**	60	100	3
2	BVBCT-602-20	Structural Engineering-II	3	0	0	**40**	60	100	3
3	BVBCT-603-20	Building Repair and Rehabilitation	3	0	0	**40**	60	100	3
4	BVBCT-604-20	Green Building	3	0	0	**40**	60	100	3
5	BVBCT-605-20	Green Building Lab	0	0	3	**60**	40	100	1.5
6	BVBCT-606-20	Material Testing Lab-II	0	0	3	**60**	40	100	1.5
7	BVBCT-607-20	Structural Engg. Lab	0	0	3	**60**	40	100	1.5
8	BVBCT-609-20	Sector skill Training*	180 hrs			--	200	200	12
			12	**0**	**12**	**340**	**560**	**900**	**30**

*The students are advised to undergo 180 hrs training in house/ industry/ Skill

Bridge courses - Level-4 (Semester-I)

(BVBG001) Building Construction and Technology

Theory

UNIT 1. Building Construction: Site Selection for construction, various components of a building (sub structure and super structure with elaboration of technical terms). Foundations: Need and function of foundation, different types of foundations and their uses. Masonry: General principles of bricks masonry, types of bonds. Floors: Types of flooring and their uses. Stairs: Need and types of stairs. Doors and Windows, Purpose of each and their classification.

UNIT 2. Concrete Technology: Definition of concrete, different types of concrete and their uses, Ingredients of Concrete. Preparation of concrete: Batching, Mixing, Transportation, Placement, Compaction, Curing, Finishing. Properties of Concrete: Properties in plastic stage: workability, segregation, bleeding. Properties of hardened concrete: strength, durability. Introduction to standard concrete mixes.

UNIT 3. Formwork, Scaffolding and Steel Fixing: Introduction and purpose of formwork. Timber joints, cutting and drilling of plywood. Shuttering for beam, column and slab floor. Codal provisions on formwork. Introduction and purpose of scaffolding, Component parts, Types of scaffolding. Types of ties and their uses. Making and placing reinforcement for slab & foundation. Codal provision on steel fixing.

UNIT 4. Services & Utilities: Introduction to plumbing, plumbing tools and their uses. Water distribution system, material for service pipes, service connection, valves. Aim and principles of house drainage, Pipes and traps. Sanitary fittings. House wiring: Types of wires used, tools used for house wiring, Circuit diagram for tube light, bulb, fan and switches & sockets. Fire protection: Fire hazards, characteristics of fire resisting materials, general fire safety requirements for buildings, fire alarms, fire extinguishing equipment.

UNIT 5. Construction Work Supervision: Roles and responsibilities of construction work supervisor. Record keeping: Muster roll, measurement book, quantities estimation, register for material receipt and issue, logbook for construction equipment. Site Registers: site diary, site order book, inspection register, cement register, steel register, register for approval of other materials, material requisition and issue records. Register for scrap material, POL records, register for construction equipment. Check list (Dos and Dont's) for construction work supervision.

Practical

1. Laying of bricks in different layer using English bond.
2. Laying of bricks in different layer using Flemish bond.
3. To determine workability of concrete by slump test.
4. Test for compressive strength of concrete cubes.
5. To make T-joint and dove tail joint in timber.
6. Cutting of plywood in different patterns.
7. Drilling in plywood.
8. T- joint in service pipes.
9. Wiring from MCB to switch board having a three pin socket, switches for fan and tube light.
10. Making entries in the measurement book for small piece of construction work.

Reference Books:

1. Building Construction by Sushil Kumar, Standard Publisher and Distributors.
2. Building Construction by B.C.Punima, Laxmi Publisher House
3. A Text Book of Building Construction by Sharma and Kaul
4. Masonry & timber structures including earthquake resistant design, A S Arya, Nem Chand & Bros.
5. Concrete Technology, by M.L. Gambhir, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
6. Indian Practical Civil Engg. Handbook, P N Khanna, Engineers Publishers, 2000.
7. National Building Code, B. I. S.
8. Handbook of Building Construction, M M Goel, Amrindia Consultancy.

(BVBG002) Bridge Workshop

Practical

UNIT 1 FITTING SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in fitting shop.
3. Introduction to common materials used in fitting shop
4. Identification of materials. Such as Steel, Brass, Copper, Aluminium etc.
5. Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z- Section, etc.
6. Demonstration of various types of work benches, holding devices.

UNIT 2 WELDING SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in welding shop.
3. Introduction to welding and its importance in engineering practice
4. Introduction to welding equipment and safety precautions during hazards of welding and its remedies.
5. Practice in setting current and voltage for striking proper arc. Earthing of welding machine.

UNIT 3 SHEET METAL SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in sheet metal shop.
3. Demonstration of various machines and equipment used in sheet metal shop.
4. Demonstration of various raw materials used in sheet metal.

UNIT 4 SMITHY SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in smithy shop.
3. Forging operations in smithy shop. Safety measures to be observed in the smithy shop.
4. Demonstration and description of bending operation, upsetting operation.
5. Description and specification of anvils, swage blocks, hammers etc.
6. Demonstration and description of tongs, fullers, swages etc.

References Books:

1 Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary; Media Promoters and Publishers Pvt. Ltd., Bombay
2 Workshop Technology by Manchanda Vol. I,II,III; India Publishing House, Jalandhar.
3 Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4 Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi [R5] Workshop Technology by B.S. Raghuwansh;,Dhanpat Rai and Co., New Delhi.
5 Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

(BVBG003) Information Technology Workshop

Theory & Practical

Note: Explanation of Introductory part and theory should be merged with practical work. Following topics may be explained in the laboratory along with the practical exercises.

UNIT 1. Computer Organization & OS: User perspective.

- Concept and scope, applications of IT, ethics and future with information technology
- Impact of computer and IT in society
- Understanding of Hardware.
- Basics of Operating System.

UNIT 2. Networking and Internet.

- Practice of Internet surfing and its Applications
- Log-in to internet, introduction to search engine
- Browsing and down loading of information from internet
- Creating e-Mail Account, Log in to e-mail account and Log out from e-mail account
- Managing e-Mail- Creating, Sending, receiving, forwarding, deleting, attaching a file
- Network Security tools and services.
- Cyber Security.
- Safe practices on Social networking.

UNIT 3. Office automation tools:

- Spreadsheet.
- Word processing.
- Presentation.

UNIT 4. Antivirus

- Antivirus- installation & scanning of corrupted files
- What is virus and its types
- Problems due to virus
- Installation and updation of antivirus (anyone out of Kaspersky,
- Mcafee, Norton, Quickheal etc).
- How to scan and remove the virus

UNIT 5. Introduction to programming

- Introduction to programming- "C/C++
- Development of C, starting with C- alphabets, digits, special symbols
- Constants, variables and special symbols, Instructions
- Study of C- pre-processor features
- Study of structures- case control structures, loops control structures and decision control structures
- Study of input output functions, types of functions
- Study of file concept- opening, reading, closing, writing etc
- Study and use of concept of pointers
- Study the concept of arrays

References Books:

1. Fundamentals of Computer by E. Balagurusamy, Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
4. MS Office by BPB Publications, New Delhi
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. C by Byron Gottfried, Schaum's outline series, McGraw Hill Education series.
7. Programming in ANSI C by E. Balaguswamy, McGraw Hill Education series

(BVBG004) Basic Engineering Drawing

Theory & Practical

Note: Explanation of Introductory part and theory should be merged with practical work. Following topics may be explained in the laboratory along with the practical exercises.

UNIT 1: Introduction to Engineering Drawing

Principles of Engineering Drawing and their significance, usage of Drawing instruments, Sizes and layout of standard drawing sheets, Sizes of drawing boards, drafting table/board, Different types of Lines and Free Hand Sketching, Different types of lines in engineering drawing as per BIS specifications, Lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

UNIT 2: Orthographic Projections

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

UNIT 3: Projections of Regular Solids

those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT 4: Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

UNIT 5: Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

References Books:

1. ND Bhatt, V.M. Panchal, Engineering Drawing-Planes & Solid Geometry", Charotar publishing house Principles of Building Drawing by MG Shah and CM Kale, MacMillan, Delhi
2. Zaidi, SKA and Siddiqui, Suhail; "Drawing and Design of Residential and Commercial Buildings", Standard Publishers and Distributors, Delhi.
3. Surjit Singh, "Engineering Drawing: A Text Book of Engineering Drawing, Dhanpat Rai & Co.

(BVBG005) Engineering Drawing with AutoCAD

Theory and Practical

Note: Explanation of Introductory part and theory should be merged with practical work. Following topics may be explained in the laboratory along with the practical exercises.

UNIT 1: Overview of Computer Graphics

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

UNIT 2: Customisation & CAD Drawing

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

UNIT 3: Annotations & layering

Applying dimensions to objects, applying annotations to drawings; Setting up and use of layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, UNIT 4: Computer-aided design (CAD) software modeling

Modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

UNIT 5: Demonstration of a simple team design project that illustrates

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling.

References:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals.

Course code	**EMC-101-25**					
Category	Skill Based					
Course title	Entrepreneurship Setup and Launch					
Scheme & credits	**L**	**T**	**P**	**Credits**	**Internal**	**External**
	0	**0**	**4**	**2**	**60**	**40**
Semester	**I**					
Prerequisites (if any)	**-**					

INTRODUCTION:

This semester lays the foundation for the learner to understand what entrepreneurship is, beyond just starting a business. It introduces key ideas like problem-solving, value creation, and self-awareness. The learner will begin exploring basic business concepts while discovering their own interests and strengths.

