Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Semester: Fifth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practicals				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE501T	Structural Analysis -II	3	1		4	4	20	80	100	40					3
BECVE501P	Structural Analysis -II			2	2	1					25	25	50	25	
BECVE502T	Reinforced Cement Concrete (RCC) Structures	3	1		4	4	20	80	100	40					4
BECVE502P	Reinforced Cement Concrete (RCC) Structures			2	2	1					25	25	50	25	
BECVE503T	Fluid Mechanics -I	3	1		4	4	20	80	100	40					3
BECVE503P	Fluid Mechanics -I			2	2	1					25	25	50	25	
BECVE504T	Geotechnical Engineering -II	3	1		4	4	20	80	100	40					3
BECVE505T	Hydrology & Water Resources (HWR)	4			4	4	20	80	100	40					3
BECVE506P	Communicative English & Technical Writing			3	3	2					25	25	50	25	
Total		**16**	**4**	**9**	**29**	**25**	**100**	**400**	**500**		**100**	**100**	**200**		

Note: 1."Technical Writing" shall consist of detailed report on Summer Training- 1 (ST-1) underwent after 4th Semester.

2. Equal weightage shall be given to the components of "Communicative English" and "Technical Writing"

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							Assessment of Marks for Theory				Assessment of Marks for Practicals				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE601T	Steel Structures	3	1		4	4	20	80	100	40					4
BECVE601P	Steel Structures			2	2	1					25	25	50	25	
BECVE602T	Surveying-II	3	1		4	4	20	80	100	40					3
BECVE602P	Surveying-II			4	4	2					25	25	50	25	
BECVE603T	Fluid Mechanics -II	3	1		4	4	20	80	100	40					3
BECVE603P	Fluid Mechanics -II			2	2	1					25	25	50	25	
BECVE604P	Building Design and Drawing			4	4	4					50	50	100	50	
BECVE605T	Environmental Engineering-II	3	1		4	4	20	80	100	40					3
BECVE606P	Site Visit & Mini Project			3	3	3					25	25	50		
Total		**12**	**4**	**15**	**31**	**27**	**80**	**320**	**400**		**150**	**150**	**300**		

Summer Training - 2 (ST-2) of 2-4 Weeks duration during Summer Vacation is mandatory and will be evaluated in Seventh Semester.

Note:

1. External Practical Evaluation of Building Design and Drawing shall be performance based by drawing assigned problem given jointly by the Internal & External Examiners on AutoCAD
2. "Site Visit" shall cover minimum Five Site Visits.
3. "Mini Project" shall include report on Site Visits and Assigned Mini Project/Software Training, etc.
4. Equal weightage shall be given for components of "Site Visits" and "Mini Project".

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

V Semester				
Code No.	**Name of Subject in Semester Pattern**	**Code No.**		**Name of Equivalent Subject in Credit Based Semester Pattern**
5CE01	Steel Structures (T)	BECVE601T		Steel Structures
5CE01	Steel Structures (P)		BECVE601P	Steel Structures
5CE02	Environmental Engineering - II	BECVE605		Environmental Engineering - II
5CE03	Surveying - II (T)	BECVE602T		Surveying – II
5CE03	Surveying - II (P)		BECVE602P	Surveying – II
5CE04	Transportation Engineering - I (T)	BECVE403T		Transportation Engineering - I
5CE04	Transportation Engineering - I (P)		BECVE403P	Transportation Engineering - I
5CE05	Building Design and Drawing (T)		BECVE604P	Building Design and Drawing
5CE05	Building Design and Drawing (P)		BECVE604P	Building Design and Drawing
5CE06	Project Management	BECVE704		Construction Management and Law
5CE07	Site Visit		BECVE606P	Site Visit and Mini Project
VI Semester				
Code No.	**Name of Subject in Semester Pattern**	**Code No.**		**Name of Equivalent Subject in Credit Based Semester Pattern**
6CE01	Structural Analysis - II (T)	BECVE501T		Structural Analysis - II
6CE01	Structural Analysis - II (P)		BECVE501P	Structural Analysis - II
6CE02	RCC Structures (T)	BECVE502T		Reinforced Cement Concrete (RCC) Structures
6CE02	RCC Structures (P)		BECVE502P	Reinforced Cement Concrete (RCC) Structures
6CE03	Geotechnical Engineering - II	BECVE504T		Geotechnical Engineering - II
6CE04	Fluid Mechanics - II (T)	BECVE603T		Fluid Mechanics - II
6CE04	Fluid Mechanics - (P)		BECVE603P	Fluid Mechanics - II
6CE05	Computer Applications in Civil Engineering		Semester - I, Serial No. 8	Computational Skills
6CE06	Technical Writing	BECVE506		Communicative English and Technical Writing

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU's relevant ordinance.

STRUCTURAL ANALYSIS –II

BECVE501T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Apply the different methods of analysis of frames in practical problems
2. Formulation of stiffness matrix, transformation matrix, load matrix for various structural components for analysis purposes.
3. Understand the basics of finite element method in the analysis of structural components.
4. Understand the concepts related to structural dynamics.

Unit – I

Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two storey)

Unit - II

Analysis of Continuous Beams & Simple Portal frames (sway and Non Sway) Using Moment Distribution.

Unit - III

Basic concept, Degree of Freedom, Basic concept of Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. Transformation Matrix, Assembly of Global/ Structural stiffness matrix up to (8x8). Member load matrix including lack of fit, temperature, Assembly of Global/ Structure load matrix, Solution to problems with maximum degree of freedom three.

Unit - IV

Formulation of element/local stiffness matrix and global stiffness matrix for beam members (without axial deformations) for continuous beams, Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, Assembly of global/ structure load matrix up to Three Elements. Solution to problems with maximum degree of freedom Three.

Unit – V

Formulation of element/ local stiffness matrix and global stiffness matrix for Plane frame members (without axial deformations), Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, temperature Moments Assembly of global/ structural load matrix.

Solution to Plane frame problems with maximum degree of freedom six inclined member problems.

Unit - VI

Introduction to structural dynamics, D'Alembert principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, (MDOF (up to 3 DOF), mode shape and nodal frequency).

Introduction to finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for bar elements (prismatic/Non-prismatic) Displacement based bar elements (Prismatic/Non-prismatic)

REFERENCE BOOKS:

1. C K Wang, 'Intermediate Structural Analysis"
2. S P Timoshenko, 'Theory of Structure'
3. Jain, Jain Krishna, 'Plain & Reinforced Concrete Structures', Vol-II
4. Rally and Dally, 'Experimental Stress Analysis'

STRUCTURAL ANALYSIS –II

BECVE501P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

Minimum Eight Problems, on complete syllabus with hand calculations using scientific calculators and also solution to same problems by using available application software.

(Solution is restricted to four degree of freedom problems and assembly restricted to eight degree of freedom problems)

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 4 hrs**

COURSE OUTCOMES: The students shall be able to

1. Understand the basic concepts of structural design Methods of RCC to the practical problem
2. Understand the composite action of reinforced steel and concrete in reinforced concrete structural members
3. Use the knowledge of the structural properties of materials i.e. steel and concrete in assessing the strength.
4. Use the knowledge in structural planning and design of various components of buildings.
5. Apply the concepts and applications of prestressed concrete in real problems

Unit – I

Introduction to the Working Stress Method of RCC design. Basic concepts in design for flexure, assumptions, design constants. Analysis of the rectangular section, Balanced, under-reinforced and over-reinforced sections; Drawbacks and limitations of Working stress methods.

Unit – II

Prestressed Concrete: Properties of high grade/strength materials, concepts of prestressed concrete, methods of prestressing, losses in prestressing. Various systems of prestressing with particular reference to Freyssinet, Magnel Blatton and Gifford Udall systems Analysis of rectangular, T and I section. Design of prestressed slab/ rectangular beam

Unit - III

Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse, other limit states. Review of IS – 456-2000.

Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode

Analysis & Design of Doubly reinforced sections

Unit - IV

Limit state of collapse in flexure: Analysis and design of Tee and L-beam section.

Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves.

Design of rectangular pad/ slopped footing for axial load

Unit - V

Limit state of Collapse in Shear & Bond: Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and force. Check for bond.

Limit state of Serviceability:

Causes and control cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced cracks, Cracks due to loading. Needs for crack width control

Moment- curvature relationship, deflection control of beams; Deflection calculation for beam.

Limit state of collapse in torsion: Concepts of interaction to torsion, shear and flexure Analysis & design of rectangular section for torsion, shear and flexure

Unit – VI (with LSM)

Design of one-way, simply supported, single span and cantilever slabs, and continuous slab/ beam with IS coefficients.

Design of RCC Two way slab with various end conditions using IS code coefficient. Deflection calculation for one-way slabs

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

1. Design of beams, columns, slab and foundation as per relevant IS Code
2. Understanding the professional RCC drawing.
3. Minimum One Site visit pertaining to above design

FLUID MECHANICS-I

BECVE503T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Measure and determine fluid pressures and forces on plates/surfaces, pipe bends, etc.
2. Apply the Bernoulli's equation to solve the problems in fluid.
3. Understand the concepts of dimensional analysis use the dimensionless number suitably.
4. Understand the basic concepts related to laminar and turbulent flow.
5. Apply the principles of hydrostatics and determine the forces.

Unit-I :

Fluids and their Properties: Definition of fluid, fluid properties, mass density, specific weight and specific gravity, viscosity; Newton's equation, coefficients of dynamic and kinematic viscosity. Rheological Diagram. Ideal and real fluids. Compressibility and bulk modulus, Surface tension capillarity, pressure inside a bulb and cylindrical jet, vapor pressure and cavitations. Effects of pressure and temperature on fluid properties.

Fluids Pressure and its Measurement: Fluid pressure, law of fluid pressure, variation of fluid pressure with depth, pressure and head, Atmospheric pressure, Gauge pressures. Pressure measurements using manometer, differential manometer and gauges

Unit-II

Hydrostatics: Hydrostatic pressure on plane and curved surface. Centre of pressure, fluids in relative equilibrium; fluid masses subjected to horizontal, vertical and inclined acceleration.
Buoyancy and Floatation: Buoyant force and centre of buoyancy, Archimedes principle, Metacenter and Metacentric height - its determination by analytical and experimental methods. Stability of floating bodies and three states of equilibrium

Unit-III

Fundamentals of Fluid Flow-I: Kinematics of Flow: Velocity, its variation with space and time; Steady, unsteady, uniform & non-uniform; One, two and three dimensional; rotational, irrotational flow. Acceleration of fluid particles, Normal and Tangential acceleration. Stream line, path line & streak line; Lagrangian and Eularian approaches in fluid flow description. Equation of continuity in Cartesian co-ordinates, stream functions, velocity potential and potential flow. Relationship between stream function and velocity potential, flow nets, circulation, vortices, source and sink. Free and forced vortices.

Unit-IV

Fundamentals of Fluid Flow-II: Kinetics of Flow: Factors influencing motion, Euler's equations of motion. Bernoulli's equation, Assumptions, derivation, limitations and application, Kinetic energy correction factor. Momentum equation, Impact of Jets, forces on plates, pipe bends and closed conduits.

Fluid Measurement-I: Velocity measurement; pitot tube, pitot-static tube and Prandit tube. Discharge measurement: Venturimeter, Orificemeter and flow nozzles.

Unit-V

Fluid Measurement-II: Orifices and Mouth pieces- Orifice: definition, types, Hydraulic coefficients, factors affecting them and their experiments. Large/small orifices and submerged orifices. Time for emptying tanks by orifices Mouthpieces: Definition, types and utility, pressure at Vena contracta, Coefficients of discharge.

Flow Measurement and Control: Notches & Weirs – Definitions, Types; Rectangular, triangular and trapezoidal, End contraction. Co-efficient of discharge and its determination; Error in measurement of head. Velocity of approach and its effects Cipolletti, broad-crested and submerged weirs

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Unit-VI

Dimensional Analysis And Theory of Models: Dimensional Analysis: Fundamentals, methods, (Raleigh's and Buckingham); Similitude, Geometric, Kinematic and Dynamic similarities. Predominant forces, Dimension-less numbers and their significances.

Behavior of Real Fluids: Viscous flow - Laminar and Turbulent flows, Reynolds apparatus critical velocity. Reynolds Number, simple problems on determination of Laminar and Turbulent flows in pipes.

FLUID MECHANICS-I

BECVE503P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Minimum eight practicals from the given below list should be performed

1. To verify Bernoulli's theorem
2. To determine the coefficient of discharge of Venturimeter
3. To determine the coefficient of discharge of Orifice meter
4. To determine the coefficient of discharge of Rectangular Notch
5. To determine the coefficient of discharge of Triangular Notch
6. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.
7. To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.
8. To determine the variation of friction factor 'f' for turbulent flow in commercial pipes.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number

GEOTECHNICAL ENGINEERING-II

BECVE504T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of different soil exploration techniques to ascertain the properties of soil
2. To analyze the stability of natural slopes, safety & sustainability of the slopes, design of retaining structures, reinforced earth walls, etc.
3. Practice Ground Improvement Techniques.
4. Design the shallow & deep foundation.

Unit- I: GEOTECHNICAL EXPLORATION

Importance and objective of field exploration , geophysical methods and its limitations, methods of subsurface exploration, methods of boring, number, location and depth of boring, types of soil samples and samplers, principles of design of samplers, collection & shipments of samples, boring and sampling record.

Unit- II: STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes, Taylor's stability numbers & stability charts, stability analysis of finite slope for purely C- soils and C - ϕ soils, center of critical slip circle, (Swedish circle method), slices method for homogeneous C - ϕ soil slopes with pore pressure consideration, Friction circle method, method of improving stability of slopes; types, selection and design of graded filters.

Unit- III: LATERAL EARTH PRESSURE

Earth pressure at rest, active and passive pressure; general & local states of plastic equilibrium in soil. Rankine's and Coulomb's theories of earth pressure. Effects of surcharge & submergence. Determination of Active earth pressure through graphical construction; Rebhann's and Culman's method

Unit- IV: GROUND IMPROVEMENT

Need of ground improvement, ground improvement techniques, stabilization using lime, cement & flyash; prealoading concept, vibrocompaction/flotation, concept of sand drains, stone columns, encased stone column, concept of NPVD (natural prefabricated vertical drain) and PPVD (polymer prefabricated vertical drain). Basic concept of reinforced soil, different types of Geo-synthetics, Geo-synthetic application and functions in civil engineering

Unit- V: SHALLOW FOUNDATION

Bearing capacity of soil: Factor affecting bearing capacity, Terzaghis theory, its validity and limitation, types of shear failure in foundation soil, effect of water table on bearing capacity, (introduction to IS method, factor affecting bearing capacity, field determination of bearing capacity through plate load test and standard penetration test,)

Settlement of shallow foundation: Causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement. (Standard penetration test, corrections for N - values to obtain design soil parameters**.)**

Unit- VI: PILE FOUNDATION

Classification of piles, constructional features of cast- in – situ & pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Pile capacity by static formula & dynamic formulae, pile load test, group action of piles, spacing of piles in group, settlement of group of pile (pile group,) negative skin friction and its effect on pile capacity, general features of under reamed piles.

