



**KALINGA
UNIVERSITY**

SCHEME & SYLLABUS FOR

Bachelor of Vocational Studies (B.Voc.): Construction Technology (W.e.f. 2024 – 2025)



Kalinga University, Naya Raipur, Chhattisgarh

B.VOC. IN CONSTRUCTION TECHNOLOGY (RUSTAMJEE)

Semester-01								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVCT101	Communication Skills	3	3	0	0	30	70	100
BVCT102	Fundamentals of Information Technology	3	3	0	0	30	70	100
BVCT103	Construction Materials & Application-I	3	3	0	0	30	70	100
BVCT104	Basics of Civil Construction	3	3	0	0	30	70	100
BVCT105	Engineering Mechanics	3	3	0	0	30	70	100
BVCT106	Construction Safety Management	3	3	0	0	30	70	100
BVCT107P	Project - I	12	0	0	24	50	150	200
Total		30	18	0	24	230	570	800
Semester-02								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVCT201	Civil Auto CAD-I	3	3	0	0	30	70	100
BVCT202	Environmental Studies	3	3	0	0	30	70	100
BVCT203	Construction Material & Applications-II	3	3	0	0	30	70	100
BVCT204	Mechanics of Structures	3	3	0	0	30	70	100
BVCT205	Estimating and Costing-I	3	3	0	0	30	70	100
BVCT206P	Project -II	15	0	0	30	50	150	200
Total		30	15	0	30	200	500	700

Semester-03								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVCT301	Public Health Engineering	3	3	0	0	30	70	100
BVCT302	Contract and Tendering	3	3	0	0	30	70	100
BVCT303	Survey-I	3	3	0	0	30	70	100
BVCT304	Civil Auto CAD-II	3	3	0	0	30	70	100
BVCT305P	Project -III	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-04								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVCT401	Geotechnical Engineering	3	3	0	0	30	70	100
BVCT402	Structure	3	3	0	0	30	70	100
BVCT403	Building Maintenance and Repair	3	3	0	0	30	70	100
BVCT404	Project Management	3	3	0	0	30	70	100
BVCT405P	Project -IV	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-05								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVCT501	Advance Surveying	3	3	0	0	30	70	100
BVCT502	Advance Construction Technology	3	3	0	0	30	70	100
BVCT503	Design of Steel Structures	3	3	0	0	30	70	100
BVCT504	Water Resource Engineering	3	3	0	0	30	70	100
BVCT505P	Project -V	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600
Semester-06								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVCT601	Building Information Modelling	3	3	0	0	30	70	100
BVCT602	Highway Engineering	3	3	0	0	30	70	100
BVCT603	Environmental Engineering	3	3	0	0	30	70	100
BVCT604	Entrepreneurship	3	3	0	0	30	70	100
BVCT605P	Project -VI	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

SEMESTER-01

COMMUNICATION SKILLS

BVCT101

Course Objective:

- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Course outcomes:

- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication
- To develop vital communication skills which should be integral to personal, social and professional interactions.
- One of the critical links between human beings.
- An important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal.
- In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Unit 1: Introduction:

06

- Theory of Communication, Types and modes of Communication, Mediums and channels of communication, barriers to communication, English as a Global language, the Lingua Franca, Social influences on English

Unit 2: Language of Communication:

06

- Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication, Varieties of English, Language, Accent, Dialect, Colloquialism, Historical influences on English

Unit 3: Speaking Skills:

06

- Monologue Dialogue Group Discussion Effective Communication/ Mis- Communication Interview Public Speech, Regional influences on English, Convergence and divergence, Linguistic Imperialism,

Unit 4: Reading and Understanding:

06

- Close Reading, Reading analysis of a text - Audience and purpose, Content and theme, Tone and Mood, stylistic devices, structure Comprehension- Analysis and Interpretation Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts

Unit 5: Writing Skills:

06

- Documenting Report Writing Making notes Letter writing, Writing tabloids, diary entry, open letters, essays, newsletter and magazine articles, skits, short stories, impersonating characters .It will enhance Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc. While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

References:

- Fluency in English - Part II, Oxford University Press, 2006.
- Business English, Pearson, 2008.
- Language, Literature and Creativity, Orient Blackswan, 2013.
- Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brati Biswas

FUNDAMENTALS OF INFORMATION TECHNOLOGY

BVCT102

- Unit 1: Computer characteristics** **06**
- Speed, storage, accuracy, diligence; Digital signals, Binary System, ASCII; Historic Evolution of Computers; Classification of computers: Microcomputer, Minicomputer, mainframes, Supercomputers; Personal computers: Desktop, Laptops, Palmtop, Tablet; Hardware & Software; Von Neumann model.
- Unit 2: Hardware** **06**
- CPU, Memory, Input devices, output devices. Memory units: RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory; Auxiliary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD/DVD-Writer; Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen Voice Input, Joystick, Optical readers, bar code reader; Output devices: Display device, size and resolution; CRT, LCD, LED; Printers: Dot-matrix, Inkjet, Laser; Plotters, Sound cards & speaker.
- Unit 3: Software** **06**
- System software, Application software; concepts of files and folders, Introduction to Operating systems, Different types of operating systems: single user, multitasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases; Application software: Generic Features of Word processors, Spread sheets and Presentation software; Generic Introduction to Latex for scientific typesetting; Utilities and their use; Computer Viruses & Protection, Free software, open source.
- Unit 4: Computer Networks and Internet** **06**
- Connecting computers, Requirements for a network: Server, Workstation, switch, router, network operating systems; Internet: brief history, World Wide Web, Websites, URL, browsers, search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line Wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, Web Programming Languages.
- Unit-5: Information Technology and Society** **06**
- Indian IT Act, Intellectual Property Rights, issues. Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

- **Programming Concepts & Techniques:** Program Concept, Characteristics of Programme, Stages in Program Development, Tips for Program Designing, Programming Aids, Algorithms, Pseudo code, Notations, Design, Flowcharts, Symbols, Rules, compiler & Interpreter. Introduction to programming techniques, Top-down & Bottom-up approach, Unstructured, & Modular programming, Cohesion, Coupling, Debugging, Syntax & Logical Errors, Linking and Loading, Testing and Debugging, Documentation.