LEARNERS OBJECTIVE:

1. Understand the core concepts of entrepreneurship through relatable, real-life examples.
2. Begin to see themselves as problem-solvers and creators.
3. Learn about business paths and choose one to try based on interest or local fit.
4. Launch a micro-hustle (online or offline) to earn their first income.
5. Build confidence and self-belief by doing.

OUTCOME: By the end of this semester, learners will start a simple business activity, earn their first income, and build belief in their ability to do business.

GUIDING PRINCIPLES/APPROACH:

This syllabus is built on principles of **experiential learning, growth mindset development**, and **identity-first learning**. Drawing from learning science and behavior design, the course shifts students from passive learning to *active doing*, where they try out small business activities in real contexts. The design helps students not just learn entrepreneurship but begin to see themselves as entrepreneurs. Emphasis is placed on *small wins, peer collaboration, and locally relevant opportunities* to ensure learning feels achievable and connected to their realities. The curriculum focuses on conceptual understanding without heavy theory, combining *practical action, reflection, and collaboration. By making progress visible and success feels possible, it plants the seeds of self-reliance, initiative, and long-term motivation.*

SEMESTER SYLLABUS:

Format: 12 weeks, 4 hours/week | 2 credits
Revenue Target: ₹10,000

Week	Learning Goal	Measurable Outcome
1	Understand what entrepreneurship is and who can be an entrepreneur	Students define entrepreneurship in their own words and list 2 entrepreneurs from their local area or community
2	Connect personal identity to entrepreneurship (strengths, interests, struggles)	Students create a "value map" showing how a skill/interest/problem from their life could become a business opportunity
3	Learn about 5 business paths: content creation, drop-shipping, cloud kitchen/food business, gig economy and local services	Students explore 1–2 examples from each domain and share one they're most curious to try and why
4	Choose a path and generate a basic business idea	Students write down a clear offer (what, for whom, why) and one way to reach their customer

Week	Learning Goal	Measurable Outcome
5	Take first real action: message, post, pitch, or sell	Students reach out to or serve 1 real potential customer and record what happened
6	Reflect on first attempt and share with peers	Students share their result, a challenge faced, and one idea to improve next time
7	Improve and try again: aim for first ₹100	Students apply a change, try again, and aim to make their first ₹100 or get meaningful response
8	Learn how to identify and understand your target customer	Students talk to 2 potential customers or observe them and list 3 insights about their needs
9	Learn how to serve your target audience better	Students improve one part of their offer (product, delivery, messaging, or interaction) based on customer feedback or need
10	Explore core entrepreneurial values (resilience, honesty, effort)	Students reflect on 1 value they're building and show it in a business task or peer story
11	Focus on earning and staying consistent	Students complete a second earning task and track their consistency (e.g., same product or message for 3 days)
12	Reflect on earnings, grit, and how to keep going	Students record total earnings, one resilience moment, and one support system or habit they'll continue with

WEEKLY COMPONENT:

Component	Duration	Description
Learning Module	~1.5 Hrs	•Introduces key concepts in a simple and engaging way. •Includes, examples, and 1–2 interactive discussions or quizzes
Action Lab	~1.5 Hrs	•Hands-on task on the weekly concept •Includes step-by-step guidance, templates, and worksheets •Ends with a submission (e.g., video, reflection, or proof of action)
Resources	Self-paced	Supplementary videos, short readings, real- life stories, and tools to deepen understanding at their own pace

EVALUATION CRITERIA:

Evaluation Component	Description	Weightage
Weekly Task Completion	Timely submission of weekly tasks including reflections, activities, quizzes etc.	30%
Target Completion	Performance-based evaluation on hitting revenue or profit targets (e.g., generating ₹10,000 revenue)	30%
Final Project	A comprehensive project based on the semester's theme	40%

Week 1: What is Entrepreneurship? Who Can Be an entrepreneur?

INTRODUCTION: Could *You* Be an entrepreneur?

When people hear "entrepreneur," they often think it means having a company, investors, or an MBA. Some even believe it's only for toppers or those with high grades. But entrepreneurship is more about mindset than qualifications: it's about seeing a problem and doing something about it. Like someone who starts selling snacks because their school canteen is always shut, or a friend who fixes broken chargers for others. If you've ever spotted a need and thought, "I can solve this," - you've already taken your first step.

Component 1: Learning Module (~1.5 hours)

Unit 1: What is Entrepreneurship?

1. *Solving problems or creating value in exchange for money.*
2. Entrepreneurship is not just about starting a company: it's about initiative, resourcefulness, and value creation.
3. Different types of entrepreneurs: small shop owners, street vendors, YouTubers, local tailors, mechanics, and more.
4. Entrepreneurs build opportunities instead of waiting for them.

Simple Slide/Visual Aid Tip:

A circle that says "Problem", an arrow pointing to "Solution", then an arrow to "Earn". That's entrepreneurship.

<A video that visually shows how entrepreneurship starts with spotting a problem (e.g., long food lines), creating a solution (e.g., pre-order lunch service), and earning from it: illustrating the simple flow: Problem → Solution → Earn>

MCQ 1

Q: What best describes entrepreneurship?

A. Getting a job in a company
B. Solving problems for others and earning from it
C. Studying business in college
D. Buying expensive things

Feedback:

1. *Correct! Entrepreneurs solve problems or offer value and get paid for it.*
2. *Not quite! Entrepreneurship is about creating something useful, not just getting a job or studying.*

Unit 2: Who Can Be an entrepreneur?

Entrepreneurship starts with spotting a problem, finding a solution, and creating value. Today, anyone with a phone and an internet connection can start a business: money helps, but mindset and initiative matter more at the start.

You just need:

1. A problem to solve
2. A simple skill or product
3. The courage to start small

Examples Carousel (Swipeable cards)

1. **Pooja (India)** – Sells handmade rakhis on Instagram, learned designing on YouTube.
   Problem she saw: *Expensive or generic rakhis in the market; no personal touch*.
2. **Luis (Mexico)** – Repairs used phones in his garage, now has loyal customers.
   Problem he saw: *Many people couldn't afford new phones or didn't trust local repair shops*.
3. **Sana (Kolkata)** – Started tiffin delivery from her home kitchen, now earns ₹500/day.
   Problem she saw: *Office workers struggled to find affordable, homemade meals*.
4. **Sal Khan (USA)** – Started Khan Academy with YouTube lessons to help his cousin.
   Problem he saw: *His cousin needed help with math, but good learning resources were hard to access*.

MCQ

Q: Which of these can be a form of entrepreneurship?

A. Making reels on skincare tips and selling homemade face packs
B. Buying new clothes from malls
C. Studying engineering
D. Playing games without sharing or streaming

Feedback:

1. Correct! Sharing useful tips + selling a product = solving a need!
2. Try again! Entrepreneurship is about creating value and helping others.

Reflection Prompt

1. If you had to earn ₹100 this week, what would you do?

Component 2: Action Lab (~2 hours) Task

Find & Learn from 2 Entrepreneurs Near You

Steps (Checklist):

1. Look around your neighborhood or online: find 2 people who earn through their own work
2. Ask or observe:
   a) What do they do?
   b) How do they earn?
   c) What makes them entrepreneurial?
3. Use the **Entrepreneur Tracker Template** (available in the resources tab)

Final Deliverable

Learner submits:

1. A short definition of entrepreneurship (in their words)
2. 2 entries from the Entrepreneur Tracker (name, what they do, what learner learned)

→ Submitted in the submissions tab.

Supplementary Resources (Optional)

1. Danny O'Neill - Getting started | Entrepreneurship | Khan Academy
2. The Better India – Stories of local entrepreneurs

Week 2: Can I Be an entrepreneur?

INTRO – What Makes an entrepreneur?

You don't need a suit, a degree, or a lot of money to be an entrepreneur.

You need one thing: a mindset. Entrepreneurs notice problems around them: and do something about it. From the boy fixing bikes outside his house to the girl teaching dance on Instagram, they all started small. What matters most is not what you have: it's how you think and act.

Component 1: Learning Module (~1.5 hours)

Unit 1: What Makes an entrepreneur?

Key Concepts:

1. **Entrepreneurs are driven by curiosity**: they ask questions, explore possibilities, and seek better ways to do things.
2. **They take initiative**: they act, experiment, and create using limited resources with creativity and courage
3. **They learn by doing**: embracing mistakes as stepping stones to progress.
4. **They take full ownership**: one day they're the marketer, the delivery person, and the customer support, all in one.
5. **They are resilient**: they persist through challenges, adapt to change, and keep moving forward with purpose.

Real-Life Examples:

1. Nithin & Nikhil Kamath (Zerodha) – Started India's largest stock brokerage without formal degrees or external funding, just deep curiosity about stock markets and a desire to simplify investing.
2. *Qualities: Took initiative early and stayed persistent through challenges.*
3. Prajakta Koli (MostlySane) – Started by making comedy sketches about everyday Indian life: family, school, relationships: and became one of India's top digital creators.
4. *Qualities*: Stayed consistent, adapted over time, and built strong audience trust.
5. Tilak Mehta (Paper n Parcels) – As a teenager, launched a courier startup using Mumbai's dabbawala network for delivery.
6. *Qualities*: Thought creatively and acted with confidence at a young age.

Unit 2: Start Small: Build Ideas from What You Know

In the last unit, you learned that entrepreneurs don't just have ideas: they act, solve problems, and use what they have.
But the big question now is:

"What can I offer?"

That's where the Value Map comes in. It helps you take your first step toward thinking and acting like an entrepreneur: in your own way.