REFERENCE BOOKS:

1. Gopal Ranjan &Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
2. Arora K.R. : Soil Mechanics & Foundation Engineering
3. Punmia B. C. : Soil Mechanics & Foundation
4. P Raj : Geotechnical Engineer,Mc Graw Hill Education,2000

HYDROLOGY AND WATER RESOURCES

BECVE505T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Use of knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff.
2. Use the techniques of the Hydrographs to forecast flood discharge at various durations.
3. Apply the Statistical techniques to analyze the flood occurrence & frequency.
4. Use the knowledge pertaining to the flood to plan flood routine & emergency plans.
5. Apply the knowledge of geo-hydrology terms in planning, assessing & computation of ground water potential and its assessment using various techniques.
6. Take-up planning of water resources mini project.

Unit – I

Introduction: Hydrology, definition, engineering hydrology, and its importance, development of hydrology and allied science, hydrological cycle, hydrological evolution and brief description of its components, the earth and its atmosphere, importance of temperature, humidity, and wind in hydrological study.

Precipitation: Definition anticipation, artificial rains, types of precipitation, orthographic, conventional and cyclonic, factors affecting precipitation with reference to physiographic divisions of India

Measurement of precipitation: non automatic and automatic rain gauges, selection of site, density and adequacy of rain gauge stations, optimal number of rain gauge, radar measurement of rainfall, mass curve, supplementary rainfall data missing records, intensity duration frequently and depth area duration analysis

Unit - II

Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement, application, problems.

Evaporation and transportation: definition, mechanism and factors affecting evaporation, evaporation estimations by pan, water budget, energy budget and imperial formula, control of evaporation. Evapo-transpiration and its measurement. Interception and its measurement.

Unit - III

Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area-velocity method.

Hydro-graphics: flood hydrology, definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph, theory, S-curve and its use, instantaneous UHG.

Unit - IV

Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, co-relation. Analysis of time series, frequency analysis.

Floods: causes and effects, factors affecting peak flows and estimation of peak flows, low flow, basin flood, flood routine and flood forecasting, economic planning for flood control (Emergency action plan)

Unit - V

Geo-hydrology: Introduction, occurrence and distribution of ground water, water table and water table maps, aquifer, aquiclude, aquitard and aquifuge. Groundwater exploration, electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test.

Unit - VI

Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, spreading method, induced recharge method, recharge well method, sub-surface dams, waste water recharge, recharge by urban storm runoff, recharge through rain water harvesting

Project planning for water resources: multipurpose projects inter basin water transfer and inter-state river dispute. Water resource planning through watershed management, (Instrument used for measurement of climatic parameter, wind vane, anemometer, Sunshine Recorder, Stavenson's Screen, Different types of thermometers, Thermo hydro graph).

COMMUNICATIVE ENGLISH & TECHNICAL WRITING

BECVE506P **Evaluation Scheme: (25-Internal/25-External)**
(P-3 Hrs/Week); Total Credits-2

Outcomes:
Students will be:

1. Adept in using functional grammar
2. Able to write at work
3. Able to draft reports and letters
4. To understand the planning and procedure of carrying out research work
5. Dexterous in presentation skills and participate in GD

Practical 1- Language and style

Grammar, Mechanics, Punctuations, Spellings, Vocabulary & Word Watch (List of Technical and Business terms with usage
Assignments: 4 Nos. (3 worksheets on Grammar, 1 on Mechanics and Punctuation)

Grammar- *Subject and verb agreement, prepositional phrases, pronouns, pronoun references, avoiding shifts, avoiding sexism (avoiding gender bias), modifiers, the clause and simple sentence, compound sentences, transition words, parallelisms.*

Mechanics- *Fragments, run-ons, and comma splices abbreviations & acronyms.*

Punctuations - *colons and semicolons, end punctuations, parentheses, dashes, brackets, ellipses, slashes, and hyphens, apostrophes.*

Method / plan – Concept clearance using Worksheets with MCQ / activities

Practical 2- Writing at Work & Other Business Writing
Assignments: 4 Nos. (2 topics from A & B each)

A. Writing at Work

Types of Letters (inquiry, order, sales, complaint etc), Memos, E- mail, The Job Search (Resume & Cover letter), Fliers & Brochures.

Method / plan: analyzing errors in mails, resumes, letters and brochures with respect to practical- 1, practice writing with samples given

B. Other Business writing

Itinerary Writing, Inter –office Memorandum (memo), Circulars (Informative, Public, Official), Notice, Agenda and Minutes

Method / plan: analyzing errors in circulars, memos with respect to practical 1, practice writing with samples given as assignment

Practical 3- Report Strategies

Assignment: 2 Nos. (Any two reports from the given topics)

Reports (Trip / study tour / site visit), Lab reports, Feasibility reports / Recommendation reports, Incident reports, Investigative reports, Technical Proposals, The Summary, Maintenance manual for buildings

Method / plan: Analyze reports and proposals in the area of your study. Attempt following all the rules in Practical -1 & Practical-5 and give a presentation to your class.

After attending a lecture / meeting / conference, summarize its contents. Provide the speakers name, location of the presentation, date of presentation for the source citation.

Sample for summary

Many textbooks begin or end chapters with summaries. Find such a summary in one of your textbooks. Then read the accompanying chapter. Is the summary effective? If so, why? If not, Why not? If the summary is ineffective, how would you rewrite it?

Practical 4- Orientation to Research

Planning and process, Structure, documentation, composing a bibliography for a research paper /report

Assignments: 3 Nos. (Preparation of a technical paper, Review of 10 technical papers on a particular subject, Study of Detailed Project Report & Preparing a summary)

Method / Plan: Assignments
1. Planning and process,

Structure*- Title, authors details, abstract, introduction, discussion, conclusion, footnotes / list of references, Bibliography*

Documentation- relevance and purpose, methods and systems available

composing a Bibliography for a research paper /report*- placement and arrangement, author, inclusive page numbers, citing an introduction, preface, foreword, or afterword, articles, online journals or website, Check list for a research paper*

2. **Choosing a Detailed Project Report / Carrying out feasibility study (prepare a summary based on the research)**

Sample

Many people are opening their own businesses. What does it take to open your own business? Before you can write an effective business plan and seek financing from a bank, you must research the project.

Choose a new venture, selling or a product or service of your choice. What would it cost to open this business? What would be your best location, or should your business

be online? What certification or licensing is needed? How many personnel would you need? What equipment is necessary? Who would be your clientele?

Based on research, write a proposal appropriate for presentation to a bank. In this proposal present your business plan for a new entrepreneurial opportunity

Practical 5- Dynamics of Professional Presentations

1. Introduction, planning, occasion, audience, purpose, thesis statement
2. Outlining and structuring, introduction, main body, conclusion
3. Nuances of delivery, modes of delivery, guidelines to effective delivery
4. Visual aids in presentation
5. Organizational GD

Activities : 2 Nos. (A PPT presentation on any one of the Research Project and GD)

Practical 6: Report Writing on Summer Training-1 (ST-1)

Note: Based on the 5 practicals prescribed, many assignments can be prepared and given to the students. Any innovative project and assignment will be highly appreciated.

Proper evidence of the execution of the projects/ Reports / assignments / worksheets should be maintained.

REFERENCE BOOKS:

1. **Technical Writing: Process and Product: S.J. Gerson and S. M. Gerson, Pearson Education Inc., Singapore (Printed in India by Anand Sons)**
2. **Basic Communication Skills for Technology: A.J. Rutherfoord, Darling Kindersley(India) Pvt. Ltd, India (Printed in India by Saurabh Printers Pvt. Ltd)**
3. **Effective Technical Communication: Rizvi. M Ashraf, Tata Mc Graw Hills, India**
4. **Communication Skills: Sanjay Kumar and Pushp Lata, Oxford University Press**

VI Semester

STEEL STRUCTURES

BECVE601T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

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COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of structural properties in assessing its strength for the construction purpose.
2. Apply the knowledge of various techniques in analyzing the steel structural components.
3. Make use of knowledge of analysis in structural planning and design of various components of buildings.

NOTE: Use I.S Code. - 800-2007

Unit – I

Steel as a structural material, various grades of structural steel properties; various rolled steel sections (including cold formed section, structural pipe (tube) sections) and their properties. Introduction to I.S. 800, 808, 816, 875 etc.

Introduction to Plastic Analysis, Shape Factor, Plastic hinge formation Collapse mechanism for beams

Design of axially loaded members: (a) Tension members. (b) Compression members. Design of roof truss: Load assessment for DL, LL and WL.

Unit - II

Structural Fasteners:

Behavior of bolted and welded connections (types, Designation, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolt and welded connections. Moment resistant bolted and welded connection (bending and torsion)

Design of connection: Beam to beam, beam to column

Unit – III

Design of simple and built up beams: Laterally restrained and un-restrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates. (Design of welded plate girder.)

Unit - IV

Design of single rolled steel section column subjected to axial load and biaxial moment including base design.

Design of axially loaded built up columns. Laced and battened (Column bases, slab base, gusseted base, and moment resistant bases).

STEEL STRUCTURES

BECVE601P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-1

Term Work –

Minimum three design assignment based on above topics along with the detailed structural drawings on A2 size sheets.

Practical Examination shall be based on the above Practical work.

SURVEYING-II

BECVE602T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Carry forward the concepts of basic surveying techniques
2. Operate various survey instruments effectively with precision
3. Use different types of techniques in various surveying problems
4. Apply the concepts of modern surveying techniques & instrumentation.
5. Take – up mini project using different surveying techniques.

UNIT-I

Tacheometric Surveying: Classification, principal of stadia method, theory of Anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.

UNIT II

Simple, Compound, Reverse Curves and Vertical Curves:

a) Simple Curves: Elements of simple curves, methods of curve ranging, obstacles in setting out curves.
b) Compound Curves: Elements of compound Curves, setting out the curve.
c) Reverse Curves: Elements of reverse Curves, setting out the curve.
d) Vertical Curves: Elements of vertical curves, types, tangent correction, location of highest or lowest point.

UNIT III

Transition Curves: Elements of transition curves, super elevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.

UNIT IV

Geodetic Surveying and Triangulation Adjustment

Geodetic Surveying: Classification of triangulation survey, inter-visibility of stations, field work, reduction to centre, base line measurement, corrections.

Triangulation Adjustment: Definitions, weighted observations, laws of weights, station adjustment, figure adjustment (Triangle only)

UNIT V

Photographic Surveying: Basic definitions, terrestrial and aerial photography, scale of Aerial photo relief, Tilt and height displacements, heights from relief displacement and parallax measurements, flight planning, study of photo theodolite and stereoscope.

UNIT VI

Advanced Techniques in Surveying:

Total station, Electromagnetic Distance Measurement (EDM)

Remote Sensing: Introduction, definitions, Remote sensing systems, advantages, Basic Principles, energy interaction in the atmosphere, Indian remote sensing Satellite series and their characteristics

GIS & GPS: Components of geographical information system (GIS),advantages, function of GIS, Raster and vector data, advantages and disadvantages, global positioning system.(GPS),Introduction, definitions, GPS receivers, antenna, advantages of GPS.

REFERENCE BOOKS:

1. Surveying & Levelling by B.C. Punmia (Vol 2 & Vol 3)
2. Surveying & Levelling by Kanetkar & Kulkarni (Vol 2)
3. Remote sensing & G.I.S. by Dr. M. Anji Rddy

SURVEYING-II

BECVE602P **Evaluation Scheme: (25-Internal/25-External)**
(P-4 Hrs/Week); Total Credits - 2

A) PRACTICALS: Minimum Eight Practicals out of following

1. Determination of constants of Tacheometer
2. Determination of elevation of points by Tacheometric surveying
3. Determination of elevation of points and horizontal distance between them by Tacheometric survey.
4. Determination of gradient of given length of road by Tacheometric survey
5. Setting out of simple circular curve by offsets from chord produced method
6. Setting out of simple circular curve by Rankine method of tangential angle
7. Setting out of simple transition curve by tangential angle method
8. Use of Advanced techniques of surveying.
9. Toposheet: Understanding and identification of different features of drawing

B) SURVEY PROJECT:

Survey project should be carried out for minimum 2 days in the following areas (Any One)

1. Road Project,
2. Irrigation Project (canal alignment, watershed demarking, contouring)
3. Water Supply Project

FLUID MECHANICS –II

BECVE603T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**.

COURSE OUTCOMES: The students shall be able to

1. Understand the concepts related to boundary layer theory and determination of drag and lift forces.
2. Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and its components including water hammer pressures.
3. Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
4. Understand the different techniques of dimensional analysis and its use in model testing.
5. Understand and apply basics related to Turbines & Pumps in Water Resources planning.
6. Make use of specific energy concepts in the analysis of open channel flow.
7. Undertake Gradually Varied Flow analysis and its computation.

UNIT-I

LAMINAR FLOW: Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen Poiseuille equation.

BOUNDARY LAYER THEORY: Nominal thickness, displacement thickness, momentum thickness of the boundary layer: Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sub-layer: Separation of boundary layer on plane and curved surfaces.

REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES: General definition of drag and lift; Flow past plates, cylinders and spheres; drag on sphere, cylinder and flat plate.

UNIT-II
FLOW THROUGH PIPES:

Hydraulically smooth and rough pipes; Frictional resistance to flow of fluid in smooth and rough pipes; Nikurade's experiment; Moody's chart; Darcy-Weisbach & Hazen- William's equation for frictional head loss; Hydraulic gradient and energy gradient: Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy-Cross method of pipe networks; Water-hammer, pressure head due to sudden closure of valve.

UNIT-III
FLOW THROUGH OPEN CHANNEL:

(A)GENERAL: Types of channel and their geometrical properties; Types of flow in open channel.

(B) UNIFORM FLOW: Chezy's and Manning's equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal depth of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.