References:

- Programming in C, R.S. Salaria, Khanna Publishing House
- Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

CONSTRUCTION MATERIALS & APPLICATION-I

BVCT103

Unit 1: Masonry Materials	10
<ul style="list-style-type: none">• Stones: Source• Types of stones• Physical properties of stones• Uses of building stones• Advantages & disadvantages of stones.• Paver blocks• Autoclaved Aerated Concrete (AAC) blocks• Cellular Light Weight Concrete (CLC) blocks.	
Unit 2: Building Materials	10
<ul style="list-style-type: none">• Lime, its Type and their Physical properties• Cement & its types Constituents of cement• Physical properties of cement• Manufacturing Process of Cement• Bogue compound• Grades of cement	
Unit 3: Other Materials	10
<ul style="list-style-type: none">• Sand: Classification & Physical properties.• Aggregate: Classification & Physical properties.• Admixture: Types & their uses• Introduction to concrete• Water use in construction	
References:	
<ul style="list-style-type: none">• A Text-Book of Building Construction, S.P.Bindra and S.P.Arora, Dhanpat Rai Publications• Building Materials and Construction, Jena and Sahu, Mc. Graw Hill.• Materials for Civil and Construction Engineers, Mamlouk and Zaniewski, Pearson• Building Materials and Building Construction, by P C Varghese• Building Construction, by B. C. Punmia, , Laxmi Publication	

BASICS OF CIVIL CONSTRUCTION

BVCT104

Unit 1:

08

- Definition of a building, classification of buildings based on occupancy, Site selection: Factors to be considered for selection of site for residential, commercial, industrial and public building,
- Components of building, arrangement of doors, windows, cupboards etc. for residential buildings.
- Concept of foundation and its purpose, Types of foundations-shallow and deep; suitability and use of - Spread foundations, stepped foundation, masonry pillars and concrete columns, raft foundation, combined footing. Thumb rules for depth and width of foundation and thickness of concrete block. Pile foundations; their suitability, classification of piles according to function, material and installation of concrete piles (undreamed, bored, compacted).

Unit 2:

08

- Masonry, brick masonry-Definition of terms: mortar, bond, facing, backing, hearting, column, pillar, jambs, reveals, soffit, plinth, plinth masonry, header, stretcher, bed of brick, bat, queen closer, king closer, frog and quoin.
- Bond-meaning and necessity; English bond; Bond only 1, 1-1/2 and 2 Brick thick walls in English Bond.T, X and right-angled corner junctions Thickness for 1, 1-1/2 and 2 Brick square pillars in English bond.
- Construction of Brick Walls-Method of laying bricks in walls, precautions observed in the construction of walls, method of bonding new brickwork with old (Toothing, raking back and block bonding) Construction, expansion and contraction joints; purpose and constructional details. Stone Masonry, glossary of terms-Natural bed, bedding planes, string course, corbel, cornice, block-in course, grouting, moldings, templates, throating, through stones, parapet, coping, pilaster and buttress. Types of stone Masonry: Rubble Masonry: random and coarsed, Ashlar Masonry: Ashlar fine, Ashlar rough, Ashler facing, specifications for coarsed rubble masonry, principles to be observed in construction of stone masonry walls.
- Surface Finishes: different types, preparations and applications of plastering, pointing, painting, white washing and curing. Damp Proofing: Dampness: sources, causes and its ill effects, Damp proofing materials and their specifications, Methods of damp proofing: basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, roofs and window sills, Plinth protection and aprons.

Unit 3:

07

- Purpose and Classification of walls- load bearing, non-load bearing, dwarf, retaining, breast walls and partition walls. Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls. Partition walls: Constructional details, suitability and uses of brick and wooden partition walls.
- Scaffolding: Constructional details and suitability of mason's brick layers and tubular scaffolding.
- Meaning and use of arches and lintels: 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.
- Arches: Types of Arches – Semi- circular, segmental, elliptical and parabolic, flat, inverted and relieving. Stone arches and their construction, brick arches and their construction.
- Doors and Windows: - Glossary of Terms used in Doors and windows, Doors – name, uses and Types: metal doors, ledged and battened doors, ledged, battened and braced door, framed and panelled doors, glazed and panelled doors, flush doors, collapsible doors, rolling steel shutters, side sliding doors, door frames, PVC shutters and metal doors, Window-names, uses and Types: metal windows, fully panelled windows, fully glazed windows, casement windows, fanlight windows and ventilators, sky light window frames, louvered shutters (emphasis shall be given for using metals and plastics etc. in place of timber).

Unit-4:

07

- Floors, Ground floors- glossary of terms: floor finish, topping, under layer, base course, rubble filling, dado and their purpose. Types of floor finishes –cast-in-situ, concrete flooring (monolithic, bonded) Terrazzo flooring, Stone flooring(marble/Granite), Timber flooring, PVC floor, ceramic floor description with sketches and the methods of construction of the floors and their specifications, floor polishing. Upper floors- flooring on RCC slab, Maintenance of floors.
- Types of roofs, concept of flat, pitched, arched and cell roofs, Glossary of terms for pitched roofs – Various types of Trusses: Timber and steel, batten, eaves, barge, fascia board, gable hip, lap, purlin, rafter, rag bolt, valley, ridge, etc
- Stairs- Glossary of terms: different means of access to various floor, stair case, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand rail, nosing, etc. Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc. Various types of layout-straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair.
- Introduction to anti-termite measures; building services; earthquakes: Magnitude and intensity, seismic zoning, seismograph, Precautions to be observed in the design of earthquake prone buildings.