What is a Value Map?

A Value Map connects three simple things:

A. **What people around you need**

→ *Look around: is there something people often struggle with or something that could be better?*

B. **What you enjoy or are willing to try**

→ *You don't need to be an expert. Start with small things you like doing: talking to people, fixing, organizing, helping, designing, or learning something new.*

→ *Even if you're just curious about something: that's enough to begin.*

C. **What solution you can create**

→ *Use what you enjoy or are learning to try solving a real need around you: even in a small way*

Visuals:

3 overlapping circles:

1. "People Need"
2. "I Can"
3. "My Offer"

Examples:

1. **People Need → Affordable meals**

   I Can → Cook + have access to home kitchen My Offer → ₹40 tiffin service

2. **People Need → Study tips in Punjabi I Can → Speak clearly + love teaching**

   My Offer → 3-minute video tips on Instagram

MCQ

Q: What's the first step to being an entrepreneur?

A. Waiting for the perfect idea
B. Solving a problem with your skills
C. Buying a shop
D. Studying for years

Feedback:

1. *Correct! Entrepreneurs start by solving small problems using what they already have.*
2. *Try again! It's not about waiting: it's about starting.*

Reflection Prompt

1. If someone gave you ₹500 and asked you to earn from it, what would you do?

Component 2: Action Lab (~2 hours)

Task: Create Your Personal Value Map Steps (checklist in app):

1. Think of 2–3 problems people face around you (hunger, phone repair, boredom, etc.)
2. List your own skills, interests, or resources.
3. Match each problem with something you could offer.
4. Use the Value Map Template in the resources to organize your ideas.

Final Deliverable (Submitted in App):

1. Your completed **Value Map** (in 3 columns: Need, Skill, Offer)
2. Highlight **1 idea** you'd like to explore for your future hustle

Supplementary Resources (Optional)

1. "Start with Why" by Simon Sinek
2. 10 Characteristics of Successful Entrepreneurs | Business: Explained

Level-5 (Semester-I)

(BVBCT-101-20) Applied Physics

Theory

UNIT 1 Units & Dimensions:

M.K.S. fundamentals & derived units, S.I. base units supplementary units and derived units, Dimensions of various physical quantities, uses of dimensional analysis.

Surface Tension and Viscosity: molecular forces, molecular theory of surface tension, surface energy, capillary action, concept of viscosity, coefficient of viscosity, principle and construction of viscometers.

UNIT 2 Vibrations:

Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance. Effects of vibrations on building bridges and machines members.

Heat: Temperature and its measurement, thermoelectric, platinum resistance thermometers and pyrometers. Conduction through compound media and laws of radiations.

UNIT 3 Optics:
Nature of light, reflection and refraction of a wave from a plane surface. Overhead projector and Epidiascope.

UNIT 4 Centroid and Moment of Inertia:

Centroid for regular lamina, centriod of composite figures. Concept of Moment of Inertia and second moment of area and Radius of gyration, theorems of parallel axes, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations). Second moment of area for I., T. and I sections,

UNIT 5 Friction:

Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; motion on horizontal and inclined planes. Methods of reducing friction,

Text and Reference Books :

1. A text book of Optics – Brij Lal and Subramanyam
2. Perspectives of Modern Physics - Arthur Beiser (TMH)
3. Modern Engineering Physics – A.S. Vasudeva (S. Chand)
4. Engineering Physics by R.K. Gaur and S.L. Gupta
5. Engineering Physics by H.K Malik and A.K. Singh (Tata McGraw Hill).
7. Engineering Physics by S.P. Taneja (Chand Pub.)
8. Introduction to Mechanics - MK Verma, CRC Press Book.

(BVBCT-102-20) Applied Mathematics

Theory

UNIT 1 Algebra:

Complex Numbers, Quadratic Equations and Linear inequalities, Principle of Mathematical Induction, Permutations and Combinations, Binomial Theorem.
Matrices, Determinants, Inverse and rank of a matrix, introduction of null space and kernel, statement of rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Similar matrices; Diagonalization of matrices; Cayley-Hamilton Theorem.

UNIT 2 Calculus:
Limits and Continuity, Differentiation, Differentiation of Trigonometric functions, Differentiation of Exponential and Logarithmic functions, Application of Derivatives, Partial Differentiation & its Applications: Functions of two or more variables; partial derivatives, Euler's theorem, Taylor's series for functions of two variables, maxima-minima of function of two variables.

Integration, Definite Integrals, Differential Equations, Evaluation of definite and Improper integrals; Applications of Single & Multiple Integration: Applications of single integration to find volume of solids and surface area of solids of revolution. Double integral, change of order of integration, Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution.

UNIT 3 Partial Differential Equations: First order:
First order partial differential equations, solutions of first order linear and non-linear PDEs. Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method.

UNIT 4 Co-ordinate Geometry

Cartesian System of Rectangular Co-ordinates, Straight Lines, Circles, Conic Sections

UNIT 5 Statistics and Probability
Measures of Dispersion, Random Experiments and Events, Probability

Text and Reference Books:

1. Advanced Engineering Mathematics : F. Kreyszig.
2. Higher Engineering Mathematics : B.S. Grewal.
3. Engineering Mathematics Part-I : S.S. Sastry.
4. Differential and Integral Calculus : Piskunov.
5. Advanced Engineering Mathematics : R.K. Jain and S.R.K.Iyengar
6. Advanced Engg. Mathematics : Michael D. Greenberg

(BVBCT-103-20) Applied Chemistry

Theory:

UNIT 1 Structure of Atom:

Rutherford model of the structure of atom, Bohr's theory of electrons, quantum numbers and their significance, de-Broglie equation and uncertainty principle, electronic configuration of 1 to 30 elements

Periodic Properties of Elements:

Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity, Division of elements into s, p, d and f blocks

UNIT 2 Chemical Bonds:

Electrovalent, covalent and coordinate bond and their properties, Metallic bonding (electron cloud mode) and properties (like texture, conductance, luster, ductility and malleability).

UNIT 3 Fuel and their Classification:

Definition, characteristics, classification into solid, liquid and gaseous fuel,. Petroleum and brief idea of refining into various factions and their characteristics and uses, Calorific value of fuel, Gaseous fuels-preparation, properties, composition and use of producer gas, water and oil gas, Natural gas: Natural gas treatment processes; Natural gas liquids; Properties of natural gas.

Unit 4 Water and Corrosion:

Impurities in water, methods of their removal, hardness of water, its types, causes and removal, disadvantages of hard water in boilers, pH value and its determination by calorimetric method. alkalinity of water and its determination, water softening.

Corrosion: Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings.

UNIT 5 Plastic and Polymers:

Plastic-thermo-plastic and thermo-setting, Introduction of Polythene. P.V.C. Nylon, synthetic rubber and phenol-formal-dehyde resin, their application in industry. composite materials & their classification, constituents of composites, role of interface in composite performance and durability, fiber – Reinforced composite, advantage and applications of composites

Text and Reference Books:

1. Physical Chemistry, P.W. Atkins (ELBS, Oxford Press).
2. Physical Chemistry, W.J. Moore (Orient-Longman).
3. Instrumental methods of Chemical Analysis, MERITT & WILLARD (East-West Press).
4. Chemistry in Engineering & Tech., Vol.I& II, Rajaram, Kuriacose (TMH)
5. Engineering Chemistry, Shashi Chawla (DhanpatRai and co.)
6. Engineering Chemistry, P.C. Jain, Monica Jain (DhanpatRai& Co.).
7. Engineering chemistry , S.S Dara (S.chand&co.)
8. Sami Matar, Lewis F. Hatch, Chemistry of Petrochemical Processes, Second Edition, Gulf Publishing Company, Houston, Texas

(BVBCT-104-20) Communication Skills

Theory

UNIT 1

Recognizing and Understanding Communication Styles: What is Communication?, Passive Communication, Aggressive Communication, Passive-Aggressive Communication, Assertive Communication, Verbal and Non Verbal Communication, Barriers and Gateways to Communication.

UNIT 2

Listening Skills: Types of Listening (theory /definition), Tips for Effective Listening Academic Listening- (lecturing), Listening to Talks and Presentations, Basics of Telephone communication

UNIT 3 Writing Skills: Standard Business letter, Report writing, Email drafting and Etiquettes, Preparing Agenda and writing minutes for meetings, Making notes on Business conversations, Effective use of SMS, Case writing and Documentation.

UNIT 4

Soft Skills: Empathy (Understanding of someone else point of view), Intrapersonal skills, Interpersonal skills, Negotiation skills, Cultural Aspects of Communication.

UNIT 5

Group Communication: The Basics of Group Dynamics, Group Interaction and Communication, How to Be Effective in Groups, Handling Miscommunication, Handling Disagreements and Conflicts, Constructive Criticism.

Text and reference Books:

1 Mckay, M., Davis, M. & Fanning, P.(2008). Messages: The Communication Skills Book, New Harbinger Publications
2 Perkins, P.S., & Brown, L. (2008). The Art and Science of Communication: Tools for effective communication in the workplace, John Wiley and Sons
3 Krizan et al (2010). Effective Business Communication, Cengage Learning.
4 Scot, O. (2009). Contemporary Business Communication, Biztantra, New Delhi.
5 Chaney & Martin (2009). Intercultural Business Communication, Pearson Education
6 Penrose et al (2009). Business Communication for Managers, Cengage Learning.