(C) CRITICAL FLOW: Specific energy and its diagram; alternate depths; Computations of critical depth, section factor for critical flow, critical slope; normal, critical slope; Specific force and its diagram; Conditions of critical flow.

UNIT-IV

(A) APPLICATIONS OF SPECIFIC ENERGY, gradual transitions of channels.

(B) GRADUALLY VARIED FLOW: Dynamic equation for GVF; Classification and characteristics of surface profiles; Direct Step method of computing profile length.

(C) RAPIDLY VARIED FLOW: Definition of hydraulic jump; Equation of hydraulic jump in horizontal, rectangular channel; Length & height of jump; Energy loss in jump; Classifications of jump.

UNIT-V

HYDRAULIC MODELS: Difference between model and prototype; Similitude- type of similarities; Model Laws- Reynolds model law and Froude model law; Types of model-distorted, undistorted; Froude's method of determining resistance to partially submerged objects like ship.

UNIT-VI
FLUID MACHINERY:

(A) TURBINES: Definition: Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.

(B) RECIPROCATING PUMPS: Components parts, working principle, Work done of single & double acting pumps; Negative slip, Air vessels – Working principle and necessity.

(C) CENTRIFUGAL PUMP: Component parts; Working principle; Static and manometric heads; different efficiencies; Priming & priming devices, Specific speed; Theoretical aspects of multistage pumps; Trouble & remedies; operating characteristics curves. Selection of pumps, system head curves and pump head curves. Model testing of pumps

REFERENCE BOOKS:

1. Hydraulics & Fluid Mechanics- Dr.Modi & Dr. Seth
2. Fluid Mechanics-Streeter & Wylie
3. Fluid Mechanics- Dr. A.K.Jain
4. Fluid Mechanics through problems- Garde
5. Theory and applications of Fluid Mechanics- K. Subramanya
6. Foundation of Fluid Mechanics-Yuan
7. Flow through open channel – K.G.Rangaraju

FLUID MECHANICS –II

BECVE603P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits - 1

PRACTICALS:
Minimum TEN practicals, from the list given below shall be performed:

1. Study of flow around immersed bodies.
2. Determination of Darcy-Weisbach friction factor for given pipes.
3. Determination of Manning's or Chezy's constant for an open channel.
4. Developing specific energy diagram for a rectangular channel.
5. Study of GVF profiles.
6. Study of hydraulic jump in a horizontal rectangular channel.
7. Study and performance of Francis turbine.
8. Study and performance of Pelton Wheel turbine.
9. Study and performance of Centrifugal pump.
10. Study and performance of Reciprocating pump.
11. Problem on pipe network analysis manually and using application software.

BUILDING DESIGN & DRAWING

BECVE604P **Evaluation Scheme: (50-Internal/50-External)**
(P- 4 Hrs/Week); Total Credits-4

COURSE OUTCOMES: The students shall be able to

1. Understand building bye laws & building code
2. Apply the principles of building planning and design.
3. To draw submission/working drawing using suitable software.
4. Make use of knowledge to give layout on the field as per the plan.
5. To draw simple perspective drawings.
6. Understand Drawings and Detailing of Building services

UNIT-I

Introduction: Site requirements, requirements of owner and Building byelaws, Importance of Building drawing to Engineer. Use of building byelaws and National building code

UNIT-II

Method of Drawing: Selection of scales for various drawings, Thickness of lines, Dimensioning, Combined First angle and Third angle method of projection, Abbreviations and conventional representations as per IS 1962. a) Developing working drawings to scale as per IS. 1962 from the given sketch design and
general specifications for terraced and pitched roofs.
b) Developing submission drawings to scale with location site and block plan complete

UNIT-III

Designing of Buildings:

Introduction: Climate and design consideration, orientation, recommendations of CBR1, Roorki and general principles of planning with emphasis on functional planning. Graph paper design (line plans) based on various requirements for residential, public, education and industrial buildings.

UNIT-IV

(A) Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc.
(B) Drawings and Detailing of Building services; electrical, plumbing, sanitary, etc.

TERM WORK:

1. Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment one manual and one with Computer Aided Drafting)
2. Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One manual and one with Computer Aided Drafting)

3. Working drawing of multistoried Public/Educational/Health/Community/Industrial building including structural details and layout of services. (One assignment)
4. Two point perspective of the single storied Residential building neglecting small building elements. (one assignment - pitched or terraced roof)
5. Minimum 10 CAD based self explanatory dimensioned sketches of various building elements.
6. Line plans of various types of buildings e.g. public/educational/industrial/hospital/ community on graph sheets (04 assignments = 2 manual+2 CAD)
7. Submission drawing of two storied residential building framed structure including all details and statements as per the local byelaws.
8. One compulsory field exercise on layout of building etc.
9. Understanding professional architectural drawing.

NOTE:-

1. The internal practical exam includes drawing exam using AutoCAD of 20 marks and 30 Marks for continuous assessment.
2. The external practical exam shall consist of performance based on above syllabus on software of 30 marks and viva voce 20 marks

ENVIRONMENTAL ENGINEERING-II

BECVE605T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs.**

COURSE OUTCOMES: The students shall be able to

1. Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
2. Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
3. To test the sample of waste water in the laboratory for physical & chemical characteristics.
4. Take-up functional planning, layout and design of water treatment plant components.
5. Take-up functional planning, layout and design of sewage treatment plant components.
6. Plan for rural sanitation provisions, perform functional design of septic tank,
7. Analyze the industrial waste water for its treatment units.
8. Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

Unit-I

General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.)

Unit - II

Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance.

Unit - III

Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatment - Screens, Grit chambers, oil & grease removal. Primary settling tank (including simple design)

Unit- IV

Secondary treatment - Principle of Biological Treatment Activated sludge process, trickling filter, (Indian Standard for disposal), Methods of disposal, Sewage farming, self purification of stream (Streeter

Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion, sludge drying beds.

Unit - V

Rural sanitation; Pit privy, aqua privy, bio-gas recovery Septic tank including soak pit, including design problem (as per relevant I.S. Code) Sullage collection and disposal

Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and processes (flow equalization, neutralization, adsorption, chemical and biological treatment (in brief)

Unit VI

Air pollution and solid waste: Sources, classification, Effects, prevention and control. Introduction to carbon credit system and climate change

REFERENCE BOOKS

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication
2. S.K.Garg, "Environmental Engineering" -Vol II Standard Publication
3. G.S.Birdie, "Water Supply & Sanitary Engineering"
4. M.J.Macghee, "Water Supply & Sewage" – McGraw Hill Publication
5. M.N.Rao & HV.N.Rao, "Air 'Pollution" McGraw Hill Publication
6. C.S.Rao,"Enviromental Pollution Control Engineering".

SITE VISITS & MINI PROJECT

BECVE606P **Evaluation Scheme: (25-Internal/25-External)**
(P-3 Hrs/Week); Total Credits-3

COURSE OUTCOMES: The students shall be able to

1. Get an idea of various project details such as contracts, layout, planning, drawing, estimates, Arbitration provision, licensee & licensor, architects, structural designer, etc
2. Get an idea of various construction equipment, manpower & techniques used at site, techniques of batching, mixing, transportation, and placement of different construction materials.
3. Get an overview on safety measures, basic amenities to provide, inventory control.
4. Write a legible, correct and technically sound report after the visit.
5. Ascertain the provisions and execution as per the working drawing.

Students should be taken for visit to various Civil Engineering construction sites such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, water tanks, Roadwork, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying & leveling etc.

- Minimum Five visits are expected.
- Students should submit a detailed report on the visit duly approved by the concerned teacher. **The Detailed Report should mainly consist of the following: -**
    - Name of Construction Site with address
    - Nature of construction work and various structural components

- Nature of ownership, executing and supervising authority
- Architect and Structural Engineer
- Architectural concept and Design features
- Commencement of the work and tentative completion
- Present Status of work
- Estimated cost of the work (Money spent till date)
- Mode of availability of finance
- Various types of manpower for the work
- Various safety measures and amenities provided to manpower
- Various construction equipments for the work
- Various materials used for the work
- CPM / PERT of the project
- Type of inventory control
- Resource planning implemented
- Social benefits and implication
- Safety measures during and posts construction
- Post Construction Maintenance provisions
- Effect on environmental aspect and sustainable development
- Various of scaffolding, Formwork, lifting devices
- Site of precast units for the work and its mode of transportation
- Use of local available material like fly-ash, slag, silica-fumes, etc.
- Causes for delay / faulty construction

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation - CBS

Semester: Seventh

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practical				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE701T	Advanced Concrete Structures	3	1		4	4	20	80	100	40					4
BECVE701P	Advanced Concrete Structures			2	2	1					25	25	50	25	
BECVE702T	Estimating and Costing	3	1		4	4	20	80	100	40					4
BECVE702P	Estimating and Costing			2	2	1					50	50	100	50	
BECVE703T	Elective -I	3	1		4	4	20	80	100	40					3
BECVE704T	Construction Management and Law	4			4	4	20	80	100	40					3
BECVE705T	Transportation Engineering - II	3	1		4	4	20	80	100	40					3
BECVE706P	Industrial Case Study and Project Seminar			3	3	3					50	50	100	50	
Total		**16**	**4**	**7**	**27**	**25**	**100**	**400**	**500**		**125**	**125**	**250**		

Note: 1. External Practical Evaluation of "Estimating & Costing" shall be performance based (Manual or using suitable Software) on assigned problem by the External Examiner

2. Evaluation of Summer Training – 2 (ST-2) shall be done as Industrial Case Study Component & minimum two seminar should be delivered as continuous college assessment for project seminar component.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation - CBS

Semester: Eighth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practical				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE801T	Irrigation Engineering	3	2		5	5	20	80	100	40					3
BECVE802T	Elective - II	3	1		4	4	20	80	100	40					3
BECVE803T	Elective - III	4			4	4	20	80	100	40					3
BECVE803P	Elective - III			2	2	1					25	25	50	25	
BECVE804T	Construction Economics and Finance	3	1		4	4	20	80	100	40					3
BECVE805P	Project			6	6	6					75	75	150	75	
Total		**13**	**4**	**8**	**25**	**24**	**80**	**320**	**400**		**100**	**100**	**200**		

Note: Internal Evaluation of Project shall be based on the academic contribution of a student and delivery of minimum one seminar on the project work.

BECVE804T - Construction Economics and Finance subject shall be dealt by Board of Basic Science and Humanities.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
CIVIL ENGINEERING

Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

VII Semester

Code No.	Name of Subject in **Semester Pattern**		**Code No.**		Name of Equivalent Subject in **Credit Based Semester Pattern**
7CE01	Structural Analysis – III (T)		BECVE501T		Structural Analysis – II
7CE02	Advanced Concrete Structures (T)		BECVE701T		Advanced Concrete Structures
7CE02	Advanced Concrete Structures (P)			BECVE701P	Advanced Concrete Structures
7CE03	Irrigation Engineering (T)		BECVE801T		Irrigation Engineering
7CE03	Irrigation Engineering (P)			BECVE801T	Irrigation Engineering
7CE04	Maintenance and Rehabilitations of Civil Engineering Structures (T)		BECVE802T		Elective – II (Maintenance and Rehabilitations of Civil Engineering Structures)
7CE05	Elective – I (T)		BECVE703T		Elective – I
7CE06	Industrial Case Study (P)			BECVE706P	Industrial Case Study & Project Seminar
7CE07	Project and Seminar (P)			BECVE706P	Industrial Case Study & Project Seminar

VIII Semester

Code No.	Name of Subject in **Semester Pattern**		**Code No.**		Name of Equivalent Subject in **Credit Based Semester Pattern**
8CE01	Estimating and Costing (T)		BECVE702T		Estimating and Costing
8CE01	Estimating and Costing (P)			BECVE702P	Estimating and Costing
8CE02	Transportation Engineering – II (T)		BECVE705T		Transportation Engineering – II
8CE03	Elective – II (T)		BECVE802T		Elective – II
8CE04	Elective – III (T)		BECVE803T		Elective – III
8CE04	Elective – III (P)			BECVE803P	Elective – III
8CE05	Project (P)			BECVE805P	Project

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU's relevant ordinance.

SEVENTH SEMESTER B.E. CIVIL

ADVANCED CONCRETE STRUCTURES

BECVE701T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

COURSE OUTCOME: The Students will be able to

1. Understand the behavior and failure modes different concrete members
2. Analyze and apply the results in designing various concrete member of structure.
3. Apply the knowledge & skills in practical problems
4. Understand the relevant software and use the same in analysis & design of concrete members.

Unit – I

Design of circular water tank with roof slab/dome resting on ground by approximate methods/IS code method (by Working Stress Method).

Design of rectangular water tank with one-way roof slab resting on ground by approximate methods/ IS code method (by Working Stress Method).

Unit – II

Analysis and design of columns subjected to biaxial moments. Design of long columns.

Design of Isolated footing, for uniaxialmoment , For Square Rectangular & Circular.

Unit – III

Moment redistribution: Analysis and Design of fixed beam, propped cantilever, two-span symmetric continuous beam.

Unit – IV (with LSM)

Design of RCC Cantilever and Counter-fort Retaining wall.

Unit - V

Analysis and design of portal frames (single bay single storey) hinged or fixed at base. Design of hinge (design of Dog-legged and Open Well Staircase).

Unit – VI : Design of combined footing.

i) Rectangular footing ii)Strap beam footing iii)Trapezoidal footing iv)Raft footing

ADVANCED CONCRETE STRUCTURE

BECVE701P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week); Total Credits-1**

PRACTICAL

1) Minimum 5 Design of Structure based on above Syllabus.
2) One problem of design of structure based on analysis and design software.
3) Minimum One Site visit pertaining to above design.

ESTIMATING AND COSTING

BECVE702T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

COURSE OUTCOMES: The Students will be able to

1. Prepare the preliminary estimate for administrative approval & technical sanction for a civil engineering project.
2. Write the specification of the works to be undertaken, prepare the tender documents, fill the contracts and make use of knowledge of different contract submission & opening in awarding the work to the contractor.
3. Use the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project
4. Schedule the project for its timely completion.
5. Use the technique of Rate analysis in estimating the exact cost of material & manpower and hence the entire project.
6. Estimate the bill of quantities using different techniques of preliminary & detailed estimation of buildings & roads
7. Arrive the exact value of the asset (movable & immovable) using different Valuation techniques.

Unit I

Introduction: Importance and purpose of the subject, Units of measurement as per I.S.1200. Items of work and Description of items of work, administrative approvals, technical sanction, preliminary estimates. objectives, and its methods

Earthwork estimates in road, hill roads and canals, mass haul curves, methods of consumptions of earthwork.