References:

- Basic civil engineering - S.S.Bhavikatti
- Basic civil engineering - BC Punmia
- Basic civil engineering - Satheesh Gopi

ENGINEERING MECHANICS

BVCT105

Unit-1: System of Coplanar Forces:

10

- Classification of force systems,
- Composition and resolution of forces.
- Resultant: Resultant of coplanar and Non Coplanar (Space Force) force system (Concurrent forces, parallel forces and non-concurrent Non-parallel system of forces).
- Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane
- Centroid: First moment of Area, Centroid of composite plane Laminas

Unit -2:Equilibrium of System of Coplanar Forces:

10

- Conditions of equilibrium for concurrent forces, parallel forces and non-concurrent non-parallel general forces and Couples.
- Equilibrium of rigid bodies free body diagrams.
- Equilibrium of Beams: Types of beams, simple and compound beams, type of supports and reaction: Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)
- Friction: Revision of Static Friction, Dynamic/ Kinetic Friction, Coefficient of Friction, Angle of Friction, Laws of friction. Concept of Cone of friction. Equilibrium of bodies on an inclined plane. Application to problems involving wedges and ladders.

Unit -3: Kinetics of a Particle:

10

- Work and Energy
- Work Energy principle for a particle in motion.
- Application of Work – Energy principle to a system consists of connected masses and Springs.

References:

1. Engineering Mechanics - R.S.Khurmi
2. Engineering Mechanics - Bhavikatti
3. Engineering Mechanics - AR Basu
4. Engineering Mechanics - Basudev Bhattacharya

CONSTRUCTION SAFETY MANAGEMENT

BVCT106

Unit 1: Construction Safety Management	06
<ul style="list-style-type: none">• Definition, Importance of Construction Safety Management• Construction Safety Management System• Scope of Safety Management in Construction• Safety Policy & Safety Plan• Roles, Responsibility and Authority• Safety Organization, Safety Communication, Safety Culture• Safety Monitoring Programme• Training/Orientation• Certification of Construction Workers• Engineering Solutions.• Safety Work Permit	
Unit-2: Safety in Construction Operations	06
<ul style="list-style-type: none">• Rock Blasting• Excavation• Work at Height• Erection of Structures• Concrete Batching Plant.• Unguarded Opening	
Unit-3: Safety in use of construction equipment	06
<ul style="list-style-type: none">• Use of Material Handling Equipment• Temporary Electrical Works• Use of Portable Electrical Equipment• Working in Confined Space• Welding & Gas Cutting• Work in and around water bodies	
Unit-4: Various Safety Gear used & First Aid on Site	06
<ul style="list-style-type: none">• Personal Protective Equipment, Proper Use and Care of PPE, Types of PPE• Respiratory Protection• Hearing Protection• Eye Protection• Face Protection• Head Protection• Body & Skin Protection• Hand & Arm Protection• Foot & Leg Protection• Special Types of PPE• Safety Showers and Eyewashes• Potential Injuries and Basic First Aid• Eye Injuries, Injuries That Cause Bleeding, Impact Injuries, Back Injuries, Burns, Head Injuries• Electrical Shocks• Breathing Problems• Contact with Chemical or Biological Substances	



Unit-5: Safety Legislation

06

- Health and safety work act (HASAWA) 1974
- Construction (design and management regulation 2007)
- Work at Heights Regulations 2005
- Lifting Equipment and Lifting Operations Regulations 1998
- Control of Substances Hazardous to Health Regulations 2002
- Confined Spaces Regulations 1997
- Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 (BOCW Act)

References:

- Construction safety - R.K. Mishra
- Safety Management in construction (Principles and Practice) - S.K.Bhattacharjee, SP 70 (2001) Handbook on construction safety practices.



PROJECT - I

BVCT107P

SEMESTER-02

CIVIL AUTO CAD-I

BVCT201

- Unit-1: Introduction to AutoCAD** **08**
- Launching AutoCAD, Text & Graphic Screens, Cursor, Menus, Toolbars, Status Bar, Command Prompt
 - Application Menu: Open a Drawing ,Create new Drawing, Save Drawing, Exiting AutoCAD, Function Keys, Units & Limits, Draw Commands, Line, Circles , Arcs, Ellipse, Polygon, Text
 - Edit Drawing: Copy, Mirror, Offset, Move, Extent, Trim, Rotate, Scale, Array, Hatch edit
- Unit-2: Dimensioning & Creation of Block** **08**
- Text, Layers, Line Types, Color, Linear Dimensions, Aligned Dimensions, Radius and Diameter
 - Dimensions, Angular Dimensions, Continued and Baseline Dimensions, Leaders, Quick, Dimensions
 - Insert and edit block, Insert Kitchen, Furniture and Landscape design,
 - Create a Template file.
- Unit-3: Different Plan and Co-ordinate system** **07**
- Centre Line Plan, Elevation-Front Elevation, Left Side Elevation, Right Side Elevation, Back Side Elevation
 - Section, Area Calculation simple Method
 - Coordinates System, Absolute Co-ordinate system
 - Relative Rectangular Co-ordinate system, Relative Polar Co-ordinate system
- Unit-4: Miscellaneous Calculations using Plan** **07**
- Draw a Bungalow Plan Draw a plan, Draw a Elevation, Draw a staircase section
 - Draw a section for plan
 - Calculation area for plan, All drawing set in template file format
 - Plot and Print.
- Reference:**
- Introduction to AutoCAD 2025 for Civil Engineering Applications: By Nighat Yasmin Ph.D.

ENVIRONMENTAL STUDIES

BVCT202

Unit 1: Introduction to Environmental Studies

06

- Multidisciplinary nature of environmental studies
- Scope and importance; Concept of sustainability and sustainable development.

Ecosystems

What is an ecosystem? Structure and function of the ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:

- a) Forest ecosystem
- b) Grassland ecosystem
- c) Desert ecosystem
- d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 2: Natural Resources: Renewable and Non-renewable Resources

06

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 3: Biodiversity and Conservation

06

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 4: Environmental Pollution

06

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 5: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

References:

- Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
- Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
- Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36--37.
- McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29--64). Zed Books.
- McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
- Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
- Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
- Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
- Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
- Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
- Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

CONSTRUCTION MATERIALS AND APPLICATION -II BVCT203

Unit 1 - Timber and Steel

10

- 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 2– Concrete

10

- 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,
- Fiber reinforced concrete
- Prestressed concrete.