(BVBCT-105-20) Applied Physics Lab

1. To determine the surface tension of a liquid by rise in capillary.
2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a sonometer.
4. To determine the frequency of AC main using sonometer.
5. To determine the time period of a cantilever.
6. To find the coefficient of thermal conductivity of a good conductor by Searle's method.
7. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton method.
8. To find the resolving power of a telescope.
9. To find the refractive index and Cauchy's constants of a prism by using spectrometer.
10. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.

(BVBCT-106-20) Applied Chemistry Lab

1. Proximate analysis of solid fuel.
2. Experiments based on Bomb Calorimeter.
3. Determination of turbidity in a given sample.
4. To determine the flash and fire point of a given lubricating oil.
5. To determine the viscosity of a given lubricating oil by Redwood viscometer.
6. To determine cloud and pour point of a given oil.
7. Determination of Ca++ and Mg++ hardness of water sample using EDTA solution.
8. Determination of alkalinity of water sample.
9. Determination of strength of HCl solution by titrating it against NaOH solution conductometrically.
10. To determine amount of sodium and potassium in a given water sample byflame photometer

(BVBCT-107-20) Communication Lab

Listening and Speaking
The audio CD shall be played in the lab to get the students familiar with the standard spoken English. The teacher shall help them in the following:
a) With the accent of the speaker if it is unfamiliar to them.
b) The Standard English sounds and pronunciation of words.
c) With the topical vocabulary and the idiomatic expressions which are generally part of colloquial speech.
d) With the implied relationships in larger texts, if they are not stated explicitly.

In addition to the above, extended listening sessions shall be arranged to promote speaking activities among students. The teachers shall play the CDs selectively in the lab and involve the students in the practice work based on them. While taking up lessons, the teacher must promote the use of dictionaries for correct pronunciation and give ample practice on word stress and weak forms.

The students are also supposed to supplement their listening practice by regularly viewing news/knowledge channels on the TV or lecture videos on the internet.

The teacher may use following different classroom techniques to give practice and monitor the progress of the students:
Role play, question-answer discussion, presentation of papers, seminars, Telephonic Conversation, Exchange of Greetings, Interview, Group Discussion, Extempore, Listening Practice Skills

Tools: A set of twin books K. Sadanand and S. Punitha Spoken English Part I and II, A Foundation Course (with audio CD), Orient Blackswan, is prescribed for use.

(BVBCT-108-20) Civil Workshop training

Practical

MASONRY SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in Plumbing shop.
3. Preparation of mortar and cement concrete
4. Importance of form work and material used in form work
5. Slab, lintel & sunshade, column & footing and beam reinforcement
6. Differentiate and demonstrate steel reinforcement bars of different diameters (plain bar, ribbed, tor steel etc.)

PLUMBING & SANITATION

1. Demonstration, function and use of commonly used tools. Necessity of plumbing, Technical terms used
2. Care, maintenance of tools and safety measures to be observed in Plumbing shop.
3. GI pipe marking, threading, cutting and jointing
4. PVC pipe marking, cutting, threading and jointing
5. Use of PPR and their jointing
6. Building services, types of valves and uses
7. Water meter connection, water closets, flush tanks
8. Field visit

CARPENTRY SHOP

1. Demonstration, function and use of commonly used hand tools.
2. Care, maintenance of tools and safety measures to be observed in carpentry shop.
3. Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).
4. Marking, sawing, planning and chiseling & their practice (size should be mentioned)
5. Introduction to various types of wooden joints, their relative advantages and uses.

PAINTING SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in painting shop.
3. Demonstration of various types of paints used
4. Methods of painting walls, wooden items
5. Preparation of walls, wooden surface before painting including primer coating.

ELECTRICAL SHOP

1. Demonstration, function and use of commonly used tools.
2. Care, maintenance of tools and safety measures to be observed in Electrical shop.
3. Familiarization with various electrical tools and safety measures
4. Study of various types of wirings: conduit/concealed/batten etc
5. Study of distribution boards
6. Various types of faults in house wiring

References Books:

1. Workshop Technology I, II,III, by S K Hajra, Choudhary and A K Chaoudhary; Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I, II, III; India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technology by B.S. Raghuwansh;,Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi

Level-5 (Semester-II)

(BVBCT-201-20) Building Planning and Design

Theory

UNIT 1

Building bye-Laws- Introduction, Terminology, Objectives, Floor area ratio (FAR) and Floor space Index (FSI), Principles underlying building byelaws, Minimum plot sizes and building frontage, Open spaces, Minimum standard dimensions of building elements. Provisions for - lighting & ventilation, safety from fire & explosions, means of access, drainage & sanitation and safety of works against hazards or accidents. Requirements for- off street parking, green belt and landscaping, special requirements for low income housing, Sizes of structural elements and Applicability of the bye-laws. Climate and its influence on building planning- Solar radiation, Temperature of air, Wind, Humidity, Precipitation, Climatic zones, Climate and comfort, Earth and its motion, Directions and their characteristics, Landscaping.

UNIT 2

Principles of Planning of Buildings- Aspect, Prospect, Privacy, Furniture requirement, Roominess, Grouping, Circulation, Sanitation, Lighting, Ventilation, Cleanliness, Flexibility, Elegance, Economy, Practical Considerations.

Orientation Of Buildings- Introduction, Orientation, Factors affecting orientation, Sun, Wind, Rain, C.B.R.I.: Suggestions for obtaining optimum orientation, Orientation criteria for Indian conditions. Economy Measures in Building Construction- General, Economy of land, material of construction, labour, time and money spending. Introduction to Building Drawing and Brief History of Building Drawing, planning of residential buildings and public buildings.

UNIT 3

Functional Planning of Buildings: Strategies for the basic planning, for various functions of various types of buildings such as Residential Buildings, Commercial Buildings, Institutional Buildings and Hospital Buildings.

UNIT 4

Spatial planning of buildings: Allocation of spaces for various functions, planning for location of doors and windows in the building, Design of window for natural day-light consideration, window-wall ratio, surface-volume ratio.

UNIT 5

Drawing & Detailing of Residential Buildings: Drawing of Layout Plans, Elevations and Sections of single storeyed and double storeyed Residential Buildings.

Text and Reference Books

1. Moore F., Environmental Control System McGraw Hill, Inc., 1994.
2. Brown, G Z, Sun, Wind and Light: Architectural design strategies, John Wiley, 1985.
3. Cook, J, Award - Winning passive Solar Design, McGraw Hill, 1984.
4. Kumara swamy and Kameswara Rao, Building Panning and Drawing, Charotar Publishing House Pvt. Ltd.
5. Dr. H. J. Shah, Building Panning and Drawing, Charotar Publishing House Pvt. Ltd.
6. Malik, R. S., "Civil Engineering Drawing", Asia Publishing House
7. Shah, M. G. and Kale, C. M., "Principles of Building Drawing", MacMillan, Delhi

(BVBCT-202-20) Estimating and costing

Theory

UNIT 1

Introduction to quantity surveying/ estimating and its importance. Types of estimates; - Preliminary estimates, Plinth area estimate, Cubic rate estimate and Estimate per unit base. Detailed estimates- Definition- Stages of preparation – details of measurement and calculation of quantities and abstract. Units of measurement for various items of work as per BIS:1200. Rules for measurements. Different methods of taking out quantities – Centre line method and long wall & short wall method. Preparation of detailed estimate complete with detailed reports, specifications, abstract of cost and material requirement statements for a small residential building with flat roof.

UNIT 2

Analysis of rates: Detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation.

(i). Steps in the analysis of rates for any item of work: Requirement of materials, labour, sundries, water charges and contractor's profit.

(ii). Calculation of quantities of materials for:

a. Cement mortars of different proportion
b. Cement concrete of different proportion
c. Brick/stone masonry in cement mortar
d. Plastering and pointing
e. White washing, painting
f. R.C.C. work in slab, beams.

(iii). Analysis of Rates- Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads.

(iv). Running and maintenance cost of construction equipment.

UNIT 3

Contracting: Meaning of contract, Qualities of a good contractor, Essentials of a contract, Types of contracts, their advantages, disadvantages and suitability, system of payment. Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period. Types of contracting firms/ construction companies. Introduction to CSR and calculation of cost based on premium on Common Schedule Rates (CSR).

UNIT 4

Billing: Measurement of work for payment of contractors and suppliers. Type of Measurement book, Maintenance of measurement book. Types of payments: First, running, advance, first & final and final payment.

UNIT 5

Valuation: Purpose of valuation, principles of valuation, Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc. Methods of valuation (i) replacement cost method (ii) rental return method .

Text and Reference Books:

1 B. N. Dutta- Estimating and costing in Civil Engg, UPSPD.
2 M .Chakraborty, "Estimating costing and Specifications in Civil Engg", Jain Book Depot
3 D.S.R. [Detailed Schedule Rates] C.P.W.D
4 PWD Account Code
5 Samuelson and Nardhaus-Economics, Mc Graw Hill
6 'Text book of Estimating and Costing' by G.S.Birdie
7 'Civil Engineering Building Drawing' by Gurucharan Singh

(BVBCT-203-20) Construction Materials and Technology

Theory

UNIT 1

Building Stones: Classification of Rocks, Geological classification: Igneous, sedimentary and metamorphic rocks. Chemical classification: Calcareous, argillaceous and siliceous rocks. Physical classification: Un-stratified, stratified and foliated rocks; Requirements of good building stones, testing & identification of common building stones and their uses.

Bricks and Tiles: Introduction to bricks, Raw materials for brick manufacturing and properties of good brick making earth, Classification of bricks as per IS: 1077, Testing of common building bricks as per IS: 3495. Compressive strength, water absorption, efflorescence test, Dimensional tolerance test. Types and use of- tiles for wall, roofing & flooring; ceramic tiles; Hollow masonry blocks; Fly ash bricks.