Unit II

Detailed estimates, objects, importance, accuracy. Methods of detailed estimates,

Detailed estimates of load bearing and framed structures. Calculation of reinforcing steel with Bar bending Schedule.

Unit III

Tenders and Contracts: Method of carrying out works, tender notice, acceptance of tender, essentials of contract, type of contracts, contract documents, land acquisition act, Legal aspects of various contract provisions, Arbitration.

Unit IV

Specifications: IS 1200 Introduction, Purpose and principles of specifications writing, Types of specifications, writing and developing detailed specifications of Important items of building and road work.

Cost Accounting : Various methods, classification of cost, direct and indirect charges, distribution of overheads, M.A.S. Account, issue rates and stores Account.

Unit V

Rate Analysis: Introduction, Purpose and principles of CSR, Factors affecting analysis of rates, labour guidelines from National Building Organization, market rates of materials and labour, Rate analysis of major items of work

Unit VI

Valuation :- Purpose of valuation, Factors affecting property price and cost, Types of Value. Real Estate, Tenure of land, Free hold and lease hold, sinking fund, Depreciation, and its methods, Capitalised value, Methods of valuation, Net & Gross income, Rent fixation.

REFERENCE BOOKS

1. Estimating and Costing by Dutta
2. Estimating & Costing by Chakraborty
3. Valuation by Roshan Namavati
4. Philosophy of Valuation. – S. S. Rathore.

ESTIMATING AND COSTING

BECVE702P **Evaluation Scheme: (50-Internal/50-External)**
(P-2 Hrs/Week); Total Credits-1

PRACTICAL – Minimum 8 practical assignment based on

1. Preliminary estimate using Plinth area method.
2. Detailed estimate of Load bearing structure
3. Detailed estimate of Frame structure.
4. Calculation of steel with Bar bending Schedule.
5. Detailed estimate of earthwork of road for Approximate 1km length.
6. Draft Detailed specification for 8 major items.
7. Analysis the unit rate of 8 major items of work contained.
8. Draft a short tender notice for proposed work.
9. Calculation of annual and total Depreciation and book value of the end of each year.
10. Fixation of standard rent of property.
11. Market survey for material and labour rates for various items.
12. Detailed planning and estimate of plumbing work.
13. Detailed estimate of building using estimate software.

EARTHQUAKE RESISTANT DESIGN OF STRUCTURE (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Understand the different aspects related to seismology and terms related to it
2. Analyze earthquake loading effect on structures.
3. Perform the analysis and design of structures against earthquake loading.
4. Analyze multi-storey structure using different methods like Equivalent Static Lateral Load Method and Response Spectrum Method
5. Understand the different seismic retrofitting techniques and its implementation.
6. Use the knowledge in practical situation.

Unit I :

Engineering seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Richter scale, Introduction on to tsunami. Seismic zoning maps of India. Response spectra. Strong motion characteristics.

Unit II :

Earthquake effects on the structures, classification of loads,. Seismic damages during past earthquakes, effect of irregularities and building architecture on the performance of RC structures

Unit III :

Seismic methods of analysis, seismic design methods, Mathematical modeling of multistoried RC buildings with modeling of floor diaphragms and soil foundation, (Winkler model.)

Unit IV :

Design of multi – story RC structure foundation as per latest IS 1893 by Equivalent static lateral load method and Response spectrum Method. Introduction to Time history method. Concept of Capacity based design of soft story RC building.concept of shear walls. Ductile detailing as per latest IS :13920

Unit V :

Seismic retrofitting, Source of weakness in RC framed building, Various retrofitting techniques, Conventional and non- conventional methods, Comparative study of various methods and case studies.

Unit VI :

Introduction to Base Isolation system. IS code provision for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques.

REFERENCE BOOKS:

1. Seismology Committee (1999). *Recommended Lateral Force Requirements and Commentary*. Structural Engineers Association of California.
2. Design of Seismic Isolated Structures- FarzadNaeim, James M. Kelly, Published 2 DEC 2007
3. A K. Chopra, Dynamics of Structures: Theory and Applications to Earthquake Engineering (3rd Edition), Prentice-Hall of India.
4. IS 13920, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice, 1993.
5. A.K. Chopra, Dynamics of Structures, 3rd Edition, Pearson, 2007.
6. PankajAgarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India, 2006.

ADVANCED TRAFFIC ENGINEERING (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1 Use the knowledge to carry out traffic studies and give solutions to planning of transportation system.
2 Apply basic principles for the geometric design of roads and other traffic controlling devices
3 To understand the parking systems, riding quality standards, traffic safety and accident study and suggest the solutions to the practical problems.

Unit – I

Elements of Traffic Engineering : Road, Road user & Road Vehicle Characteristics, problems related to heterogeneous traffic.

Traffic Surveys and Data collection : –Speed, journey time and delay studies, methods of measurement of spot speed, headway, gaps, volume / capacity surveys, speed, volume-density interrelations, measurements of running and journey speeds, origin-Destination surveys, necessity, survey methods, sample size, data analysis & Presentation. Highway capacity, level of service concepts.

Unit – II

Statistical methods : Binomial, Normal Poisson, Probability. distributions, Discrete and continuous, variable application to traffic flow, Test of significance – Chi-square & 'T' test, (Regression analysis)

Unit – III

Traffic Design : Hierarchy of urban roads and their standards, Diverging, merging crossing weaving maneuver's conflict points, types of road junctions ,channelization of traffic flow, traffic rotary design, Grade separated inter-sections, Drive ways, design of pedestrian facilities, Design criteria for separate cycle track, Exclusive Bus lane, (Bus stop locations and facilities.) introduction to Intelligent Transport system

Unit – IV

Traffic Control Devices : Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems,(Queuing)Theory, Traffic control aids, and street furniture. Introduction to transport systems, Traffic controls for Expressway.

Unit – V

Traffic Safety, **Enforcement and Education :**

Elements responsible for accidents, situations in India, Collection and interpretation of accident data and recording in Standard form, Analysis of Accidents. Traffic regulation and E`s of traffic management, (vulnerable road user safety, Introduction to Regulation Act.)

Motor Vehicle Acts and Rules, traffic Education, traffic Controls on National Highways

Unit – VI

Urban Traffic: Present traffic scenario. Urban transportation problems, mixed traffic flow, head and administrative set up of traffic cells at various levels, co-ordination with other transport modes.

Parking : Parking surveys, on and off street parking, parking systems, parking demand, design of off-street parking lot, underground & multistoried parking.(Truck lay bye, bus lay bye, facilities to parking and way side amenities.

Students should complete the assignment based on

1. ***Accident data collection***
2. ***Speed, Volume and Parking studies.***
3. ***Data collection for Rotary design and traffic signal.***

Reference Book:

1. Traffic Flow fundamentals: Adolf D.MayVIII
2. Traffic Engineering :Mcshane and Roess
3. Traffic Engineering and Transport Planning : L.R. KadyaliI
4. Principles of Transportation Engineering :PathaChakraborty and Animesh Das III
5. Traffic Flow Theory *by* Drew, D.R., McGraw- Hill Book Co., New York.VII
6. Highway Engg*by*S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.IV
7. Traffic Engg. *by* Matson, T.M., Smith, W.S. and Hurd, F.W., McGraw- Hill Book Co., New York.VI
8. principles of traffic engg. Garber &Hoel. II

AIR POLLUTION AND SOLID WASTE MANAGEMENT (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students will be able to

1 Understand different aspects of air pollutants, its sources and effects on man and material etc.
2 Design controls methods and equipments for air pollution to reduce its impact on environment.
3 Understand problems arriving in handling large amount of solid waste generated ,its collection and transportation, processing and will bw able to design safe collection and disposal methods.

Unit - I

Introduction to air pollution : Definition, air pollution episodes, atmosphere & its zones.

Classification and sources of air pollutants, Standards for air pollution (as per Indian Standards and CPHEEO). Effects of air pollutants on man, and materials.

Unit - II

Meteorological parameters and Air sampling: Primary and secondary parameters, atmospheric stability, plume behavior. Wind rose diagram, wind data analysis & wind impact area diagram, Stack height determination.

Air sampling and measurement : ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, site selection criteria methods of estimation.

Unit – III pollution control

Air pollution controls methods and equipments ; Principles of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters, cyclones and wet scrubbers, (adsorption, absorption, incineration, condensation)

Automobile exhaust :Introduction to Pollution due to diesel & petrol engines,

Noise Pollution : Sources, ill effects, control measures.

Unit - IV

Introduction to solid waste management.(SWM) : Structure , necessity and responsibility,

Sources, Quantity and quality, Sources of solid waste, classification and components, physical and chemical characteristics, per capita contribution, sampling and analysis.

Unit – V : Collection and Transportation methods:

Collection and transportation of solid waste: Method of collection, equipment used for collection and transportation, transfer stations, optimization of transport route.

Solid waste processing : Methods of processing, choice of methods, merits and demerits of various methods, gas control measures.3R concept

Unit – VI : Disposal methods:

Composting of waste, methods of composting, factors affecting composting

Sanitary land filling : Site requirements, methods, leachate management., control of gases.

Incineration: Principles of incineration, types of incinerators, advantages and disadvantages.,3T Diagrams

REFERENCE BOOKS

1. M.N. Rao & H.V.N.Rao, " Air Pollution", Tata McGraw Hill Publishing Co. Ltd.
2. C.S.Rao, "Environmental Pollution Control Engineering", Wiley Estern Ltd. New Delhi.
3. Stern A.C., "Air Pollution" Vol I to X.
4. A. D. Bhide, & Sunderesan B.B., "Solid Waste Management in developing countries, INSDOC, N. Delhi.
5. Tchobanoglous, "Integrated Solid Waste Management in Engineering principles and management isssues,
6. K.V.S.G. Murlikrishna" Air Pollution" JTNU, Kakinada.

ADVANCED HYDRAULICS (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Apply the concept of uniform flow and critical flow in open channels.
2. Analyze and identify GVF profiles and its importance in practical aspects.
3. Understand the concept of rigid water column theory and elastic water column theory and apply it to the hydraulic projects.
4. Understand water hammer theories and problems encountered in practical situations.

Unit-I : GENERAL:

Computation of uniform flow, computation of critical flow, conveyance of channel section factor, hydraulic exponent for uniform & critical flow.

Theory of gradually varied flow, dynamics equations for GVFin various forms, Analysis of gradually varied flow profiles.

Unit-II : GVF (GRADUALLY VARIED FLOW):

Computation of gradually varied flow, Bresse's method, Chow's method, Direct step method, Standard step method

Unit- III : HYDRAULIC JUMP:

Theory of Hydraulic jump, Location of hydraulic jump, application of hydraulic jump types of hydraulic jump, stilling basin with horizontal apron. Numerical on hydraulic jump.

Unit- IV : UNSTEADY FLOW IN PIPE :

Equation of unsteady flow in a pipe line for incompressible fluid, time of flow establishment, rigid water column theory of water hammer and computation of water hammer pressures.

Unit-V : WATER HAMMER :

Equation describing water hammer phenomena when compressibility of fluid and elasticity of pipe is considered, computation of water hammer pressure of frictionless flow in horizontal pipe, for sudden and slow closure of valve, Application of Allievi's method and charts, approximate pressures, water hammer pressures in pumping systems, method characteristics.

REFERENCE BOOKS

1. Fluid flow in pipe & channel by G.L.Asawa, CBS publication.
2. Open Channel Flow – K. Subramanya
3. Open Channel Flow – V.T. Chow
4. Open Channel Flow – Ranga Raju

SUSTAINABLE RESOURCE MANAGEMENT IN CIVIL ENGINEERING (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : The students shall be able to

1. Understand the concept of sustainability, sustainable resources management and make use of understanding in planning the civil engineering project.
2. Understand the need of environment protection and energy saving through the use of alternative green construction materials.

Unit – I

Sustainability & Resource Management- Definition of Sustainability & Background. Need ,

Gap between need and practice, Current Global and local scenario, Resources in Construction, current status.

Unit – II

Sustainable Construction Materials & Management- concept of zero waste production in construction engineering, classification of Solid waste (Industrial, agricultural, municipal) utilization in various construction materials (Masonry, concrete, interior, timber, rerolled steel, etc. Alternative building materials e.g. CMB.AAC blocks etc

Unit – III

Sustainable Water Management- 3Rof water **conservation**, reduce, reuse, and recycle (grey water treatment)

Unit – IV

Sustainable Energy Management- Non-renewable energy sources & potential in India (Solar, wind, geothermal, hydro, etc.), energy conservation , introduction to ECBC

Unit – V

Public Health Engineering & Management- Health issues during construction, occupants comfort & indoor air quality, basic design principles (SP41), effects of light , heat, humidity etc.

Unit – VI : Life Cycle Costing of Sustainable Technologies & Management

Recommended Standards- National Building Code, concept and need of life cycle costing, advantages, Introduction to techniques of life cycle costing. Provision of national building code.

Reference :

1. Green Rating for Integrated Habitat Assessment, TERI, New Delhi;
2. Indian Green Building Council, Hyderabad
3. Energy conservation building code -2011
4. SP 41 -1987
5. SP 7-2005 (NBC)

BUILDING SERVICES (ELECTIVE I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-

1. To design a building with all essential facilities for better life style.
2. To create a sustainable structure.
3. To design a green building

Unit-I:

Plumbing work :- water supply and sanitary provisions, Accessories of sanitary provision, methods of plumbing, problems associated with plumbing work.

Unit-II:

Acoustics, Sound Insulation and Noise Control: Basic terminology and definitions, Physics of sound. Behaviour of sound in an enclosed space. Requisites for acoustic environment , Acoustic design approaches for different building types, with reference to applicable standards. Selection of acoustic materials.Noise and its control, control of structure borne sound and noise from different mechanical equipment.

Unit-III

Electrical and Allied Installations: day lighting , basic design, artificial lighting . Different types of wiring, need of earthing, comparison between fuse and MCB, substation, types of lightening fixtures, electricity distribution in multi-storeyed building. Building protection against lightening, Planning and layout of electrical installations within a building complex.

Unit-IV:

Ventilation: Functions of ventilation, supply of fresh air, convective cooling, Stack effect, physiological cooling, provision for air movement; wind effect, Air flow through buildings, cross-ventilation, position and size of openings, air flow around buildings, humidity control.