Unit 3 - Miscellaneous Materials

10

- 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 nonferrous metals.
- Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes.
- Types use and application of- Fiber Sheets,
- sound and heat insulating materials,
- Materials used in interior decoration works like POP, Water proofing compounds, fire resisting materials

References:

- A Text-Book of Building Construction, S.P.Bindra and S.P.Arora, Dhanpat Rai Publications
- Building Materials and Construction, Jena and Sahu, Mc. Graw Hill.
- Materials for Civil and Construction Engineers, Mamlouk and Zaniewski, Pearson
- Building Materials and Building Construction, by P C Varghese
- Building Construction, by B. C. Punmia, , Laxmi Publication

MECHANICS OF STRUCTURES

BVCT204

Unit-1: Simple Stress and Strain

10

- Elasticity and plasticity – Types of stresses & strains–Hooke’s law – stress – strain diagram for mild steel
- Working stress – Factor of safety – Lateral strain,
- Poisson’s ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

Unit-2: Shear Force and Bending Moment Diagram

10

- Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure.

Unit-3: Columns

10

- Concept of compression member, short column, long column, effective length, radius of gyration, slenderness ratio, type of end conditions for columns, buckling of axially loaded columns. Euler’s theory, assumptions made in Euler’s theory and its limitations, application of Euler’s equation to calculate buckling load. Rankin’s formula and its application to calculate crippling load. Concept of working load/safe load, design load and factor of safety.

Reference:

- Mechanics of Structures Vol. I By Dr. H. J. Shah, S. B. Junnarkar

ESTIMATING AND COSTING - I

BVCT205

Unit – 1: Approximate and Detailed Estimate

15

- Introduction to Quantity survey, Estimation and Costing. Its purpose and uses in industry.
- Introduction to conversion technique
- Types of estimates - Preliminary estimates or approximate estimate- Detailed estimates Contingencies, Work charged Establishment, Overhead cost, miscellaneous cost and profit.
- Definition: Plot Area, Plinth/Built-up Area, Carpet Area, Super Built Up Area
- Stages of preparation – details of measurement and calculation of quantities and abstract. Measurement sheet, abstract of cost and material requirement.
- Units of measurement for various items of work as per BIS:1200. Rules for measurements.
- Different methods of taking out quantities.
 - a) Traditional method (Centre line method and long wall & short wall method.)
 - b) Detail estimate (Based on individual items of work)
 - c) Preparation of specifications, statements for a small residential building with flat roof.

Unit - 2: Rate analysis and Quantity Estimation

15

- Analysis of rates: Detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation.
- Steps in the analysis of rates for any item of work: Requirement of materials, labor, sundries, water charges and contractor's profit.
- 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, beam, column and footing.
- Quantity of steel required in formation of slab, column, beam & footing:
- Analysis of Rates- Steps involved in the analysis of rates. Requirement of material, labor, sundries, contractor's profit and overheads (D) Running and maintenance cost of construction equipment.

Reference:

- Estimation and costing - BN Datta, Chakrabarti



PROJECT - II

BVCT206P

SEMESTER-03

PUBLIC HEALTH ENGINEERING

BVCT301

Unit – 1: Introduction to Public Health Engineering

08

- Necessity of Water and historical development
- Introduction to water demand
- Variation in demand
- Factors affecting per capita demand
- Method of population forecasting
- Numerical of population forecasting

Unit – 2: Sources of water and its Conveyance

08

- Surface and underground water sources
- Well and its types
- Yield from Well
- Intakes and its types
- Pipes
- Pipe and its joints
- Testing of pipeline

Unit – 3: Quality of Water and its Treatment

07

- Physical and chemical impurities
- Chemical test done for impurities
- Sampling
- Treatment of water
- Usual coagulants
- Filtration
- Rapid sand filter its advantages and disadvantages
- Pressure filters

Unit -4: Distribution system and Appurtenances

07

- Method of distribution
- Pressure in distribution system
- Plumbing in building
- Sanitary Engineering
- Quantity of sewage
- Variation in sewage flow
- Factors Affecting Quantity of storm water
- Design of sewer
- Non scouring velocity

Reference:

- Public health engineering-Pooja Deepak Pawar

CONTRACT AND TENDERING

BVCT302

Unit-1: Tendering

10

- Tender
- An invitation to tender
- Requirements to Be Fulfilled before Inviting Tenders
- Modes of Inviting Tender
- Mode of Publication of Tender Notice for Public Works
- Contents of the Tender Notice
- Preparation and Submission of Tender
- Decision to Accept a Tender
- Rejection of All Tenders
- Rejecting the Lowest Tender
- Re-advertisement
- Tender Documents
- Pre-Qualification Process
- Typical document required for pre qualifier
- Invitation Of Tender
- Earnest Money Deposit
- Security Deposit
- Measurements
- Qualities of a Good Bidder
- Single and Two Cover-Bids:

Unit-2: Contract

10

- Contract
- Parts of a contract
- Essentials of a Contract
- Types of Contracts
- Important Conditions of Contract 2.05. Formation Of Contract
- Contract Document
- System of Payment
- Types of Contracting Firms/Construction Companies
- Introduction to CSR (Common Schedule Rates) and Calculation of Cost based on Premium on CSR
- Measurement of quantities for construction works
- Maintenance of Measurement Book
- Types of payments: First, running, advance, first & final and final payment
- Valuation
- Principles of Valuation
- Factors Consider for Valuation
- Important Terms
- Methods of valuation (i) replacement cost method.(ii) rental return method



Unit-3: Specification

10

- Specification in tender and contract

References:

- Contract and Tendering - B.S. Patil (Author)
- E-Contracts, Tenders & Agreements (Lawmann's Book) Hardcover – by Namarata Shukla (Author)