UNIT 2

Cement: Introduction, raw materials, manufacturing of ordinary Portland cement, flow diagram for wet and dry process. Properties and uses of ordinary Portland cement. Special cements and their uses. Storage of cement.

Lime: Introduction: Lime as one of the cementing materials. Definition of terms; quick lime, fat lime, hydraulic lime, hydrated lime, lump lime. Calcinations and slaking of lime IS classification of lime. Definition- Properties and uses of Mortar. Types of mortar, cement & lime Mortar, Preparation of cement Mortar.

UNIT 3

Timber and wood based products: Identification of different types of timber: Teak, Deodar, Shisham, Sal, Mango. Market forms of converted timber as per IS. Seasoning of timber: purpose, methods of seasoning. Defects and decay in timber, Preservation of timber and methods of treatment, Properties and specifications of structural timber. Other wood based products, their brief description of manufacture and uses: Lamina board, Black board, fiber board. Hard board and gypsum board.

Steel: Manufacture of steel, market forms of steel e.g. mild steel and HYSD steel bars, rolled steel sections.

UNIT 4

Concrete: constituents of concrete, important properties of concrete both in plastic state and hardened state, brief idea about- various stages of preparation of concrete, workability of concrete and Methods to determine workability, Reinforced cement concrete, shotcrete, lightweight & heavyweight concrete, Ready- mixed concrete, fibre reinforced concrete and pre-stressed concrete.

UNIT 5

Miscellaneous Materials: Paints- Purpose, Types, ingredients, properties and uses of oil paints, water paints and Cement paints. Varnishes- Types, properties and uses of varnishes, Trade name of different products. Metals: - uses of ferrous and non- ferrous metals, Commercial forms of ferrous and non-ferrous metals. Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes. Types uses and application of- Fiber Sheets, sound and heat insulating materials, Materials used in interior decoration works like POP, Water proofing compounds, fire resisting materials.

Text and reference Book(s):

1. Surendra Singh; "Engineering Materials; "New Delhi". Vikas Publishing House Pvt. Ltd.
2. TTTI, Chandigarh "Civil Engineering Materials; "Tata McGraw Hill.
3. M.L.Gambhir and Neha Jamwal, "Building Materials", Tata McGraw Hill.
4. Building Materials, P.C.Varghese, PHI Publications
5. Engineering materials S.C. Rangwala, Charotar Publishing House
6. Building Materials, Duggal, New Age Publication
7. Kulkarni, GJ; "Engineering Materials; "Ahmedabad, Ahmedabad Book Depot.
8. Gambhir, M. L., "Concrete Technology" MacMillan India Ltd., New Delhi

(BVBCT-204-20) Construction Planning, Machines and Equipments

UNIT 1.
Introduction: Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs.

UNIT 2.
PERT :Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems.

UNIT 3.
CPM :Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems.

UNIT 4.
Cost Analysis and contract :Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems, updating a project, when to update, time grid diagram, resource scheduling.

UNIT 5.
Construction Machinery and Equipment :Tractors, bull dozers, rippers, scrappers, power shovels, dragline, hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment.
Hoisting & Transporting Equipments: Hosts, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons.
Other Equipments: Plants for grading, batching, mixing, types of mixers, concrete pumps, bitumen plants.

Reference Books:

1. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi
2. PERT and CPM - L.S.Srinath, East West Press
3. Management Guide to PERT & CPM - Wiest & levy; Prentice Hall
4. Construction Equipment & Planning and Application. - Mahesh Verma Artec Publication.
5. Construction Planning and Management by U. K. Shrivastava; Galgotia Publications Pvt. Ltd.
5. Construction

(BVBCT-205-20) Building Drawing Lab.

1. Sectional views:
a. cutting planes methods of representing sections
b. conventional sections of various material
c. classification of sections
d. conventions in sectioning
2. Drawing of full section, half section, partial or broken out section, offset sections, revolved sections & removed sections. Exercise on sectional views of different objects.
3. Drawing of different conventions for materials in sections. Conventional breaks for shafts, pipes: Rectangular /square/circular, angle, channel and Rolled sections.
4. Symbols, Conventions and simple drawing of sanitary fitting symbols
5. Draw the Electrical fittings Symbols for domestic interior installations
6. Building plan drawing with Electrical and Civil Engineering symbols.
7. Drawing of Layout Plans,
8. Drawing of Elevations of single storeyed and double storeyed Residential Buildings
9. Drawing of Sections single storeyed and double storeyed Residential Buildings
10. Isometric drawing of Residential buildings.

Note: Students should be encouraged to use drawing and drafting software like AutoCAD, FreeCAD, etc

(BVBCT-206-20) Estimating and Costing Lab

List of Activities:

A. Detailed estimate for building taking of quantities for all items of works in the following types of building:

1) A small residential building with two / three rooms with RCC roofs.
2) Two storied building (frame structure) with RCC roofs.
3) Cottages with sloped RCC roofs.
4) Industrial buildings with AC / GI sheet roof with steel trusses.
5) Community hall with columns and T-Beams.
6) Open well with masonry steining.
7) Septic tanks with dispersion trench / soak pit.
8) R.C.C. slab culvert.
9) Water bound Macadam Road

B. Rate analysis for following item of works.

1. Brick work for super structures.
2. PCC work for footing.
3. RCC work for beam, Column and slabs.
4. Plaster work
5. White/ Color washing

C. Taking out quantities for embankment and canals

(BVBCT-207-20) Construction Materials Lab.

1. Students will do the market survey of below mentioned construction materials and products and prepare a report on types, rates, use, measurement and other specifications, etc.
    - Bricks. Hollow blocks, etc., Tiles- Flooring tiles and clay roofing tiles, Terra Cotta- earthen ware, stone ware, S.W. pipes, water closets gully traps & glazed earthen tiles.
    - Cement - ordinary Portland, quick setting cement & other special cement, Lime: Hydraulic lime, & limes.
    - Stones - Coarse aggregate and fine aggregate, Brick ballast & surkhi, marble, granite, etc
    - Marketable forms of various types timber available in market, Various preservatives of timber available in market, Timber allied products such as plywood, hard board, block board, and sunmica.
    - Hardware - such as screws, nails, bolts & nuts, hinges for door fitting, door closer and stoppers.
    - Sound insulating material available in the local Market, Fire proofing materials available in the local market, Dam proofing materials available in the local market, use of damp proofing chemical.
2. Brick – Stacking of bricks, counting of bricks
3. Field tests of bricks such as for texture, dimensions, water absorption, colour & efflorescence, etc
4. Field tests of cement - texture, touch and feel, colour, etc.
5. Field tests of steel - unit weight, dimensions, visual inspection, etc
6. Field visits for demonstration of application or use of construction materials.

SEMESTER 3rd

Applied Mechanics

1. Introduction

Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics. Definition, basic quantities and derived quantities of basic units and derived units .Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration .Concept of rigid body, scalar and vector quantities

2. Laws of forces

Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force .Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position .Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components .Free body diagram .Equilibrant force and its determination . Lami's theorem (concept only) [Simple problems on above topics]

3. Moment

Concept of moment .Moment of a force and units of moment .Varignon's theorem (definition only) . Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support) . Parallel forces (like and unlike parallel force), calculating their resultant . Concept of couple, its properties and effects .General conditions of equilibrium of bodies under coplanar forces .Position of resultant force by moment [Simple problems on the above topics]

4. Friction

. Definition and concept of friction, types of friction, force of friction . Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction . Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane. Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force: a) Acting along the inclined plane Horizontally b) At some angle with the inclined plane

5. Centre of Gravity

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion . Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed [Simple problems on the above topics]

SURVEYING - I

1. Introduction:

1.1 Basic principles of surveying

1.2 Concept and purpose of surveying, measurements-linear and angular, units of measurements

1.3 Instruments used for taking these measurements, classification based on surveying instruments

2. Chain surveying:

2.1 Introduction, advantages and disadvantages

2.2 Direct and indirect ranging offsets and recording of field notes

3. Compass surveying:

3.1 Purpose of compass surveying. Use of prismatic compass: Setting and taking observations

3.2 Concept of following with simple numerical problems: a) Meridian - Magnetic and true b) Bearing - Magnetic, True and Arbitrary c) Whole circle bearing and reduced bearing d) Fore and back bearing e) Magnetic dip and declination

3.3 Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse

4. Levelling:

4.1 Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks

4.2 Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages, use of auto level.

4.3 Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis

4.4 Levelling staff: single piece, folding, invar precision staff, telescopic

4.5 Temporary adjustment and permanent adjustment of dumpy level by two peg method.

4.6 Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels

4.7 Level book and reduction of levels by

4.7.1 Height of collimation method and

4.7.2 Rise and fall method

4.8 Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems.