Air Conditioning, Heating and Mechanical (Thermodynamics of human body.) Ventilation: Requirement of air conditioning, air conditioning system, elements of air conditioning, Working and p-H diagram of vapour compression cycle, refrigeration effect,

Unit-V

Mechanical Equipment & Installation: Installation of lifts and escalators, different types of Security and alarm systems. Hot Water Provision (Solar and Electrical), Special features required for physically handicapped and elderly, -

Unit-VI:

Firefighting and safety measures : Planning considerations in buildings using non-combustible materials, escapes, Fire detection and fire fighting systems. Heat and smoke detectors, Fire alarm system, Automatic sprinklers.

Assignment:

Case Study of any Building & its services

Reference Books:

1 Building Services Engineering by David V Chadderton
2 General Specification for Electrical Work – Part – I, II & III, Government of India Publication, Jain Book Depot.
3 General Specification of Heating & Ventilation - 2004, Government of India Publication, Jain Book Depot.
4 Handbook on Functional Requirement of Buildings.
5 Building Services Environmental & Electro – Mechanical Services, by S M Patil, Jain Book Depot.

ADVANCED CONSTRUCTION MATERIALS (ELECTIVE I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1. Understand properties and utilities of cement, mortar, concrete ceramic materials.
2. Understand properties and its utilities of metals and various composites
3. Study the importance of Construction chemicals
4. Study shoring and formwork materials
5. Understand the elementary concepts of smart materials

UNIT I: CEMENT, MORTAR AND CONCRETE CERAMIC MATERIALS

Study of Special Purpose Cement, Mortar, Concrete - High Strength And High Performance Concrete, Self Compacting Concrete, supplementary cementitious material - Fly Ash, Red Mud, Gypsum, Various Types of Finishes & Treatments, Engineering Grouts, Mortar plaster, Gypsum, Glass. GGBS, micro silica etc. Replacement of aggregates; stone dust, light weight aggregates, recycled aggregate.

UNIT II: METALS

Steels - HYSD, TMT, Tendons, Light Gauge Steel, Steel Fastenings, New Alloy Steels – Aluminum and Its Products, Protective Coatings to Reinforcement.

UNIT III: COMPOSITES

A) Polymer and its composites
B) Ceramic and its composite, FRC, Ferro cement etc.
C) Timber, bamboo, veneer, Laminates, Particle boards.
D) Thermal and Sound insulating materials.

UNIT IV: CONSTRUCTION CHEMICALS AND WASTE

Chemical Admixtures and Adhesives, Water Proofing Compounds – Non Weathering Materials, Geo-Synthetics, Geo-Membranes,, Asphalt, Tar & Bituminous Materials, Agro Waste Materials, Industrial Waste Materials, Disposable Materials.

UNIT V: SHORING & FORMWORK MATERIALS

Materials, Accessories and Proprietary Products - Lumber - Types - Finish - Plywood -Types and grades, Reconstituted wood -Steel -Aluminum Form lining materials, Design Considerations, Building and Erecting the formwork, Causes of Failure of Formwork.

UNIT VI: ELEMENTARY CONCEPT OF SMART MATERIAL

Smart and Intelligent Materials-Piezoelectric Materials, Shape Memory Alloys & Polymers, Magnetostrictive Materials, Temperature Responsive Polymer, Halo chromic Materials, Smart Hydro-gels, Chromomeric Systems, Photomechanical Materials, Self Healing Materials, Dielectric Elastomers.Bio cement, Phase change material.

CONSTRUCTION MANAGEMENT & LAW

BECVE704T **Evaluation Scheme: (80/20)**
(L-4, T-0, P-0) Total Credits-4 **Exam Duration: 3 hrs**

OUTCOMES :
On completion of this syllabus, the students should be able to:

1. *Demonstrate the understanding of various types of projects, modern construction techniques and will exhibit the mastery in construction planning, scheduling and various controls.*
2. *Achieve the knowledge of various types' of equipments to be used in the construction and its operational cost estimates, understand manpower requirement, planning, resources utilization and management.*
3. *To know the quality control aspects in planning & management, modern trends project management, application of information system in management of construction projects, safety provisions and equipments.*
4. *Analyze the legal aspects in construction projects through the understanding of various laws pertaining to civil engineering and architectural planning & sanctioning, labor & organizational welfare measure, provisions of arbitration and litigations.*

UNIT - I :
BASIC STUDIES IN CONSTRUCTION PROJECT
Type of Project & its Financing, Detailed Project Report Analysis and Feasibility, Time of Completion, Provisions of Escalation in Time and Cost, Choice of Technology and Construction Tecniques, Site Planning.

UNIT- II :
CONSTRUCTION SCHEDULING
Network Analysis : The Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT), Bar Chart, Resource Oriented Scheduling, Allocation, Leveling, Crashing and Time/Cost Tradeoffs, Line of Balance.

UNIT III - :
MANPOWER, MATERIAL AND MACHINERY (3M) MANAGEMENT
Manpower – Requirement and methods of calculating Productivity, Staffing, planning, directing & controlling. Organisational Charts, Duties and Responsibility of Personal Manager

Material – Requirement, Procuring, Storing & Delivery. Quality Checks, Inventory Control techniques, construction Waste generation and Management .

Machinery – different type of construction equipments and their applications- Excavators, Dozer,Rollers, Hoisting and Hauling equipments, Cost & Working Hour analysis, Depreciation analysis,

UNIT- IV:
QUALITY AND SAFETY MANAGEMENT
Concept of Total Quality Management, Safety Provisions as per National Building Code of India, Safety Equipments, MIS in Construction Project, Project Management System-MS Project.

UNIT –V :

LEGAL ASPECTS IN CONSTRUCTION PROJECTS

Town Planning Requirements, Acts and codes related to planning, Regional Town Planning, Housing Development act, Highway Act, Irrigation act, Local Rules (Gunthewari),

UNIT –VI :

INTRODUCTION TO DIFFERENT LAWS

Environmental (Protection) act, Forest Conservation - Water Pollution and air pollution, Transfer of property act – sale, purchase, lease. Land Acquisition and Rehabilitation act, Indian Contract act.

Reference Books :

1. Construction Planning and Management – Purifoy
2. Construction Planning and Management – Dr U K Shrivastava, Galgotia Publ.
3. Project Planning & Management – B C Punmia
4. Laws related to buildings and engineering contracts in India- Gajaria G T, LexisNexis Butterworths India Publisher, 2000
5. Construction Contracts- Jimmie Hinze McGraw Hill,
6. Contracts and the legal Environment for Engineers and Architects- Joseph T Bockrath, McGraw Hill,

TRANSPORTATION ENGINEERING-II

BECVE705T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students are able to

1. Understand the functions of various elements of railways, airports, tunnels and docks and harbor.
2. Plan and design various elements of railways, airports, tunnels and docks and harbor.
3. Understand the various principles traffic control in railways, airports, tunnels and docks and harbor.
4. Understand layout, design and construction permanent way, runway, taxiways, tunnels, births and jetty.
5. Understand the maintenance of various elements of railways, airports, tunnels and docks and harbor.

Unit – I : RAILWAYS

Classification of Rail way÷ lines and their track standards.

Traction and Tractive Resistance, Hauling capacity and Tractive effort of locomotives, Different Types of tractions

Permanent Way: (Ideal permanent way), gauges, track section. Coning of wheels, Stresses in railway track, High speed track.

Unit – II

Rail types and functions, selection for rails, wear & defects, creeps of rails, long welded rails., sleepers -function, types, merits and demerits, sleeper density. Ballast cushion. Ballast section, Spikes, fishplates, hook bolts, Dog bolt, pondrot clip .

Geometric design of railway track, Gauge, Gradients speed, super elevation, cant deficiency, Negative super elevation, objectives of transition curves, grade compensations.

Unit - III

Points & crossings: Left and right hand turnouts, design calculations for turnouts ,–Station and Yards: Types, functions,

Railway signaling and interlocking: Objects of signaling, principles of signaling. Classification and types of signals. Necessity of interlocking methods and mechanical devices Railway track construction, inspection & modern techniques of maintenance. Modern technology related to track, signaling & controlling.

Unit – IV : AIRPORTS

Aircraft components and characteristics, Airport site election. modern aircrafts.

Airport obstructions: Zoning Laws, Approach and turning Zone, clear zone, . (vertical) Clearance for Highway & Railway.

Runway and taxiway design: Wind rose, cross wind component, Runway Orientation and configuration. Basic runway length and correction, runway geometric design standards. Taxiway Layout and geometric design standards, Exit Taxiway.

Unit – V

Airport layout and classification: Terminal Area, Aircraft parking, configuration and system. Aprons, Hangers, Helipads and Heliports,

Visual Aids: AirPort marking and Lighting for runway, Taxiway and other areas.

Air traffic control: Need, network, control aids, instrumental landing systems, Microwave loading system

Unit – VI (Tunnel Engineering and Docks and Harbors)

16. Tunnel (Engineering) – surveys, Drainage, Ventilation, Lighting (and Lining)

Text Books and Reference Book:

1 A text book of Railway Engineering *by*S.C.Saxena and S.P.Arora, Dhanpat Rai Publicatios, N.Delhi.
2 Railway Track Engg. *by* J.S.Mundray, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.
3 Airport Planning and Design *by*S.K. Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
4 Planning and Design of Airports *by*RobortHornjeff, McGraw Hill Book Co.
5 Air Transportation Planning and Design *by* Virender Kumar &Satish Chandra, Galgotia Publications, N.Delhi.
6 Mundary, J.S. Railway Track Engineering, Tat McGraw Hill, New Delhi.
OZA, Docks and Harbours, Charotar Publisher)
7 Air Planning and Design by G.V. Rao

INDUSTRIAL CASE STUDY & PROJECT SEMINAR

BECVE706P **Evaluation Scheme: (50-Internal/50-External) (P-3 Hrs /Week); Total Credits-3**

Industrial Case Study

The student is expected to prepare Mini project report on the basis of data collected in Summer Training (ST-2) of 3 / 4 Weeks and submit detailed report .

Project & Seminar

This includes preparation of preliminaries for the project work to be under taken in 8th Semester.

1. Finalizing the title of the Project .
2. Literature Survey
3. Collection of Data
4. Scope of the project

Each group shall deliver seminar on the work done during the semester. In addition student will deliver one more seminar on the topic finalized by him with the consent of his guide.

EIGHTH SEM. B.E CIVIL

IRRIGATION ENGINEERING

BECVE801T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-2 Hrs/Week); Total Credits - 5 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students shall be able to

1. Understand the importance and scope of irrigation engineering
2. Understand fully the methods and efficiencies of irrigation, crop water requirement.
3. Understand the planning, design and operation of storage reservoir and make use of it in the practical situation.
4. Understand the basic profile of dams and use the knowledge in checking stability of Gravity dams and Earth dams.
5. Understand the theories of Canal design and apply the concept to design lined and unlined canals and detail out the cross sections.
6. Understand water logging and provide the solution to such problem.

Unit – I

General : Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation; General principles of flow, lift, perennial, inundation Irrigation systems; Comparative study of sprinkler and drip Irrigation systems.

Water Requirement Of Crops : Suitability of soils for Irrigation, Standards of Irrigation water; (Modified Penman Method), Depth and frequency of Irrigation; Definitions of field capacity, wilting point, available moisture, duty, delta, GCA, CCA, or depth, base period, outlet factor, capacity factor, time factor, root zone depth; Relation between duty and delta; Factors affecting duty; Principal crops in India; Crop rotation; Methods of assessment of Irrigation water.

Unit – II

Reservoir Planning : Selection of site for Reservoirs; Engineering surveys, Geological and Hydrological Investigations; Fixing of LWL, FTL, TBL, HFL; Different storage zones in reservoir; Determination of storage capacity by mass curve method; (Reservoir operation scheduling,) Reservoir sedimentation; Life estimation of reservoir by Brune's method; Organizational setup & Administration of Irrigation projects.

Dams: General Classification of dams as per use, hydraulic design and materials; Factors governing selection of dams. Instrumentation in dam.

Unit – III

Gravity Dam : Forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.

Earthen Dams: Types of earthen dam; Description of component parts of earthen dams-foundation, cut off trench, rock toe, hearting, central impervious core, pitching and chipping, turfing; seepage through body of earthen dam and drainage arrangements; Failure of earthen dams; Plotting of phreatic line for earthen dams with horizontal filters; Stability of foundation against shear. (OMC and ODD tests for hearting and casing zones)

Unit – IV

Spillways: Types of spillway, General principle of design of ogee spillway; Spillway gates – vertical lift, radial, rolling and drum; Gate O.S. Energy dissipation methods.

Diversion Head Works: Component parts of diversion headworks – Fish ladder, guide wall, divide wall, silt excluder and silt ejector; Causes of failure of weirs on permeable foundation; Bligh's Creep theory; Dr. Khosla's theory for design of weirs on permeable foundations.

Unit – V

Canals : General : Types of canal; Alignments of canal; Cross section of Irrigation canals; Balancing depth; Schedule of area statistics; Losses in canals,

Canals In Alluvial Soils : Kennedy's silt theory – Design procedure, drawbacks; Lacey's silt theory - Definition of initial, final and permanent regime channels, Lacey's Regime equation, channel design procedure, drawbacks; Garret's diagram for channel design.

Lined Canals: Design procedure, Types of lining; relative merits and demerits of canal lining; Economics of canal lining.

Unit – VI

Canal Structures: Canal Regulation Works : Purpose, components of Head Regulator, Cross regulators, canal escapes, Canal falls and canal outlets.

Cross Drainage Works : Purpose aqueducts, siphon aqueducts, super passage, canal siphon, inlets and level crossings.

Water Logging And Land Drainage : Causes, effects, preventive measures of water logging, types of drains, layout of tile drains system, flow of ground water to drains.

(Components of lift irrigation scheme)

RECOMMENDED BOOKS

1. Irrigation Engineering and Hydraulic Structures- Santosh Kumar Garg
2. Irrigation Engineering and Hydraulic Structures- S.R. Sahastrabudhe
3. Irrigation Engineering and Water Power Engineering- B.C. Punmia
4. Irrigation Engineering and Hydraulic Structures- K.R.Arora
5. Irrigation Engineering- N.N. Basak
6. Irrigation Engineering and Hydraulic Structures-R.K.Sharma
7. Irrigation Engineering- G.L. Asawa
8. Water Resource Engineering Principles and Practice-C.S. Murty

ADVANCED STRUCTURAL ANALYSIS (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1 Analysis of Symmetrical & Unsymmetrical plane frames, plane Grids, space trusses.
2 Analysis for Free & Forced Damped/ un-damped vibrations for SDOF
3 Perform the earthquake Analysis of structures using IS:1893.