SURVEY - I

BVCT303

- Unit-1: Introduction:** **08**
- Basic principles of surveying , Concept and purpose of surveying,
 - measurements-linear and angular, units of measurements ,
 - Instruments used for taking these measurements,
 - Classification based on surveying instruments :Introduction, advantages and disadvantages , Direct and indirect ranging offsets and recording of field notes
- Unit-2: Compass surveying:** **08**
- Purpose of compass surveying. Use of prismatic compass: Setting and taking observations,
 - 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
 - Local attraction - causes, detection, errors and corrections
 - Problems on local attraction, magnetic declination and calculation of included angles in a compass traverse
- Unit-3: Leveling:** **07**
- Purpose of leveling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and benchmarks,
 - Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages,
 - Use of auto level, Leveling staff: single piece, folding, invar precision staff, telescopic,
 - Temporary adjustment and permanent adjustment of dumpy level by two peg method,
 - Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels,
 - Level book and reduction of levels by Height of collimation method and Rise and fall method problem on reduction of levels fly leveling, check leveling and profile leveling (L-section and X-section), errors in leveling, permissible limits, reciprocal leveling. Numerical problems.
- Unit-4: Plane Table Surveying** **07**
- Purpose of plane table surveying,
 - equipment used in plane table survey,
Setting of a plane table:
 - (a) Centering
 - (b) Levelling
 - (c) Orientation;Methods of plane table surveying
 - (a) Radiation,
 - (b) Intersection
 - (c) Traversing
 - (d) Resection
 - Concept of Two point and Three point problems (Concept only);
 - Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidade

Reference:

- Surveying Vol. I, Volume 1 - B. C. Punmia

CIVIL AUTO CAD-II

BVCT304

Unit –1:	06
Correct Concept and Sketch the arrangement of Bricks in different types of bond:	
<ul style="list-style-type: none">• Stretcher Bond, Header Bond L corner, Header Bond 1 1/2 brick thick wall 1.2.English Bond 1 1/2 brick thick wall in L corner• Flemish Bond 1 1/2 brick thick wall in L corner• Drafting Building Plan	
Unit –2:	06
Draw different floors, various types of Arches and Lintels:	
<ul style="list-style-type: none">• Draw wood floor, Draw Flooring details of concrete floor. Draw Brick floors or Block floors details. Various types of Arches, Various types of Arches semicircular etc.• Various types of Arches in various design• Lintel detailing/S of Lintel and Sunshade detailing.• Drafting Building Plan.	
Unit -3:	06
Draw different types of Doors and Windows	
<ul style="list-style-type: none">• Draw different types of windows-Paneled & Glazed Window• Draw different types of doors	
Draw and Design Staircases:	
<ul style="list-style-type: none">• Draw and Design Staircase• Different types of staircases	
Unit -4:	06
Prepare various Drawing of Sanitary:	
<ul style="list-style-type: none">• Prepare Various Drawing of Sanitary• Prepare Various Drawing of Sanitary	
Unit -5:	06
Introduction of 3D layers:	
<ul style="list-style-type: none">• 3 D modeling toolbar ,Solid Editing- Commands in AutoCAD 3D, 3D Draw commands• 3D Modify commands, Types of 3d Models, Mesh Modeling and Gizmo Mesh Modeling, 3D Views, Create Material• 3D Coordinates, Render 3D model-Find, Render with all views	
Reference:	
<ul style="list-style-type: none">• Introduction to AutoCAD 2025 for Civil Engineering Applications: By Nighat Yasmin Ph.D.	



PROJECT - III

BVCT305P

SEMESTER-04

GEOTECHNICAL ENGINEERING

BVCT401

Unit 1: Introduction to geotechnology

08

- Definitions and scope of Geotechnical Engineering: rocks, soil, origin & mode of formation
- types of soil obtained, soil mechanics, rock mechanics, geotechnical engineering.
- Soil phase systems, volumetric ratios: void ratio, porosity, degree of saturation, air voids, air content.
- Weight-volume relationship: different unit weights, water content, specific gravity of soil solids, mass and absolute specific gravity.
- Functional relationships among different unit weights, volumetric ratios, and water content.
- Relative density, relative compaction.

Unit 2: Particle Size Distribution and Classification of Soils

08

- Wet & dry sieve analysis, Sedimentation analysis:
- Stoke's law, Hydrometer method of analysis, Limitation of sedimentation analysis.
- Particle size distribution curve/ gradation curve and its uses.
- Introduction to cohesive and cohesionless soil.
- Necessity of soil classification, Indian standard particle size classification,
- Indian standard soil classification system as per IS: 1498 -1970, boundary classification.

Unit -3: Permeability of Soils & Seepage Analysis

07

- Types of soil water, definition of hydraulic head, hydraulic gradient, Darcy's law, validity of Darcy's law, permeability of soil.
- Determination of coefficient of permeability of soil in lab using constant head and variable head methods, factors affecting permeability of soil,
- effect of permeability on various properties of soil, determination of in-situ permeability with pumping out and pumping in tests.
- Permeability of stratified soil deposits.
- Definition of seepage and its importance for the analysis & design of hydraulic structures, graphical representation of seepage by flow net diagram,
- definition of flow line, equipotential line, flow channel, flow field, characteristics of flow net, use of flow net, phreatic line.

Unit -4: Compaction of Soil & Soil Exploration

07

- Theory of compaction, determination of optimum moisture content (OMC) & maximum dry density (MDD) in laboratory by conducting the light and heavy compaction tests
- Factors affecting the compaction, effect of compaction on properties of soil, soil structure, placement water content, relative compaction, Proctor needle method for compaction.
- Necessity of soil exploration, methods of soil investigation, methods of boring, disturbed and undisturbed soil samples
- soil sampling and samplers, number and spacing of bore holes, depth of bore holes.
- Penetrometer tests: SPT, SCPT and DCPT.
- Representation of data with borehole logs.