4.9 Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas, numerical problems

5. Plane Table Surveying

5.1 Purpose of plane table surveying, equipment used in plane table survey

5.2 Setting of a plane table: (a) Centering (b) Levelling (c) Orientation

5.3 Methods of plane table surveying (a) Radiation, (b) Intersection (c) Traversing (d) Resection

5.4 Concept of Two point and Three point problems (Concept only)

5.5 Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidade

BUILDING CONSTRUCTION

1. Introduction: 1.1 Definition of a building, classification of buildings based on occupancy

1.2 Different parts of a building

2. Foundations: 2.1 Concept of foundation and its purpose

2.2 Types of foundation-shallow and deep

2.2.1 Shallow foundation - constructional details of: Spread foundations for walls, min. depth criteria, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation for masonry pillars and concrete columns

2.2.2 Introduction to deep foundation and their types

2.3 Earthwork

2.3.1 Layout/setting out for surface excavation, cutting and filling

2.3.2 Excavation of foundation, trenches, shoring, timbering and dewatering

3. Masonry

4.1 Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters

4.1.1 Bond – meaning and necessity; English, flemish bond and other types of bonds

4.1.2 Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints

4.1.3 Mortars: types, selection of mortar and its preparation

4.2 Stone Masonry

4.2.1 Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttress

4.2.2 Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls

5. Arches and Lintels:

5.1 Meaning and use of arches and lintels:

5.2 Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span

5.3 Arches:

5.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving

5.3.2 Stone arches and their construction

5.3.3 Brick arches and their construction

5.4 Lintels

5.4.1 Purpose of lintel

5.4.2 Materials used for lintels

5.4.3 Cast-in-situ and pre-cast lintels

5.4.4 Lintel along with sun-shade or chhajja

6. Doors, Windows and Ventilators:

6.1 Glossary of terms with neat sketches

6.2 Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, glazed door, rolling shutter, steel door, sliding door, plastic and alumininium doors

6.3 Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminium windows.

6.4 Door and window frames – materials and sections, fixtures and fasteners, hold fasts

7. Damp Proofing and Water Proofing

7.1 Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health

7.2 Sources of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture. Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc.

7.3 Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals

8. Floors

8.1 Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose

8.2 Types of floor finishes - concrete flooring, tile flooring, stone (marble and kota) flooring. Timber flooring, timber floor finish and their brief description

8.3 Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase

9. Roofs

9.1 Types of roofs, concept of flat, pitched and arched roofs

9.2 Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts

9.3 False ceilings using gypsum, plaster boards, cellotex, fibre boards

10. Stairs

10.1 Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing

10.2 Classification of staircase on the basis of material – RCC, timber, steel, Aluminium

10.3 Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc

10.4 Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

11. Surface Finishes

11.1 Plastering - classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing

11.2 Pointing - different types of pointing and their methods

11.3 Painting - preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces

11.4 Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints

11.5 Selection of appropriate paints/finishes for interior and exterior surfaces

11.6 Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes

B.Voc . Building Construction and Technology

Human Values and Professional Ethics

1. Course Introduction -

Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education. Self Exploration-what is it?- its content and process; Natural Acceptance and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels

2. Understanding Harmony in the Human Being –

Harmony in Myself! Understanding human being as a co-existence of the sentient and the material Understanding the needs of Self and Body - Sukh and Suvidha Understanding the Body as an instrument of (I being the doer, seer and enjoyer) Understanding the characteristics and activities of and harmony in Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Swasthya

3. Understanding Harmony in the Family and Society-

Harmony in HumanHuman Relationship 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-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship Understanding the meaning of Vishwas; Difference between intention and competence Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

4. Understanding Harmony in the Nature and Existence –

Whole existence as Co-existence Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space Holistic perception of harmony at all levels of existence

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics –

Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: . Ability to utilize the professional competence for augmenting universal human order . Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems o Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: o At the level of individual: as socially and ecologically responsible engineers, technologists and managers o At the level of society: as mutually enriching institutions and organizations

Applied Mechanics Lab

LIST OF PRACTICALS

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

B.Voc . Building Construction and Technology

Surveying - I Lab

LIST OF PRACTICALS

I. Chain surveying: i) a) Ranging a line b) Chaining a line and recording in the field book c) Taking offsets - perpendicular and oblique (with a tape only) d) Setting out right angle with a tape ii) Chaining of a line involving reciprocal ranging iii) Chaining a line involving obstacles to ranging iv) Chain Survey of a small area.

II. Compass Surveying: i) a) Study of prismatic compass b) Setting the compass and taking observations c) Measuring angles between the lines meeting at a point

III. Levelling: i) a) Study of dumpy level and levelling staff b) Temporary adjustments of various levels c) Taking staff readings on different stations from the single setting and finding differences of level between them ii) a) To find out difference of level between two distant points by shifting the instrument iii) Longitudinal and cross sectioning of a road/railway/canal iv) Setting a gradient by dumpy and auto-level

IV. Plane Table Surveying: i) a) Study of the plane table survey equipment b) Setting the plane table c) Marking the North direction d) Plotting a few points by radiation method ii) a) Orientation by - Trough compass - Back sighting b) Plotting few points by intersection, radiation and resection method iii) Traversing an area with a plane table

V. Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

Building Construction Drawing

Drawing No.1: Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

Drawing No.2: Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

Drawing No.3: Drawing plan, elevation of arches: circular arch, segmental arch

Drawing No.4 Elevation, sectional plan and sectional side elevation of flush door, glazed door, paneled door with wire gauge shutter

SEMESTER 4th

Water Supply & Waste Water Engineering

1. Introduction 1.1 Necessity and brief description of water supply system. 1.2 Sources of water – surface/sub-surface sources 1.3 Purpose of sanitation 1.4 Necessity of systematic collection and disposal of waste 1.5 Definition of terms in sanitary engineering 1.6 Collection and conveyance of sewage 1.7 Conservancy and water carriage systems, their advantages and Disadvantages 1.8 (a) Surface drains (only sketches) : various types, suitability (b) Types of sewage: Domestic, industrial, storm water and its seasonal variation

2. Quantity & Quality of Water 2.1 Water requirement 2.2 Rate of demand and variation in rate of demand 2.3 Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems) 2.4 Population Forecasting 2.5 Meaning of pure water and methods of analysis of water 2.6 Physical, Chemical and bacteriological tests and their significance 2.7 Standard of potable water as per Indian Standard 2.8 Maintenance of purity of water

3. Water Treatment 3.1 Sedimentation - purpose, types of sedimentation tanks 3.2 Coagulation/floculation - usual coagulation and their feeding 3.3 Filtration - significance, types of filters, their suitability 3.4 Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine. 3.5 Flow diagram of different treatment units, functions of (i) Areation fountain (ii) mixer (iii) floculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.

4. Conveyance of Water 4.1 Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes. 4.2 Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses 4.3 Distribution system: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes 4.3.1 Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories. 4.3.2 Wastage of water - preventive measures 4.3.3 Maintenance of distribution system 4.3.4 Leakage detection

5. Laying of Pipes 5.1 Setting out alignment of pipes 5.2 Excavation for laying of pipes and precautions to be taken 5.3 Handling, lowering and jointing of pipes 5.4 Testing of pipe lines 5.5 Back filling 5.6 Use of boring rods

6. Building Water Supply 6.1 Connections to water main (practical aspect only) 6.2 Water supply fittings (with sketches) and terminology related to plumbing

7. Sewerage System 7.1 Types of sewerage systems, materials for sewers, their sizes and joints 7.2 Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts

8. Laying and Construction of Sewers: 8.1 Setting out/alignment of sewers 8.2 Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes. 8.3 Construction of surface drains and different sections required

9. Building Drainage 9.1 Aims of building drainage and its requirements 9.2 Different sanitary fittings and installations 9.3 Traps

B.Voc . Building Construction and Technology

Surveying-II

1. Contouring: Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors effecting contour interval, characteristics of contours, methods of contouring: Direct and indirect, use of stadia measurements in contour survey, interpolation of contours; use of contour map, Drawing cross section from a contour map; marking alignment of a road, railway and a canal on a contour map, computation of earth work and reservoir capacity from a contour map

2. Theodolite Surveying: Working of a transit vernier theodolite, axes of a theodolite and their relation; temporary adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; measurement of horizontal and vertical angles. Prolonging a line (forward and backward) measurement of bearing of a line; traversing by included angles and deflection angle method; traversing by stadia measurement, theodolite triangulation, plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected), errors in theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing. Height of objects – accessible and non-accessible bases

3. Tacho-metric surveying : Tachometry, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, general principles of stadia tachometry, examples of stadia tachometry and Numerical problems.

4. Curves: 4.1 Simple Circular Curve: Need and definition of a simple circular curve; Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord deflection angle, Apex distance and Mid-ordinate. Setting out of simple circular curve: a) By linear measurements only: - Offsets from the tangent - Successive bisection of arcs - Offsets from the chord produced b) By tangential angles using a theodolite 4.2 Transition Curve: Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve; length of transition curve for roads; by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only 4.3 Vertical curve Setting out of a vertical curve

5. Introduction to the use of Modern Surveying equipment and techniques such as: a) EDM or Distomat b) Planimeter (Digital) c) Total station d) Introduction to remote sensing and GPS e) Auto level f) Digital theodolite

Strength of Material

I: Concept of Equilibrium: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem.

II: Stresses and Strains: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain, Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.

III: Principal Stresses and Strains: Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress.

IV: Shear Force and Bending Moment Diagrams: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.

V: Bending and Shear Stresses: Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.

VI: Columns and Struts: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.

VII: Stresses and strains in thin cylinders: spherical shells subjected to internal pressures; Normal stress, tangential stress.

Soil Mechanics

UNIT I SOIL CLASSIFICATION AND COMPACTION

History – formation and types of soil – composition -Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction – theory – laboratory and field technology – field Compaction method – factors influencing compaction.

UNIT II EFFECTIVE STRESS AND PERMEABILITY

Soil – water – Static pressure in water – Effective stress concepts in soils – Capillary phenomena— Permeability – Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage – Two dimensional flow –Laplace's equation – Introduction to flow nets – Simple problems Sheet pile and weir.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and udl) Use of Newmarks influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – $\sqrt{t}$ and log t methods. e-log p relationship consolidation settlement N-C clays – O.C clays – Computation.