Unit – I

1. Beams On Elastic Foundation: Introduction, Case studies, infinite beams on elastic foundation, Development of computer program.
2. Beam Curved in Plan (Statically Determine Beams Only)

   Introduction, circular beam loaded uniformly and supported on symmetrically placed columns, semicircular Beams, Varandah circular beams.

Unit – II

3. Advanced MATRIX METHOD OF ANALYSIS FOR PLANE Frames, Analysis of Symmetrical & Unsymmetrical plane frames Effects of Shear deformation. Symmetry, Anti-symmetry conditions for solving symmetric frames.

Unit – III

4. MATRIX METHOD OF ANALYSIS FOR PLANE GRIDs Analysis of Symmetrical & Unsymmetrical plane Grids, space trusses using stiffness approach subjected to member loading (UDL, Conc. Load, Temperature etc.) and joint loads. Introduction to computer program development. Introduction to MATARIX METHOD OF ANALYSIS FOR Space Structures frames.

Unit – IV

5. INTRODUCTION TO STURCTURAL DYNAMICS : Basis concepts, D'Alemberts Principle, equation of Motion of the Basis Dynamic System, Effect of Gravitation force, Influence of Support Excitation, Analysis for Free & Forced Damped/ undamped vibrations for SDOF only, Transmissibility ratio, Response to Harmonic Loading.

Unit – V

6. Response to Periodic loading, Response ti Impulse loading, Numerical methods. Approximate methods for analysis of impulsive loading, Response to ground dynamic Loading. MDOF (3DOF), mode shape and frequency

Unit – VI

7. Earthquake Analysis of structures using IS:1893 : Introduction to Earthquake code, Calculation of earthquake forces on building using codal coefficient method.

Note: Solution is restricted upto three DOF problems and assembly restricted upto 8 DOF problem.

RECOMMENDED BOOKS:

1. Matrix Method of Structural Analysis - Gere and Weaver
2. Computer Analysis of Structures - Beaufait, Rowen, Headly et al
3. Structural Dynamics- Clough &Penzin
4. Computational Structural Mechanics, S Rajasekaran& G Sankarasubramanian
5. Computer Analysis of Structures – Flemmings

PRE-STRESS CONCRETE (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1) Gaining the thorough knowledge of the basic theories and the fundamental behavior of pre-stressed concrete
2) Perform the analysis and design of pre-stress elements.
3) Apply the fundamental knowledge to the solution of practical problems.

Unit – I

1. Losses in prestress.
2. Partial prestressing
3. Analysis and design of End Blocks as per IS 1343 Method. (Only comparative study with the other methods is expected)
4. Use of untensioned reinforcement.
5. Types of pre-stressed concrete structures - Type – I, II, and III

Unit - II

6. Structural design of pre-stressed concrete beams, including I Section by Limit state method, including Limit state design criteria for pre-stressed concrete members.

7. Deflection of pre-stressed concrete beams.
8. Behaviour of unbounded and bonded pre-stressed concrete beams.

Unit - III

9. Shear and Torsional resistance of the pre-stressed concrete members.

   Composite construction of pre-stressed concrete structures and in-situ concrete, Differential shrinkage, deflection, flexural strength, serviceability (Limit state) of the composite sections.

Unit - IV

10. Statically Indeterminate structures, Continuous beams, primary and secondary moment, transformation profile, concordant profile.
11. Flexibility Influence coefficient, Analysis of single-storey, single-bay fixed portal frame.

Unit - V

12. Analysis and design of circular water tank, fixed, hinged and sliding base at the bottom, use of IS-3370.
13. Design of pre-stressed concrete poles.

Unit - VI

14. Special problems in pre-stressed concrete structures like corrosion, fatigue, dynamic behavior of pre-stressed concrete beams, behavior of pre-stressed concrete structures under fire.

    Introduction to pre-stressed concrete bridges, pavements, one way, two way and grid floor.

RECOMMENDED BOOKS:

1 Pre-stressed Concrete by Dr, N. Krishna Raju
2 Pre-stressed Concrete by Dr. TY Lin
3 Pre-stressed Concrete by N. Rajgopalan, Narosa Publishing House, Mumbai, Ed. II- 2007.
4 Pre-stressed Concrete Design & Construction- Leonhardt F. Ernst Wilhelm and Sohen, Publ .

PAVEMENT ANALYSIS AND DESIGN (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students shall be able to

1. Analyze and Design pavement and under different loading conditions for highways and airfields taking into consideration different characteristics.
2. Propose a pavement management system framework.
3. Design highway appurtenance and highway drainage.
4. Perform different tests considering field conditions and using the knowledge to increase the strength of pavements along with its economy point of view.

UNIT - I

1) General: Structural action of flexible and rigid pavements. Characteristics of high way and airfield pavement.
2) Design parameters: Standard axle load and wheel assemblies for road vehicles. Under carriage system for aircraft, type and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield, pavement, airport traffic area.

UNIT - II

3) Material characteristics: AASHO subgrade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for K, Marshal's method of Bituminous mix design, modulus of rupture, elasticity, poisons's ratio and coefficient of thermal expansion of concrete. Layer equivalent concepts.
4) Analysis of flexible and right pavements: stress, strain, deflection analysis for single, two three and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis, joints.

UNIT - III

5) Highway pavement design:

   Flexible: North Dakota cone, CBR, IRC-37, Burmister, Traiaxial (Kansas), AASHTO method of design

6) Airfield pavement design

UNIT - IV

7) RIGID IRC58, PCA, AASHTO method of design, design of joints and reinforcements.

   Flexible: US Corps of engineering, CBR, FAA, McLeod (Canadian)

   Rigid PCA, FAA & LCN, Ultimate load analysis yield lines patterns method

UNIT –V

8) Pavement testing and evaluation: field density, CBR, plate load test, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, Benkalman beam deflection study. Introduction to high way Design method(HDM)

UNIT VI

9) Strengthening of pavements: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.
10) Specification and cost estimate: Review of IRC/MOST/ICAO/IAAI specifications and standards for highway and airfield construction. Cost evaluation and comparative study.
11) case studies of highway and airfield pavement projects.

Reference Book:

1) Highway Engg *by* S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.
2) Relevant IRC Code: 37 , 58, (latest) and BIS standards.
3) Principles and Practice of Highway Engg. *by*L.R.Kadiyali, Khanna Publishers, Delhi.
4) Principles of Pavement Design *by*Yoder,E.J&Witczak,M.W., John Wiley and Sons, USA.
5) Pavement analysis and Design by Huang, Y. H. (1993), Prentice Hall, Englewood Cliffs, New Jersey.

WATERSHED MANAGEMENT (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students ~~will~~shallbe able to

1. Understand the Watershed and its characteristics
2. Understand the importance of watershed in terms of drinking water, irrigation water, increases in ground water.
3. Plan and design of Watershed protection, conservation elements
4. Envisage the management plan of Watershed.

Unit – I

Soil and Water – Issues related to plant life like composition of soil, water requirement of crops, necessary conditions for plant growth etc. Soils, their origin and classification. Land classification for WM, Land capability rating, determination of land capability class, land capability and suitability surveys, (Desalination of water logging and its remedial measures).

Unit – II

Watershed Behavior – Physical elements of a watershed, effects of land use changes on hydrological cycle component Concept of vegetative management of water yield and quality. Watershed Experiments, extrapolation of results from representative and experimental basins, Regional studies.(Water auditing and Bench marking).

Soil erosion – problem, types, conservation, and control measures in agricultural and non-agricultural land.

Unit – III

Water conservation and Harvesting – Agronomical measures in soil and water conservation. Examples and critical reviews. Inventory techniques for precipitation runoff, soil, timber, range-land and wild life

Water harvesting techniques – Elements, Development of modern harvesting Techniques Estimation of peak runoff rate Land capability classification

Unit IV

Erosion process – Factors affecting erosion, Types of erosion, Assessment of erosion, Control measures for erosion

Conservative practices – Objective and general practices, land and soil classification, identification of critical areas, (Catchment area treatment).

Unit V

Watershed Management – Objectives of Planning Watershed Projects, Guidelines for Project Preparation. Approach in Govt. programmes, people's participation, conservation farming, watershed-management planning, identification of problems, objectives and priorities, socioeconomic survey, use of tools like GIS.

Unit VI

Watershed Modelling: Runoff components –Simple parametric models – Curve Number Method, variable source area models; quasi- physically based models; a simple physically based model. Rainfall, Runoff modeling, USLE model for soil erosion.

RECOMMENDED BOOKS

1. J. V. S Murthy, Watershed Management, New Age International Publishers, 1998.
2. Suresh Rao, Soil and Water Conservation Practices, Standard Publishers, 2003.
3. V.V. N. Murthy, Land and Water Management, Kalyani Publishers, 1994.

4. Ghanshyam Das, Hydrology &soil Conservation Engineering ,PHI Publication.

ENVIRONMENTAL MANAGEMENT SYSTEM (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1 Understand the Environmental issues such as pollution, degradation and its impact.
2 Understand the environment management system and certification
3 Understand and carry out Environment Impact Analysis of a civil engineering project
4 Learn to Perform the risk analysis.

Unit – I : Environmental Management

Environmental management- issues and strategies, Environmental reporting and certification, Development and implementation of international environmental management system, Introduction to ISO 1400 series , International voluntary standards,

Unit – II : Environmental legislation

Pollution control acts, rules & notifications, Environmental audit, EMS certification , Post Project Monitoring

Unit – III : Environmental impact Assessment :

Environmental impact analysis-Concept-methodology, Identification, Prediction and evaluation, checklist material, network and overly methodology. Environmental clearance Procedures in India EIA Case studies

Unit – IV

Methods of Impact Analysis :- -**Environmental clearance procedure in India ,**Cost benefit analysis & its dimensions, Role of GIS in EIA-base line study , risk assessment & management,

Unit – V : Risk Analysis

- Environmental Risk Analysis, Fundamentals of hazards, exposure & risk assessment, management Basic Steps in risk management- hazard identification, exposure assessment & risk characterization, Quantified risk assessment for industrial accidents , Design of risk management program , Risk assessment application to environment management problems.

Unit – VI

Energy Impact Analysis

Energy sources, Importance of energy impact analysis, Energy inventory, Supply demand scenario, Energy conservation, Energy alternatives , Energy Inventory data, energy conservation.

Recommended Books:

1. A.Chadwick, Introduction to Environmental Impact Assessment, Taylor & Francis, 2007.
2. Larry, W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996.
3. R.Therirvel, E. Wilson, S. Hompson, D. Heaney, D.Pritchard, Strategic Environmental Assessment Earthscan, London, 1992.
4. A.Gilpin, Environmental Impact Assessment-Cutting edge for the 21st century, CUP, London, 1994.
5. Paul, A Erickson, A Practical Guide to Environmental Impact Assessment, Academic Press, 1994.
6. Suresh, K.D., Environmental Engineering and Management, SK Kataria Publishers, New Delhi, 2002.
7. Gupta, K.R., Environmental Legislation of India, Atlantic Publishers, 2006.
8. Chandrasekhar M., Environmental Science, Hi-Tech Publications, Hyderabad, 2004.

WATER TRANSMISSION AND DISTRIBUTION SYSTEM (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1. Understand concepts of pipes, reservoir, pumps and valves.
2. Analyze water distribution networks and its designing process.
3. Carry out optimal design of water distribution network
4. Carryout the reliability analysis of water distribution network

Unit-I

General Hydraulic Principles: Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe.

Reservoir Pumps and Valves: Impounding reservoir, Service and balancing reservoir, Three reservoir system, Multi reservoir system, pumps and pump co-ordinations, Valves- their types, analysis of reservoir system with checks valves and pressure reducing valves.

Unit- II

Analysis of Water Distribution Networks: Types and parameters, Parameter relationship, Formulation of equations, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method, Introduction of gradient method, Introduction of Dynamic analysis.

Unit-III

Node Flow Analysis (NFA): Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhave's approach- Node classification, node category compatibility, NFA theory. Introduction to other NFA methods- Germanopolus approach, Wagner ethal approach, Gupta and Bhave's approach.

Unit-IV

Reservoir capacity: Estimation of minimum required reservoir capacity using graphical and analytical method. Design of pumping main: Optimal design of pumping main considering pipe diameter as continuous and discrete variable.

Unit-V

Design of Water Distribution Networks: Design of single source branching networks using critical path method, number of branching, configuration of looped networks using Graph Theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of single source looped networks using critical path method

Unit-VI

Optimal Design of Water Distribution Networks: Cost Head Loss Ratio(CHR) method- CHR criterion, Problem formulation, CHE methodology for single source branching networks. Linear programming formulation and solution using simplex method.Introducton of Non- Linear Programming based approaches.

Reference Books:

1 Jeppaon R.W.(1977), “Analysis of Flow in Pipe Networks’’ Ann Arbor Science. Ann Arbor Michigan, USA
2 Walski. T.M.(1984),’’ Analysis of flow in water distribution networks’’
3 Technomic Publishing CO.Lancaster, Pennsylvnia,USA
4 Analysis of water distribution networks by P.R. Bhave, R.Gupta.

GEOTECHNICAL INVESTIGATION & GROUND IMPROVEMENT TECHNIQUE (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
((L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Understand methods of soil exploration and analysis of the results
2. Understand the methods ground improvement and material used.
3. Understand the use of geosynthetic materials.

Unit I - Importance and objects of Geotechnical exploration:

Planning of geotechnical exploration program: Methods of boring, location, number of bore, depth of boring.

Sub-surface Investigation Report: Salient features and boring logs; Types of soil samples & their suitability, precautions in sampling, parameter for sampler design, preservation & shipment of samples.

Seismic refraction method, electrical resistivity method, qualitative and quantitative interpretation of test results, limitations.

Unit II - Field investigation:

Standard Penetration test, static cone and dynamic cone penetration tests, interpretation of test results for obtaining design soil parameters for cohesive and cohesion less soil,

Plate load test– purpose, procedure, interpretation for bearing capacity and settlement of foundation.

Field vane shear test, design value of un-drained shear strength of clays, correction factor;

Unit III - Introduction to ground improvement techniques:

Need for ground improvement and ground improvement techniques, economic considerations and suitability.

Grouting: Materials and methods of grouting grout volume and grouting pressure, grout requirements and tests.

Stone Column: Application, layout feature, procedures of installation, rammed & floated column, quality control in construction, methods of improving the effectiveness of stone column, skirted and cemented stone column technique, geosynthetic encased stone column.