Reference:

- Soil Mechanics and Foundations , by Dr. B.C.Punmia (Author), Er. Ashok Kumar Jain (Author), Dr. Arun Kumar Jain (Author)

STRUCTURE

BVCT402

Unit 1:	06
• Direct, Bending Stresses in Vertical Members & Slope, deflection of beams	
Unit 2:	06
• Analysis of beams	
Unit 3:	06
• Design of Slab by Limit State Method	
Unit 4:	06
• Design of Beam & Column by Limit State Method	
Unit 5:	06
• Design of Footing by Limit State Method	
Reference:	
• Structural Analysis-I, 5th Edition, by Bhavikatti S.S	

BUILDING MAINTENANCE AND REPAIRS

BVCT403

Unit -1:

08

Durability of civil engineering structures:

- Importance of durability – Factors affecting durability of buildings – life expectancy of different classes of buildings.
- Environmental factors that affect the durability of structures – Effect of natural agents (Air, sun, rain, frost and biological agents such as vegetation & insects) – Environmental pollution
- Effect of pollution of air, water and soil – Location effect (Marine, Industrial area etc.) – Usage aspects (Structures subjected to dynamic loading & abrasive condition) - Preventive and remedial measures.
- Role of maintenance in durability and serviceability of buildings: – Necessity of maintenance – Economic aspects of maintenance. Different types of maintenance – Preventive maintenance
- Remedial maintenance – Routine maintenance – Pre-monsoon maintenance - Special maintenance – Planning aspects of maintenance.

Unit – 2:

08

Cracks in buildings:

- Defects in foundation, masonry, plastering, Painting, flooring, doors and windows, concrete (RCC and PCC) and wooden roof
- Corrosion of reinforcement and steel structures – structural damage due to fire - Causes – Preventive and remedial measures
- Cracks in buildings – Causes - Preventive and remedial measures Defects in foundation – Causes - Preventive and remedial measures. Defects in masonry – Causes - Preventive and remedial measures Defects in wooden roof – Causes - Preventive and remedial measures Defects in concrete (RCC and PCC) - Causes – Preventive and remedial measures
- Corrosion of reinforcement and steel structures – Causes – Preventive measures. Defects in plastering – Causes – Preventive and remedial measures Defects in flooring – Causes – Preventive and remedial measures
- Defects in doors and windows – Causes – Preventive and remedial measures
- Defects in Painting – Causes – Preventive and remedial measures Defects due to fire - Causes – Preventive and remedial measures

Unit –3:

07

Defects in Stair case, water supply system, sewage and sullage system, in drainage system and electrical system

- Causes – Preventive and remedial measures. Defects in Stair case – Causes – Preventive and remedial measures.
- Defects in water supply system – Causes – Preventive and remedial measures. Defects in sewage and sullage system - Causes – Preventive and remedial measures. Defects in drainage system - Causes – Preventive and remedial measures.
- Defects in electrical system - Causes – Preventive and remedial measures. Building Services Introduction to other building services (Topics under this section needs only brief description to understand their basic functions and requirements. Explanations with sketches are sufficient) Lift – Location – RTT – Number of lifts – lift well and shaft – Machine room.
- Air conditioning system: Types of A/C – Capacity determination – Requirements for an A/C room
- Electrical installations: Panel board & Buss bar, rising mains – distribution boards – MCB – ELCB – DP - TP and change over switch switches - Telephone and TV connectivity – Requirements of domestic gas pipeline.

Unit –4:

07

Retrofitting and restoration of building:

- Need for retrofitting and restoration – Common retrofitting works carried out – Shoring and underpinning
- Different methods of retrofitting and restoration – Challenges in retrofitting and restoration works.
- Deterioration of monumental and historical buildings – Common causes – Preventive measures – Restoration works – Conservation of world heritages.

References:

- S.P 25-1984 - Hand book on causes and prevention of cracks in buildings
- Philip.H.Perkins: Concrete Structures-repair waterproofing and protection; Elsevier Science Ltd
- S. Champion: Failures and repair of concrete structures ; John Wiley & Sons . Jacob Feld:Construction failures ; Wiley
- Shetty M.S. : Concrete technology - ; S.Chand
- P.K.Guha : Maintenance and repair of buildings - ; New Central Book Agency
- B.S.Nayak : A book on Maintenance Engineering ; Khanna Publishers

PROJECT MANAGEMENT

BVCT404

Unit – 1: Project Management	06
<ul style="list-style-type: none">• Overview of Project Management: Concepts and attributes of Project, Project lifecycle and stakeholders,• Project Organization, WBS, Scope and priorities, Project Identification, Market feasibility with Moving Average and Exponential smoothing methods,• Techno Economic feasibility, Government policy to location, legal aspects, Preparation of DPR	
Unit -2: Planning	06
<ul style="list-style-type: none">• Project Planning: Time and cost estimates with AON and AOA conventions, 2.2 Budget estimates, Network analysis, Float analysis, crashing concepts.	
Unit -3: PERT	06
<ul style="list-style-type: none">• Project scheduling and Risk Management: Gantt chart, splitting and multitasking• Risks in time estimates, PERT analysis.	
Unit -4: Responsibilities of Project Manager	06
<ul style="list-style-type: none">• Project Organization : Role and responsibilities of Project Manager• Team development model, sources of conflicts, conflict resolution.	
Unit -5: Revised Estimate and S curve	06
<ul style="list-style-type: none">• Earned value analysis : ‘S’ curve, Cost and schedule performance indices using network• Revised estimates of cost and time	
Reference:	
<ul style="list-style-type: none">• Civil Engineering Project Management , by Alan Twort (Author), Gordon Rees (Author)	



PROJECT -IV BVCT405P

SEMESTER-05

ADVANCE SURVEYING

BVCT501

Unit – 1: Contouring:

06

- Concept of contours, purpose of contouring, contour interval and horizontal equivalent.
- Factors affecting 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

Unit – 2: Theodolite Surveying

06

- 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

Unit – 3: Tacho-metric surveying

06

- Tacheometry, Instruments to be used in tacheometry,
- Methods of tacheometry, stadia system of tacheometry,
- General principles of stadia tacheometry, examples of stadia tacheometry and Numerical problems.