UNIT IV SHEAR STRENGTH

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shear strength – Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil.

UNIT V SLOPE STABILITY

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c – soil –Slope protection measures.

Surveying-II lab

LIST OF PRACTICALS

I. Contouring: i) Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer ii) Preparing a contour plan by method of squares iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

II. Theodolite: i) Taking out the Theodilite, mounting on the tripod and placing it back in the box ii) Study of a transit vernier theodolite; temporary adjustments of theodolite iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods iv) Measurement of vertical angles and use of tachometric tables v) Measurement of magnetic bearing of a line vi) Running a closed traverse with a theodolite (at least five sides) and its plotting vii) Height of objects with and without accessible bases

III. Curves i) Setting out of a simple circular curve with given data by the following methods a) Offsets from the chords produced b) One theodolite method

IV. Minor instruments: i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc. ii) Use of planimeter for computing areas

V. Demonstration of digital instruments through field visits to Survey of India and other government agencies.

VI. To plot an area with the help of Total Station

Strength of Material Lab

LIST OF PRACTICALS

i) Determination of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel
ii) Testing of HYSD Steel
iii) Determination of Young's modulus of elasticity for steel wire
iv) Determination of modulus of rupture of a concrete beam
v) Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point
vi) Verification of forces in a framed structure

Water Supply & Waste Water Engineering Drawing Lab

LIST OF PRACTICALS

1. Drains and Sewers 1.1 Cross section of standard types of open drains (circular, V-shaped and U-shaped) with their foundations 1.2 Cross section of earthen ware and RCC sewer pipes 1.3 Cross sections of masonry sewers (circular and egg shaped)

2. Traps, manholes and inspection chamber 2.1 Detailed section of floor trap and gully trap 2.2 Detailed plan and section of an inspection chamber 2.3 Detailed plan and section of a manhole

3. Septic Tank and Soak Pit Detailed plan and cross sections of a domestic septic tank with soak pit for 5-10 users

4. Bath room and W.C connections: 4.1 Cross-section through the external wall of lavatories at ground and first floor showing the one and two pipe system and the connections of the lavatory to inspection chamber 4.2. Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers 5. Draw sectional elevation of a two storeyed building showing details of one pipe and two pipes systems with sanitation system.

6. Practice of reading water supply and sanitary engineering working drawings (PWD/urban Development agencies) including hot water and cold water supply system of a two room set. To study the installation of following: a) Water meter b) Connection of water supply of building with main c) Pipe valves and bends d) Water supply and sanitary fittings

7) To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SWG pipes, PVC pipes and copper pipes.

8) To demonstrate the laying of SWG pipes for sewers

9) Demonstration of plumbing tool

1	BVBCT-501-20	Irrigation Engineering	3	0	0	**40**	60	100	3

UNIT 1

INTRODUCTION: Importance of Irrigation Engineering, purposes of Irrigation, objectives of Irrigation, Benefits of Irrigation, Advantages of various techniques of irrigation-

- Furrow Irrigation, Boarder strip Irrigation, Basin Irrigation,Modern irrigation methods : Sprinkler Irrigation, DripIrrigation.

Basics of Economics & financing of irrigation works. Introduction to Detailed Project Report and pre feasibility report.

UNIT 2

METHODS OF IRRIGATION: Advantages and disadvantages of irrigation, Micro irrigation Methods, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta, Duty of water, Base Period, relation between delta, duty and base period, crop rotation, Soil crop relation-ship and soil fertility. Irrigation Scheduling

UNIT 3

CANAL IRRIGATION: Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories.

UNIT 4

LINED CANALS: Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

UNIT 5

LOSSES IN CANALS, WATER LOGGING AND DRAINAGE: Losses in canals-Evaporation and seepage, water logging, causes and ill effects of water logging. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

Books:-

Principles & practice of Irrigation Engg. S.K.Sharma; S. Chand, Limited.

Irrigation & Water Power Engg. B.C. Punmia, Pande B.B.Lal; Laxmi Publications (p) Ltd Fundamentals of Irrigation Engg. Dr. Bharat Singh; Nem Chand & Bros

Irrigation Engg. & Hydraulic Structure S.R.Sahasrabudhe; S. K. Kataria & Sons

Irrigation Engg. & Hydraulic Structure Varshney, Gupta & Gupta; Nem Chand and Brothers
Irrigation Engg. & Hydraulic Structure Santosh Kumar Garg; Khanna Publishers

2	BVBCT-502-20	Structural Engineering-1	3	0	0	**40**	60	100	3

DESIGN OF REINFORCED CONCRETE ELEMENTS

1. Objectives and Methods of Analysis and Design
2. Properties of Concrete and Steel
3. Design Philosophies of Working Stress Method and Limit State Method
4. Limit State of Collapse - Flexure
5. Numerical Problems on Singly Reinforced Rectangular Beams
6. Doubly Reinforced Beams – Theory and Problems
7. Flanged Beams – Theory and Numerical Problems
8. Shear, Bond, Anchorage, Development Length and Torsion
9. Reinforced Concrete Slabs: One and Two way Slabs
10. Design of staircase and isolated foundation

BOOKS:

1. Properties of Concrete by A.M.Neville – Prentice Hall
2. Concrete Technology by M.S.Shetty. – S.Chand & Co.;
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
4. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
5. Advanced Design of Structures N. Krishna Raju
6. Advanced RCC Design Pillai & Mennon; Tata MacGraw Hill
7. Limit State Design Ramachandra
8. Limit State Design A.K. Jain

3	BVBCT-503-20	Highway Engineering	3	0	0	**40**	60	100	3

UNIT 1

Introduction: Importance of Transportation, Different Modes of Transportation,Characteristics of Road Transport. Highway Development &Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys

UNIT 2

Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

Highway Geometric Design: Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves

UNIT 3

Highway Materials: Preparation of subgrade, Specification and construction of i) Granular Sub base, ii) WBM Base iii) WMM base,iv) Bituminous Macadam v) Dense Bituminous Macadam vi) Bituminous Concrete,vii) Dry Lean Concrete sub base and PQC viii) concrete roads. Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials. Use of waste material in Highway construction.

UNIT 4

Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.

Traffic Engineering

UNIT 5

Traffic Characteristics: Road User Characteristics, Driver Characteristics, Vehicular Characteristics.**Traffic Studies**: Volume Studies, Speed Studies, O-D Survey, Parking Study. Basics of barrier design

UNIT 6

Traffic Safety and Control Measures: Traffic Signs, Markings, Islands, Signals, Causeand Type of Accidents, Use of Intelligent Transport System.

Traffic Environment Interaction: Noise Pollution, Vehicular Emission, Pollution Mitigation Measures.

Books Recommended:

1. Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee,1998.
2. Kadiyali, L.R. "Principles and Practice of Highway Engineering", Khanna Publishers, NewDelhi, 1997.
3. Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand &Company Ltd., New Delhi, 1985.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, NewDelhi.

4	BVBCT-504-20	Geotechnical Engineering-	3	0	0	**40**	60	100	3

Unit-1Soil Investigation: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler,. Rotary sampler, Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.

Unit-2Earth Pressure Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and Kp for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfill. Merits and demerits of Rankine and Coulomb's theories,

Unit-3 Shallow Foundation: Type of shallow foundations, Depth and factors affecting it.Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis.Types of failures. Factors affecting bearing capacity. Skemptons equation. B.I.S.recommendations for shape, depth and inclination factors. Plate Load test and standard penetrationTest.

Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmarks chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts, Proportioning of rafts,Methods of designing raft, Floating foundation.3.

Unit-4 Pile Foundations: Necessity and uses of piles, Classification of piles, Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Limitations of pile driving formulae. Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile.

Reference Books:

1. Soil Mech. & Foundation Engg, by K.R.Arora, Standard Publishers Distributors
2. Geotechnical Engineering, by P. Purshotama Raj
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy
4. Principle of Foundation Engineering by B.M.Das, CL Engineering
5. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, New Age International
6. Soil Mech. & Foundations by Muni Budhu Wiley, John Wiley & Sons
7. Geotechnical Engineering by Gulhati and Datta, Tata McGraw - Hill Education
8. Foundation Engineering by Varghese P.C, PHI Learning.

5	BVBCT-505-20	Geotechnical Engg. Lab	0	0	3	**60**	40	100	1.5

1. Determination of specific gravity and water content of soil

2. Determination of Liquid Limit & Plastic Limit

3. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).

4. Determination of permeability by Constant Head Method and Variable head Method.

5. Unconfined Compression Test for fine grained soil.

6. Direct Shear Test

7. Triaxial Test

8 Determination of field test CPT and SPT on soil.

9. Determination of field density by core cutter and sand replacement method

Books Recommended:-

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

6	BVBCT-506-20	Material Testing Lab-I	0	0	3	**60**	40	100	1.5

1. To Determine the Specific Gravity of and Soundness of cement
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement and Compressive Strength of Cement.
3. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Fine and Coarse Aggregates.
4. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete.
5. To Determine the Compressive Strength of Concrete by Cube and Cylinder.
6. To carry out the Split Tensile and Flexural strength of Concrete.
7. Compressive strength of Brick and Tile as IS standard.

Books/Manuals :-

1. Concrete Manual By Dr. M.L. Gambhir, Dhanpat Rai & Sons Delhi.
2. Concrete Lab Manual by TTTI Chandigarh

Concrete Technology, Theory and Practice by M.S.Shetty. S.Chand & Company

7	BVBCT-507-20	Computer Aided Structural Drawing Lab	0	0	3	**60**	40	100	1.5

1. Structural drawings of singly reinforced beams
2. Structural drawings of doubly reinforced beams flanged beams – theory and numerical problems
3. Structural drawings of flanged beams
4. Structural drawings of reinforced concrete slabs: One and Two way Slabs
   - All drawings should be prepared on computer drafting software.