Unit IV - Reinforced soil and Geo-synthetics:

Basic theory of reinforced soil, concept of reinforced soil wall and slope geo-synthetics types, -application and function in civil engineering,. Application of Geofoam & Geocell.

Unit 5 : Ground Anchor and Soil Nailing

Concept , Design features , types, construction procedure, Functions, Application, Advantages. Limitations of soil nailing system and ground anchor.

Unit 6 : Diaphragm wall

Construction sequence, cement slurry wall, Design features, Functions, applications, Case study on Diaphragm wall.

Deep soil mixing – Concept, procedure, Advantages and limitations.

Reference Book:

1. Geotechnical Engineering, Principles & Practices of Soil Mechanics and Foundation Engineering: VNS Murthy
2. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor, 1989 and later
3. Soil Mechanics and Foundation Engineering: B.C. Punmia, Laxmi Publications Pvt. Ltd.
4. Basic and Applied soil mechanics: Gopal Ranjan & A.S. Rao, New Edge International Ltd., (2004)
5. Ground Improvement Techniques: Dr. P. Purushothama Raj, Laxmi Publications Pvt. Ltd., 1999 and later
6. Engineering Principles of Ground Modification: M.R. Housmann, McGraw Hill (1990)
7. Geotechnical engineering – Braja M.Das, N.Sivakugan, Cengage, learning.

ADVANCE ENGINEERING GEOLOGY (ELECTIVE- II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1 Acquire sufficient knowledge of existing rocks , its failure and its remedial methods.
2 Understand the application of Geological fundamentals in various fields of Civil Engineering.
3 Understand different Geological Hazards on earth and plan for the mitigation of such hazards..

Rock Mechanics

Unit-I

Foundation Geology : Methods of rock investigation for major Civil engineering projects, Geological Drilling Method, borehole logs, Correlation, percent recovery and Rock quality designation, Engineering classification of Rock based on RMR, RQD, Strength and Weathering resistance.

Unit-II

Rock Strengthening : Defects in rock masses, Grouting method and material, Design of Rock bolts and anchors. Water percolation tests at foundation site. Case studies of Civil Engineering projects in India.

Unit-III

Groundwater Hydrology: Groundwater and well Hydraulics, Determination of permeability, storage capacity, transmissivity, specific capacity, safe yield. Groundwater trends and fluctuations. Construction of Wells.

Unit-IV

Groundwater Exploration : Surface and sub-surface investigations of Groundwater. Geological, Geophysical methods and remote sensing; Water balance technique, Artificial recharge of ground-water.

Unit-V

Environmental Geology: - Land use/cover planning; pollution of surface and groundwater; waste disposal site selection for solid and liquid wastes.

Unit-VI

Geological Hazards: Natural Disaster Management with emphasis on Earthquakes, Stability of slopes and landslides. Prediction, Prevention and Rehabilitation.

RECOMMENDED BOOKS

1 Fundamentals of Engineering Geology- F.G.Bell Publisher BS Publications Edition 2005.
2 Engineering Geology- Parbin Singh, S K Katariya& Sons Edition Sixth Edition.
3 Principles of Physical Geology- Homes Arthur and Homles Doris, ElBS Publications Edition 1987.

WATER POWER ENGINEERING (ELECTIVE- II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOME:-
At the end of syllabus, students shall be able to

1. Understand the significance of water power and hydraulic structures related to water power engineering
2. Apply the knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes
3. Understand concepts of turbines and pumped storage tanks.
4. Design complete unit of hydro electric power station & its components.

Unit 1:

Introduction: Sources of energy, types of power station, choice of type of generation, component of water power project, types of hydro power schemes, general layouts of various hydropower schemes General arrangements of a power station, power house, sub-structure and super structure, underground power station – necessity principal, types, development and economics.

Unit 2:

Estimation of hydro power potential, basic water power equation, gross head, net head nature of supply, storage and pondage. Method of computing hydrographs, mass curves, flow duration curves.
Nature of demand: Load curve, load duration curves, load factor, plant factor, plant use factor, firm power secondary power

Unit 3:
Intake structures - Types, level of intake, hydraulics of intake structures, trash rack, transition, intake gates.
Conduits: Types, economic section, power canals, pen-stock types hydraulic design and economic diameter pipe supports, anchor blocks, tunnels – classification, location and hydraulic design, tunnel linings

Unit 4:
Surge Tank: Functions and behaviour of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, fore-bay

Unit 5:

Turbines: Classification of turbines, characteristics of different types, choice of type of turbine, turbine setting and cavitations

Tail race: Functions, types, channel and tunnel draft tubes, function and principal types

Unit 6:

Pumped storage plants, purpose and general layout of pumped storage schemes, main types, typical arrangements of the upper reservoirs, economics of pumped storage plants. Introduction to Tidal power stations

Assignment:

1. Feasibility Study of Hydro Power Station in Vidarbha Region
2. Complete Design of Components of Hydro Power Station .

Recommended books:

1. Dandekar M. M. & Sharma K. N, Water Power Engineering, Vikas Publishing House Pvt. Ltd. , New Delhi.
2. Sharma R.K. & Sharma T.K., Water Power Engineering, S. Chand Publication.
3. Streeter V. L. & Wylie E. B, Hydraulic Transient , McGraw Hill Book Company, New York.
4. ChaudharyHanif, Applied Hydraulic Transients, Van Nostrand Rein Hold Company, New York.
5. Warshne, Water power engineering ,Nemchand Publication.

FORENSIC CIVIL ENGINEERING (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1 Understand various testing methods of Failed Structures.
2 Understand the aspects of failures connected with various structural systems and materials.
3 Plan the strategic measures against failures.
4 Can write the legal and technical report of the failure in lucid manner.

Unit – 1

Introduction to forensic engineering, Forensic investigations-tools and techniques. Scope and extent of application of Forensic Engineering techniques in various fields of Civil Engineering.

Unit - 2

Structural Failures: Failure of construction materials steel, concrete - Joints by Bolt and weld. Failure of compression members and tension members by reversal of loads – Failure aspects of post tensioned concrete systems, space frame, plane frame, precast buildings, failure of bridges.

Geo-Technical Failures: Soil liquefaction, failure of foundation systems – Causes and prevention.

Unit - 3

Testing of failures: Various methods of testing of failed structures & instrumentation- Laser scanning, microscope, Radio graphic evaluation, Load Testing of shoring systems and repair technology.

Back analysis: Selection of theoretical model - methods of analysis, Instrumentation and Monitoring. Development of the most probable failure hypothesis - cross-check with original design.

Unit - 4

Designing Against Failure: Quality control – Material selection, workmanship, design and detailing.

Performing reliability checks, Legal issues involving jurisprudence system, insurance, reducing potential liability, responsibility of engineers and contractors. Professional practice and ethics.

Reporting – Oral & Written

Assignment:

One Case Study of complete forensic study of civil engineering structure and reporting.

Recommended Books:

1. Guidelines for Forensic Engineering Practice by Gary L Lewis, ASCE Publication
2. Introduction ot Forensic Engineering by Randall K Noon, CRC Press
3. Forensic Engineering Investigations by Randall K Noon, CRC Press
4. Forensic Engineering by Sam Brown, ISI Publication
5. Forensic Structural Engineering by Robert T Ratay, Mc-Graw Hill Professional
6. Construction Failures by Jacob Feld & Kenneth L Carper, John Wiley & Sons

DISASTER RESPONSE AND MANAGEMENT TECHNIQUES (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:

After studying the subject, student should be able to understand the nature & types of disaster, its preparedness, Role of different government & private agencies, Act & other Statute Provisions, Management of Disaster, Post disaster condition & its management.

Unit - 1
Disasters:

Natures and extent of disasters, natural calamities such as floods, earthquake, drought, forest fire, etc. Manmade disasters such as Chemical and Industrial hazards, Epidemic, etc.

Disaster Response Plan:

Long term & Shot term planning for disaster. Preparation of vulnerable locations map, data assimilation of past recurrence of similar disasters, socio-economic parameters of the area, Resources availability, Training Emergency Response Mechanism, Medical Aid.

Role of Local, State & Central administration, Role of NDRF, NCDC, NGOs, Media, and SHG. Forecasting and Warning Communication aid.

Unit - 2
Risk & Cost Assessment:

Geographical conditions, Population, Living habits, Threats, Extent of damages to the lives, agricultural area, industrial units, Awareness & Safety Program.

Relief arrangement & essential components, Shelters, Rescue & search tools &equipments, transport facilities. Cost assessment of each unit and funding.

Unit - 3
Disaster Management:

Principles/Components of Disaster Management, Organizational Structure for Disaster Management, Disaster Management Schemes/SOPs, Important Statutes, Provisions of DDM Act – 2005.

Natural Disasters and Mitigation Efforts, Flood Control, Drought Management, Cyclones, Epidemic Management, IEDs /Bomb Threat Planning and Safety & Rescue Measures, Forest Fires Management, Oil Fires, Crisis in Power Sector, Accidents in Coal Mines, Terrorism and Emergency Management, Rumors & Panic Control.

Unit - 4

Post Disaster Management:

Rehabilitation: Physical, Psychological & Medical Rehabilitation, Epidemic management through medical camping, Trauma and Stress Management, Rumor and Panic Management, Medical facilitation and Health management post Disasters. Insurance & Claim management.

Assignment:

One Case Study on any one Disaster in India.

Recommended Books:

1. Forest Fire Disaster Management by Satendra Ashutosh & D Kaushik
2. Environmental Extremes – Disaster Risk Management by Anil K Gupta & Sreeja Nair
3. Disaster Management in India – Ministry of Home Affair, Govt of India
4. Risk to Resilience: Strategic Tools for Disaster Risk Management by A K Gupta, S Nair, S Chopde & P Singh
5. Disaster Management by Mukesh Kapoor
6. Management of Manmade Disaster by S L Goel
7. Earthquake & Natural Disaster by Manik Kar
8. A Practical Guide to Disaster Management by A K Jain
9. A manual on Disaster Management by Parag Diwan

ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week) Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-At the end of the course teaching, the student shall be able to

1. Understand the properties of clay
2. Know the swelling and shrinkage characteristics of soil.
3. Understand the basics of pile foundation

Unit-I :

EXPANSIVE SOILS:

Origin and classification of clay minerals, Mechanism of swelling recognition & identification of expansive soil. Free swell indices, ground heave, swelling pressure & swelling potential, factors affecting expansivity and swelling pressure of soil, properties and uses of benotonite slurry, design approaches for foundations in swelling soil, introduction to CNS technique, Swelling shrinking of clays identification of clay minerals by x-ray diffraction and DTA methods.

Unit-II:

GRAIN MORPHOLOGY

Effect of size, shape of sand an engineering properties. Effects of grain morphology, stress- strain behavior of soil.

Unit-III:

DRAINAGE &DEWATERING :

Purpose, various methods, well point systems, their suitability, flow towards slots from line source, concept of electro osmosis.

UNIT-IV

CONSOLIDATION:

2-D consolidation theory, application to consolidation due to sand drains, constructional features and design of sand drain installation. Secondary consolidation phenomenon & estimation of secondary consolidation settlement. Over consolidated soil, over consolidation ratio, Schmertmann's method for determination of Preconsolidation pressure field consolidation curve

Unit –V : DYNAMIC SOIL PROPERTIES

-Introduction, Representation of stress condition by Mohrs circle.Measurements of Dynamic soil properties, stress-strain behavior of cyclically loaded soil.Strength of cyclically loaded soil.

Unit-VI : LIQUEFACTION

Introduction, phenomenon, evaluation, effects of Liquefaction.

Reference Book:

1. Arora K.R. : Soil Mechanics & Foundation Engineering
2. Punmia B. C. : Soil Mechanics & Foundation
3. Gopal Ranjan & Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
4. P Raj : Geotechnical Engineer, McGraw Hill Education,2000
5. VNS Murthy: Soil Mechanics & Foundation Engineering,Vol.-1, Saikripa Tech Consultant, Bangalore 1991
6. Purushottam Raj: Geotechnical Engg.
7. B. M. Das: Principle of Geotechnical Engg.
8. Winterkom H.F &Farg H.: Foundation Engineering Handbook
9. Geotechnical engineering , A practical problem solving Approch- Braja M.Das, N. Sivakugan, Cengage learning.
10. Principles of geotechnical Engineering- Braja M.Das, Cengage learning

ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week); Total Credits-2**

PRACTICALS:

A. Any three of the following laboratory practicals :

1. Determination of swelling pressure of soil.
2. Determination of swelling, potential of soil
3. Determination of tensile strength of rock by Brazilian test.
4. Determination of stress -strain nature, compressive strength and elastic modulus of rock from uniaxial Compression test.
5. Determination of consolidation property parameters.

B. Any two design assignments:

1. Design of sand drain installation.
2. Design of under reamed pile foundation
3. Stability analysis of well foundation.

ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

UNIT I: INTRODUCTION TO CONCRETE

Constituentsof Concrete, Special Purpose Cements Binary cement , ternary cement, Hydration Process and Hydrated Cement Pasteof blended cement,Aggregate cement paste interface.– Transition Zone in Concrete, Standards, Specifications and Code of Practice.

UNIT II: SPECIAL CONCRETE AND CONCRETING TECHNIQUES

a) Concrete with difference cementatious materials: fly ash, GGBS, Silica fume.
b) Concrete with different Aggregates: No fines, high weight, gap graded, Recycled Aggregate, Auto clave aerated concrete.
c) Modified property: high density, high performance, ultra rapid hardening concrete, transportation concrete, Fiber reinforcement concrete.
d) Techniques: RMC, Underwater concrete , Shot crete, nano concrete.

UNIT III: DESIGN OF CONCRETE

Concept of Design of concrete, Quality control (field and statistical) Indian Standard Method, Comparison with British and.American Method of Mix Design. Acceptance criteria.

Design of High Strength Concrete Mixes, Design of Light Weight Aggregate Concrete Mixes, Design of Fly Ash Cement Concrete Mixes, Design of High Density Concrete Mixes, Standards, Specifications and Code of Practice

UNIT IV: BEHAVIOR AND STRENGTH OF CONCRETE

a) Failure modes inconcrete, type deformation stress strain relation and modulus of elasticity, Shrinkage cause, Factors Affecting and control, creep, causes, Factores influencing and effects. Effects of temperature.
b) Compressive strength, Tensile strength, Fatigue strength, and impact strength, Factors influencing strength of concrete.