Unit – 4: Curves

06

- 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
- 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
- Vertical curve Setting out of a vertical curve

Unit – 5: Introduction to the use of Modern Surveying equipment and techniques such as: 06

- EDM or Distomat
- Planimeter (Digital)
- Total station
- Introduction to remote sensing and GPS
- Auto level
- Digital theodolite

Reference:

- A Text Book of Advanced Surveying , Author R. Agor

ADVANCE CONSTRUCTION TECHNOLOGY

BVCT502

Unit – 1:

06

Sub Structure Construction:

- Boxjacking, Pipe jacking, Underwater drilling, blasting, and concreting. Underwater construction of diaphragm walls and basement
- Driving well and caisson, sinking cofferdam, cable anchoring, and grouting. Driving diaphragm walls, sheet piles
- Laying operations for built-up offshore system, Shoring for deep cutting, large reservoir construction, and well points. Dewatering for underground open excavation.

Unit -2:

06

Super Structure Construction for building:

- Vacuum dewatering of concrete flooring, Concrete paving technology
- Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections, Erection techniques of tall structures, large span structures, launching techniques for heavy decks, insitu prestressing in high rise structures, post-tensioning of the slab, aerial transporting, Handling, and erecting lightweight components on tall structures.

Unit -3:

06

Construction of Special Structures:

- Erection of lattice towers - Rigging of transmission line structures, Construction sequence in cooling towers, Silos, chimneys, skyscrapers. Construction sequence and methods in domes, Support structure for heavy equipment and machinery in heavy industries, Erection of articulated structures and space decks. Roof truss erection problems Building / Industrial component, Equipment and tackles used for erecting these. Plate girder launching a portion of bridge girder, large span lattice girder. Erection of chimney, Erection of overhead tank.

Unit -4:

06

Advancement in Construction techniques:

- Building construction techniques: Zero energy building, green building, pre engineering building, Solar Paints, Building Integrated Photovoltaic (BIPV), Earthquake Resisting Controls- Isolation and Dissipation.
- Coastal construction techniques: Sound Proofing walls, water-resistant roofs, high-performance doors and windows, air and moisture barriers.
- Road construction techniques: 3D Printing, Road Printer, smart roads.
- Ground improvement techniques: Advanced piling techniques - Stone Column, Vibro Floatation, Grouting, Geotextile application, Micro Piles, and Soil Nailing. Vertical drains-Sand Drains, Prefabricated Vertical Drains. Thermal Methods- soil heating and soil freezing.

Unit – 5:

Dredging:

- Dredging System, Mechanism, Hydraulic dredger in waves, dredging equipment, Water Booster System, dredging in the navigation system, Agitation dredging system, silt dredging system, water injection system, Pneumatic dredging system, Amphibious & scrapper dredging system.
- Advantages & Disadvantages of Various Dredging Systems, Production Cycle for Dredgers, Application, Capacity of dredgers, & its economical use, dredging economics.

Rehabilitation and Strengthening Techniques:

- Seismic retrofitting, strengthening of beams, strengthening of columns, strengthening of the slab, strengthening of a masonry wall, Protection methods of structures, Mud jacking and grouting for foundation, Micro piling and underpinning for strengthening floor and shallow profile, Subgrade waterproofing, Soil Stabilization techniques
- Repair of steel structures, bridge, building, towers etc., monuments and historical structures. Prevention of water leakage in structures; underwater repair; Durability of repairing material. Maintenance of underground railways.

Reference:

- Advanced Construction Technology ; Author Name : Dr. R. Vigneswaran

DESIGN OF STEEL STRUCTURE

BVCT503

Unit -1:	06
Introduction to limit state design of steel structures:	
<ul style="list-style-type: none">• Advantages and disadvantages of Steel structures, structural steel sections• loads and load combinations,• Limit state design- Design considerations,• Failure criteria for steel, codal specifications and section classifications as per IS 800-2007.	
Unit -2:	06
Bolted Connections:	
<ul style="list-style-type: none">• Introduction, advantages and disadvantages of bolted connections,• Difference between unfinished bolts and High strength friction grip bolts (HSFG).• Behaviour of bolted joints, failure of bolted joints,• Simple problems on finding shear strength, bearing strength, tensile strength of bolts (bearing type only).• Tensile strength of plate, Efficiency of the joint.• Simple Lap Joint Design problems. Note: Excluding problems on HSFG Bolts and Long joints conditions.	
Unit -3:	06
Welded Connections:	
<ul style="list-style-type: none">• Introduction, advantages of welding• types of joints, weld symbols, specifications, effective area of weld,• Design strength of fillet weld, Simple problems on welded joints (fillet weld only).	
Unit -4:	06
Flexural Members:	
<ul style="list-style-type: none">• Lateral buckling, Web buckling and crippling,• Difference between laterally restrained and unrestrained beams,• Determination of the moment capacity of laterally restrained beams.• Design of laterally restrained simple beams using standard rolled steel sections only.	
Unit – 5:	06
Tension Members:	
<ul style="list-style-type: none">• Introduction, types of tension members, slenderness ratio, net area,• behaviour of tension members, modes of failure, factors affecting the strength of tension member,• Design strength of tension member due to yielding of gross section, due to rupture of critical sections and block shear.• Design of tension members.	
Compression Members:	
<ul style="list-style-type: none">• Columns –Classification, Boundary conditions, effective length, slenderness ratio.• Design strength of Columns. Design of axially loaded Columns (Excluding Built up sections)• Design of struts: Continues and Discontinues strut for given end conditions for axial load only.	
Reference:	
<ul style="list-style-type: none">• Design of Steel Structures By Limit State Method as per IS: 800-2007 ,by S. S. Bhavikatti (Author)	

WATER RESOURCE ENGINEERING

BVCT504

Unit -1: Reservoir Planning and Management:

08

- Purpose of reservoir, classification of Reservoir, site selection, Investigation works for reservoir, storage zones storage capacity of reservoir, Yield and capacity of reservoir, mass inflow curve and demand curve, Determination of reservoir capacity, determination of safe yield, reservoir losses, reservoir sedimentation, sediment control, Multipurpose reservoirs, Flood Routing and its methods.