References: 1. FOSSEE: (Free/Libre and Open Source Software for Education), National mission on education through ICT, MHRD, Govt. of India 2. Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt.Ltd., Hyderabad.

Sixth Semester

1	BVBCT-601-20	Sustainable construction methods	3	0	0	**40**	60	100	3

Course Objective:

(i) Understand the Definition, Concept & Objectives of the terms cost effective construction and green building

(ii) Apply cost effective Technologies and Methods in Construction

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Classify the sustainable construction materials.

2. Apply cutting-edge construction technologies.

3. Evaluate different sustainable construction methods.

4. Apply different rating systems of construction/buildings as a professional.

CONTENT DETAILS

UNIT-I Concepts of energy efficient & environment friendly materials and techniques: Cost effective materials: Soil, Fly ash, Ferro-cement, Lime, Fibers, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer. Energy Efficient & Environment friendly building material products: Walls - Stabilized and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferro cement partitions. Green Materials, Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials.

UNIT-II Cost effective construction techniques and equipments:- (a) Techniques: Rat trap bond construction, Energy Efficient roofings, Ferro cement technique, Mud Technology. (b) Equipments: Brick moulding machine, Stabilized soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferro cement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

Unit 3 Types of foundations and construction methods. Basics of Formwork and Staging. Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls). Modular construction methods for repetitive works.

Precast concrete construction methods. Basics of Slip forming for tall structures. Basic construction methods for steel structures.

Unit 4 Green Building rating Systems- Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights .Environmental impact of materials; life-cycle assessment; material selection to optimize performance

REFERENCE BOOKS

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkatta Rama Reddy & K S Nanjunda Rao – New Age International Publishers

2. Integrated Life Cycle Design of Structures – By Asko Sarja – SPON Press

3. Non conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers

4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford

2	BVBCT-602-20	Structural Engineering-II	3	0	0	**40**	60	100	3

Course objectives: This course will enable the students to:

1. Understand the concept of determinacy and indeterminacy of beams, columns and trusses.
2. Design concrete columns
3. Know about steel joints
4. Design the steel beams

Course Outcomes: At the end of the course the student will be able to:

1. Analyze the beams in the building structures.
2. Calculate optimum quantity of reinforcement in concrete columns.
3. Choose the accurate sections for steel beams.
4. Know about the practical utility of bolted, welded and riveted connections in steel structures.

UNIT I

Determinate and Indeterminate Structures: Concept, Calculation of Indeterminacy in beams, frames and trusses.

Deflection of determinate beams: Moment area method, Conjugate beam method, Unit load method

UNIT II

Analysis of indeterminate continuous beams: Slope deflection method, Three moment equation (Clapeyron's Theorem), Moment distribution method

UNIT III

Axially loaded concrete columns: Introduction, Design, Slenderness ratio, Radius of gyration, Long column and short column

Introduction to built-up columns

UNIT IV

Joints: Riveted Bolted and welded steel connections for axial loads.

Steel beams: Introduction, Design, Purlins and Beams.

BOOKS:

9. Limit State Design Ramachandra
10. Limit State Design A.K. Jain
11. Limit state Design of Reinforced Concrete by P.C. Vergese
12. Theory of Structures by B.C. Punmia
13. Steel structures by S.K. Duggal
14. Design of steel Structures Volume I by Subramanyam
15. IS 456-2000 and IS 800 -2007

3	BVBCT-603-20	Building Repair and Rehabilitation	3	0	0	**40**	60	100	3

Course outcomes

By the end of this course students will have the capability/knowledge of

- various distress and damages to concrete and masonry structures
- the importance of maintenance of structures, types and properties of repair materials etc
- assessing damage to structures and various repair techniques

UNIT-I

Introduction: Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures.

Cracks in R.C. buildings: Various cracks in R.C. buildings, causes and effects

Damages to masonry structures: Various damages to masonry structures and causes,

UNIT-II

Repair materials: Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials

Special mortars and concretes: Polymer Concrete and Mortar, Quick setting compounds

Grouting materials: Gas forming grouts, Salfo alumate grouts, Polymer grouts, Acrylate and Urethane grouts.

Bonding agents: Latex emulsions, Epoxy bonding agents.

Protective coatings: Protective coatings for Concrete and Steel

UNIT-III

Damage diagnosis and assessment: Visual inspection, Non-Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation depth testing, Corrosion activity measurement

Substrate preparation: Importance of substrate/surface preparation, General surface preparation methods and procedure,Reinforcing steel cleaning

UNIT-IV

Crack repair: Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing,Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks,

IS codes related to retrofitting and repair.

Corrosion of embedded steel in concrete: Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair ofvarious corrosion damaged of structural elements (slab, beam and columns)

Jacketing: Jacketing, Column jacketing, Beam jacketing, Foundation jacketing Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing.

RECOMMENDED BOOKS

1. Nayak, BS, "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi
2. Ransom, WH "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span
3. Repair and protection of concrete structures by Noel P.Mailvaganam, CRC Press,1991.
4. "Earthquake resistant design of structures" by Pankaj agarwal, Manish shrikande, PHI, 2006.
5. Ravishankar K., Krishnamoorthy T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

4	BVBCT-604-20	Green Buildings	3	0	0	**40**	60	100	3

Course objectives: *This course will enable students to:*

Understand the Definition, Concept & Objectives of the terms cost effective construction and green building.

Apply cost effective techniques in construction.

Apply cost effective Technologies and Methods in Construction.

Understand the Problems due to Global Warming.

State the Concept of Green Building.

Understand Green Buildings.

Course outcome: *At the end of the course the student will be able to:*

CO1 Select different building materials for construction.

CO2 Apply effective environmental friendly building technology.

CO3 Analyze global warming due to different materials in construction.

CO4 Analyse buildings for green rating.

CO5 Use alternate source of energy and effective use water.

UNIT I

Green Building Technologies: Introduction- Necessity - Concept of Green building, sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development, Green building rating systems – GRIHA (Green Rating for Integrated Habitat Assessment), IGBC and LEED, overview of the criteria as per these rating systems.

UNIT II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT III

Global Warming – Definition - Causes and Effects, Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green Materials - Comparison of Initial cost of Green V/s Conventional Building

UNIT IV

Building materials: Methods to reduce embodied energy in building materials: Use of local building materials; Use of natural and renewable materials like bamboo, timber, rammed earth,

stabilized mud blocks; Use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, various types of tiles (thermal resistant), materials from agro and industrial waste. Reuse of waste and salvaged materials, Waste Management: Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management.

UNIT V

Utility of Solar Energy in Buildings, Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings, Low Energy Cooling, Green Composites for Buildings, Water Utilisation in Buildings, Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage Water and Sewage, Urban Environment and Green Buildings, Green Cover and Built Environment.

Text Books

1. HarharaIyer G, Green Building Fundamentals, *Notion Press.*

2. Dr. Adv. Harshul Savla, Green Building: Principles & Practices.

3. Mike Montoya, Green Building Fundamentals, *Pearson, USA, 2010.*

4. Charles J. Kibert, Sustainable Construction – Green Building Design and Delivery, *John Wiley & Sons, New York, 2008.*

5. Mili Majumdar, Energy-efficient buildings in India, *Tata Energy Research Institute, 2002.*

6. K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, Alternative building materials and technologies.

5	BVBCT-605-20	Green Building Lab	0	0	3	**60**	40	100	1.5

List of Experiments (Green Buildings Lab)

1To study and acquire knowledge about modern building material

2. To design a water harvesting system for an educational institute.

3. To study and design the roof top solar panel system.

4. To identify the source of solid waste from a locality/institute and estimate the quantity of waste generated.

5. To study and evaluate power rating systems of various appliances.

6. Estimation of quantity of waste water for reuse from a residential building/institute.

7. Study on use of waste material as fly ash/agro based products in construction materials.

8. To carry out life cycle cost analysis using waste material.

9. Estimation of carbon emission and carbon credit for a convention and green building.

10 To evaluate green rating for building and construction activities

6	BVBCT-606-20	Material Testing Lab-II	0	0	3	**60**	40	100	1.5

Laboratory Experiments:

1. Rebound Hammer Test
2. Ultrasonic Pulse Velocity Test
3. Reinforced Bar Locator Test
4. Cut and Pull Out (CAPO) Test
5. Bitumen Extraction Test
6. Standard Penetration Test (SPT)

7 Cone penetration TEST (DCPT, SCPT)

Recommended Books / Manuals:

1. M.L. Gambhir, „Building and Construction Materials: Testing and Quality Control‟, TMH.
2. Concrete Lab Manual by NITTTR Chandigarh.
3. Concrete Technology, Theory and Practice by M.S. Shetty, S. Chand & Company.
4. Khanna S.K. and Justo, C.E.G. "Highway Material & Pavement Testing", Nem Chand.

7	BVBCT-607-20	Structural Engg. Lab	0	0	3	**60**	40	100	1.5

1. To verify the moment area theorem for slope and deflection of a given beam.
2. To determine the flexural rigidity of a given beam.
3. Mix design of Concrete
4. Structural drawings of
   (i) Reinforced concrete columns
   (ii) Riveted Bolted and welded steel connections
   (iii) Steel beams, Purlins and Encased Beams
   on **Computer Drafting Software**.