Unit – 2: Gravity Dams:

08

- Various forces acting on gravity dam, Load combinations for design, Stability requirements & modes of failure principal and shear stress, Profile of dam- elementary and practical profile, low and high gravity dam, Limiting height of gravity dam
- High and Low gravity dam, Design of gravity dams, Galleries, Joints, Keys, Water seals, crack control in concrete dams.

Unit -3: Arch and Buttress Dams:

07

- Types of arch dams, forces acting on arch dam, design of arch dams
- Types of buttress dams.

Unit -4: Earth and Rock Fill Dams:

07

- Types of earth dams, causes of failures of earth dams, design criteria, section of earth dam, downstream drainage system, seepage analysis, phreatic line, Stability analysis, stability of d/s slope during steady
- seepage, stability of u/s slope during sudden drawdown, stability of u/s and d/s slopes during construction, slope protection, seepage control measures, design considerations in earthquake regions, types of rock fill dams

Reference:

- Hydrology and Water Resources Engineering Vol.1 By S.K.Garg (Author)



PROJECT -V BVCT505P

SEMESTER-06

BUILDING INFORMATION MODELLING

BVCT601

Unit -1: Exploring the User Interface

10

- Working with Revit elements, creating a basic Floor Plan.
- Working with grids and Structural Columns, adding and Modifying Walls,
- Loading Additional Building Components, importing and Exporting using External Files and Linking Files
- Creating Advanced Components, Creating and Modifying Parametric Families.
- Viewing the Building Model, Controlling Object Visibility, Creating and Modifying Section and Elevation Views.

Unit -2: Developing the Building Model

10

- Creating and Modifying Floors, Ceilings, Roofs and Curtain Wall.
- Detailing and Drafting, Duplicating Views,
- Creating Elevations, Creating Section structural Works
- Floor Framing, Working with Roofs, Working with Structural Steel Frames.
- Working with Sloped Beams, Working with Floor Decks, Working with Foundation Slabs and Slabs
- Footings and Grade Beams, Managing Revisions, User Interface & File Organization.

Unit -3: Viewing the Building Model

10

- Controlling Object Visibility
- Creating and Modifying Section And Elevation Views
- **Nevis Works** : (Model Development User Interface & File Organization
- Overriding transparency, color, and object/model location.
- Importing 3D Files, How to import and append 3D model File, and Understanding NavisWorks file Formats, Object enablers

HIGHWAY ENGINEERING

BVCT602

Unit -1: Soil:

08

- **Tests on Soil:** CBR test, effect of lateral confinement on CBR and Evaluate of Subgrade soil, Consistency, Engineering Properties and Modulus of sub-grade reaction of soil, estimation of modulus of subgrade reaction

Unit -2: Stresses in Soil:

08

- Theories of elastic and plastic behavior of soils, Cyclic triaxial test on subgrade soils, resilient deformation, resilient strain, resilient modulus. Stabilized Soils: Method of sampling and Preparation of Stabilized Soils for testing
- Relation for Moisture content and Dry Density of Stabilized mixes

Unit -3: Aggregates:

07

- Classification, requirements, Blending of aggregates, Importance of aggregate shape factor in mix design
- Grading requirements for aggregate, selection of bases and sub-base material (including stabilized materials)

Unit -4: Pavement Evaluation

07

- Flexible and rigid pavement distresses, condition and evaluation surveys, present serviceability index, roughness measurement, Benkelman beam deflections, skid resistance and measurement.
- **Highway construction:** Construction of WBM roads, bituminous pavements, cement concrete roads, Reinforced concrete pavements construction.

Reference:

- Highway Engineering By Khanna And Justo Highway Engineering - L.R. Kadiyali

ENVIRONMENTAL ENGINEERING

BVCT603

Unit -1: Introduction:

08

- Basic ideas of environment, basic concepts, man, society & environment, their interrelationship. Mathematics of population growth and associated problems,
- Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.
- Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Land slide causes, effects and control/management; anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

Unit -2: Air pollution and control Atmospheric Composition

08

- Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.
- **Energy balance:** Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.
- **Green house effects:** Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.
- Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozonemodification.

Unit – 3: Water Pollution and Control Hydrosphere

07

- Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/groundwater pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants.
- Effect of oxygen demanding wastes on river [deoxygenation, reaeration], COD, Oil, Greases, pH. Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contactor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.

Unit -4: Land Pollution, Noise pollution and Environmental management

07

- Lithosphere; Internal structure of earth, rock and soil 1L Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).
- Noise Pollution Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighborhood noise] Environmental Management: Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.

References:

- Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
- De, A. K., "Environmental Chemistry", New Age International.

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ENTREPRENEURSHIP

BVCT604

Unit -1: Basics of Entrepreneurship	08
<ul style="list-style-type: none">• Meaning, Definitions & characteristics of Entrepreneurship• managerial competency attributes• Entrepreneurial functions• Need for Entrepreneurship	
Unit -2: Acquiring Entrepreneurial Values and Motivation	08
<ul style="list-style-type: none">• Attitude and Motivation- Meaning and concept.• Developing Entrepreneurial Motivation and Competency• Creativity, Risk Taking, Leadership,• Barriers to Entrepreneurship.	
Unit -3: Introduction to Market Dynamics	07
<ul style="list-style-type: none">• Meaning, characteristics & types of market• perfect competition & its features• monopoly market & its features• monopolistic competition & its features	
Unit -4: Entrepreneurial Opportunities and Enterprise Creation	07
<ul style="list-style-type: none">• what is a business opportunity• environmental factors (the Pestel model)• selection of an enterprise• steps in setting up of an enterprise	



PROJECT -VI

BVCT605P



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