UNIT V: DURABILITY OF CONCRETE

Water As An Agent Of Deterioration, Permeability Of Concrete, Classification of Causes of Concrete Deterioration, Deterioration By Surface Wear/Abrasion, Freezing And Thawing of Concrete, Alkali-Aggregate Reaction (Alkali-Silica Reaction / Alkali-Carbonate Reaction), Deterioration By Chemical Reactions, Sulfate

Attack, Concrete In Seawater, Carbonation, Corrosion of Embedded Steel In Concrete, Deterioration By Fire, Guide To Durable Concrete

UNIT VI: TESTING OF CONCRETE

Advanced Non-Destructive Testing Methods: Ground Penetration Radar, Probe Penetration, Pull Out Test, Break off Maturity Method, Stress Wave Prorogation Method, Electrical/Magnetic Methods, Nuclear Methods And Infrared Thermograph, Core Test.

ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

BECVE 803P **Evaluation Scheme: (25-Internal/25-External)**
(P - 2 Hrs/Week); Total Credits-2

1. Minimum 3 Mix Design
2. Minimum 5 Practical on Testing of Concrete with NDT Equipments.

ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand the principles of analysis and design of special RC structures viz bridge, deck, ESR, shell etc.
2. Understand the behavior of special RC structure under different loading conditions such as IRC, dynamic etc. as per the code provision.
3. Analysis and design of multistoried frame structure incorporating seismic forces.
4. Analysis and design of cylindrical shells.

Unit – I

Design of overhead circular, and Intze service reservoirs (by using Working Stress Method). Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes. including ductile detailing. Design of foundation- Annular raft, Full raft.

Unit – II

Design of highway bridges with IRC loading and equivalent UDL. Slab type, Two/Three girder type.

Unit – III

Analysis & Design (Using Limit state Method) of building frames upto two bay/two storey, including design of foundation, ductile detailing, and introduction to Seismic Coefficient Method.

Unit – IV

Design of cylindrical shells by beam theory, advantages, assumption, ranges of validity and beam analysis. Design of shells with or without edge beams.

RECOMMENDED BOOKS:

1 Advanced Reinforced Concrete Design - Varghese P.C, Publisher Prentice Hall of India Edition 2001.

2 Advanced reinforced Concrete - N. Krishna Raju, Publisher CBS Publishers & Distributers Edition 2002.

3 Reliability Analysis & Design of Structures- Ranganathan R Publisher Tata McGrawHill Edition 1990.

4 Reinforced Design- Pillai ,S.U.,D. Menon, Publisher T M H Publication Edition (Second Edition)2003

ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week) Total Credits-2**

PRACTICALS : (Minimum 3 designs)

1) Design of up to two bay two storey by using Analysis/Design Software.
2) Design and analysis using above syllabus.
3) Minimum One site visit pertaining to above design.

ADVANCED STEEL DESIGN (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-

At the end of this course, students will be able to

1. Understand the analysis and design of tension members, bolted connections, welded connections, compression members and beams.
2. Understand the basic concepts and to incorporate the same in the analysis and design of special structures such as gantry girders, foot bridges, railway bridges, storage vessels etc.

Unit – I

1. Gantry Girders: Cranes, Electrically operated overhead, Design consideration, Crane girder and Gantry girder design.
2. Industrial building frames
   i. Upto two bay single storeyed, foundations, connections, detailing of steel connections.
   ii. North light trussed and lattice girders for industrial buildings.

Unit - II

3. Bridges : Types of bridges foot bridge, road bridge, railway bridge.

   Rolled beam bridges, plate girder bridges, trussed bridge, through type, deck type bridges.

   Loading on foot ways, IRC loading, loading on railway bridges.

   Design of a foot bridge, design of components of railway and road bridges
4. Bearings : Types of bearings, bearing pads, design of rocker and roller bearings

Unit - III

5. Storage Vessels : General concepts, design of bunkers, silo,
6. Open web sections : Introduction, design of open web sections.

Unit - IV

7. Composite construction. General concepts.

   Properties, Steel – concrete composite design of encased beams, columns, shear connectors.

ADVANCED STEEL DESIGN (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/ 25-External)**
(P-2 Hrs/Week) Total Credits-2

PRACTICLAS:

Minimum 3 designs based on above syllabus

WATER AND WASTE WATER TREATMENT (ELECTIVE III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand composition of typical municipal solid wastes, their sources, collection, treatment and disposal methods.
2. attain an ability to use the techniques, skills, and modern engineering tools necessary for environmental engineering practices.
3. designing of different units of water &waste water treatment plant.
4. Give the knowledge about recent development in water &waste water treatment .

Unit – I - Introduction to WTP & Aeration:

1. Objective of water treatment, unit operation and unit processes, treatment flow sheet, site selection for water treatment plant.
2. Aeration: objective of aeration, types or aerators, design of cascade aerator, gas transfer, two film theory.

Unit – II - Coagulation, Flocculation & Sedimentation

3. Coagulation- Flocculation: Theory of coagulation objectives, types& Design of rapid and slow mixing devices(hydraulic and mechanical), factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids
4. Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and clariflocculators.

Unit – III - Filtration, Disinfection &Minor methods

5. Filtration: mechanism of filtration, types of filters, design of rapid sand filters, filter media specifications, preparation of filter sand from stock sand, problems in filtration.
6. Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants, chlorination, method of chlorination (breakpoint chlorination), factors affecting efficiency of chlorination.
7. Iron and manganese removal, deflourination.
8. Recent development in water treatment.

Unit – IV - Characteristics & Disposal of Waste water

9. physical and chemical characteristics of waste water, DO, BOD, COD, determination of BOD rate constant
10. Disposal of sewage by dilution and by land disposal, Streater-Phelps's equation. Numerical

Unit – V - Preliminary & Primary Treatment

11. Treatment Methods: Waste water treatment flow sheet, preliminary & primary and secondary methods of treatment, design of screen. Girt chamber and primary settling tank.

Unit – VI- Secondary Treatments

12. Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process, aerated lagoons and stabilization ponds. Design of ASP
13. Sludge treatment, aerobic and anaerobic digestion, reactor types (such as UASB, AFFB, Hybrid reactor) & factors affecting anaerobic digestion and sludge drying beds (excluding design)
14. Recent development in waste water treatment.

REFERENCE BOOKS:

1 Sali J. Arcelvala, Tata Mcgraw "Waste Water Treatment for Pollution Control and Reuse".
2 Dr. P.N. ModiVol I – Environmental Engineering I – Standard Publication.
3 Dr. P.N. ModiVol I – Environmental Engineering II – Standard Publication.
4 Dr. A.G. Bhole – Design of Water Treatment Plant, IWWA, Nagpur centre.
5 Dr. B.C. PunmiaVol I &Vol II – Laxmi Publication.
6 CPHEEO Manual.
7 V.N.S. Raju" Water and Waste Water Treatment"- Tata McGraw Hill.
8 Matcalf and Eddy - Water and Waste Water Treatment, Disposal And reuse - Tata McGraw Hill.

WATER AND WASTE WATER TREATMENT (ELECTIVE III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-2

PRACTICALS:

A) Minimum 6 experiments

1. Determination of Sulphates
2. Determination of Chlorides.
3. Residual, Available Chlorine and Chlorine demand.
4. Determination of BOD
5. Determination of COD.
6. Jar test.
7. Determination of filter sand from available stack sand.
8. Balferiology test on water.

B) Design of individual unit of water and waste water treatment.

APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : - The students shall be able **to**

- Develop skills and knowledge regarding basic principles of GIS
- Apply knowledge of remote sensing and GIS in various fields of civil engineering
- Understand fundamental knowledge of principles of ariel photography and remote sensing.
- Remote Sensing and GIS for mapping and monitoring land cover and land use changes
- Remote Sensing and GIS approach in the monitoring and evaluation of rapid urban growth for sustainable development.
-

UNIT-I: Basics of Remote Sensing:

Introduction. history & development, Definition and Scope of Remote Sensing, Advantages and disadvantages of remote sensing techniques, Type of Remote Sensing, Basic principle of remote sensing, Electromagnetic energy and its wavelength, Wavelength regions and their applications in remote sensing, Interaction of EMR with atmosphere, Atmospheric windows Ideal Remote sensing system. Radiometers. Spectral signature and Spectral response curves.

UNIT-II: Remote Sensing Platforms and Sensors:
Introduction, Terrestrial, Airborne and Space borne platforms-classification of satellites, Sun-synchronous and geostationary satellites, Type of Orbit. Satellite launch vehicles GSLV and PSLV, Sensors and Scanners, sensor material, sensor systems, Resolution of sensors, Swath, Image referencing system- Path and Row, Multispectral, Thermal and Radar Scanners,, Remote sensing data products, and their types: Analogue and Digital data formats, Thermal and Radar imageries, FCC, Indian remote sensing program. Various Earth resources satellites and their characteristics,

UNIT-Ill: Aerial Photography:
Introduction, Terminology. Geometry of vertical aerial photograph. Elements of photo and image interpretation, Interpretation key, Interpretation Instruments, Orientation of aerial photographs, Aerial mosaics, Flight planning, Types of aerial photographs. Scale of Aerial photographs, Number of photographs to cover a given area, Relief displacement of vertical objects, Image Parallax and vertical exaggeration.

UNIT-IV: Digital Image Processing:
Introduction, Image reduction, Image magnification, Image rectification and restoration, Image Enhancement contrast manipulation, spatial feature manipulation multi image manipulation. Image classification: supervised and unsupervised classifications, accuracy assessments and data merging

UNIT-V: Geographical Information System
Introduction, Components of GIS- Hardware and Software components. data input and editing, spatial and non spatial data, raster and vector data, database management, data manipulation and analysis, data output.
Global Positioning System: Introduction to Global Positioning System (GPS) Fundamental concepts. GPS system elements and signals, Classification of GPS receivers.

UNIT-VI : Applications: Integrated Approach of RS and GIS Application:
Application in Geological Investigations, Water Resources Management. Environmental studies, Land cover and Land use, Transportation planning, Application in Civil Engineering Projects — Dams and Bridges site investigations, Land slide studies. Flood studies.

RECOMMENDED BOOKS

1. Remote Sensing and Geographical Informatiotn Systems - M. Anji Reddy.
2. Concepts and techniqes of Geographic Information Systems- C.P LO Albert KW Yeung, Pritince Hall of India Edition 2002 .
3. Remote Sensing of the Environment ..an Earth Resource Perspective - John R Jensen, Pearson Education Edition 2006 .

APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-2

PRACTICALS:

RS Data Formats and their study : Analogue and Digital Data Products

1. Digital Image Processing : Registration, Enhancements and digital Classifications
2. Case Studies in water Resources (Surface, Ground water) Environmental geology, engineering projects
3. Calculations on RS Data : Elevation, spatial attributes
4. GIS : Vector data generation, data attachments and data analysis.

Construction Economics and Finance

BECVE804T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : - The students shall be able **to**

- Acquaint with various economic and financial aspects of construction industry
- Understand the tools and techniques of economic analysis for improving their decision making skills
- Understand the knowledge of economics and finance with special reference to construction industry
- Understand the concept of IRR, turnkey construction projects
- Apply knowledge of inflation, recession, financial ratios

Unit I:

Importance of construction and infrastructure in economic development and growth. Construction – a key industry of India, Concepts of Time value of money, discounted cash flow, internal rate of return, numerical problem based on calculation of IRR.

Unit II:

Factors of production with special reference to construction industry, definition and nature of turnkey construction projects, numerical problem based on calculation of Rate of Return and Net Present Value

Unit III:

Types of market structure in construction industry of India-monopoly, oligopoly and monopolistic competition, definition of recession, inflation, stagflation and its impact on construction industry.

Unit IV :

The sources of finance for construction industry, types of foreign direct investment in infrastructure development of India, project cash flow and numerical problem based on calculation of project cash flow.

Unit V:

Elements of Balance sheet and income statement in construction industry, affordable housing scheme by government of India. numerical problem based on calculation of financial ratios – liquidity ratio, debt/equity ratio, operating profit ratio, return on investment ratio.

Unit VI :

Relevance of capital structure, cost of capital, working capital management in construction projects, factors influencing working capital, the concept and practice of CIBIL in finance, numerical problem based on calculation of working capital for construction project.

***Note** : Numerical problem shall be of 4 to 6 marks .*

References :

1. Tarquin, A.J and Blank L.T, (1976) Engineering economy and behavioral approach. Mc Graw Hill Company.
2. Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition.
3. Thuesen, H.G. (1959). Engineering Economy, Prentice-Hall, Inc.
4. Van Horne, J.C. (1990). Fundamentals of Financial Management, Prentice-Hall of India Ltd.
5. Brigham, E.F. (1978). Fundamentals of Financial Management, The Dryden Press, Hinsdale, Illinois.
6. Kolb, R.W. and Rodriguez, R.J. (1992). Financial Management. D.C. Heath & Co.
7. Walker, E.W. (1974). Essentials of Financial Management, Prentice Hall of India Private Limited, New Delhi.
8. Wilfred, N. (1971). Accounting for the Building Trade, Hutchinson Educational, London.
9. Pilcher R. (1966). Principles of Construction Management. McGraw Hill Publishing Co Ltd.
10. Lifson, N.W. and Shalfer, E.F. (1982). Decision and Risk Analysis for Construction Management, John Wiley & Sons.
11. Degoff, R.A. and Friedman, H.A. (1985). Construction Management, John Wiley & Sons.
12. Van Horne, J.C. (1990). Management and Policy, Prentice-Hall of India Ltd.
13. Harris, F. and McCaffer, R. (1989). Modern Construction Management. BSP Professional Books.

BECVE805P Project

BECVE805P **Evaluation Scheme: (75-Internal/75-External)**
(P-2 Hrs/Week); Total Credits-6

Minimum two presentations on the work done, Dissertation copy shall be approved by respective guides.

Syllabus for

Applied Mathematics- III (Civil Engineering)

Scheme (Theory: 4 hrs, Tutorial: 1hr)

UNIT –I : FOURIER SERIES (06Hrs)

Periodic functions and their Fourier expansions, Even and Odd functions, Change of interval, Half range expansion.

UNIT - II: PARTIAL DIFFERENTIAL EQUATIONS(12Hrs)

Partial Differential Equations of first order first degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Applications to simple problems of vibration of strings and beams, Elementary concept of double Fourier series and their application to simple problems of vibration of rectangular membrane.

UNIT – III: CALCULUS OF VARIATIONS (08Hrs)

Maxima and minima of functional, Euler's equation, Functionals dependent on First & Second orders derivatives. Rayleigh-Ritz method, Simple applications.

UNIT –IV: MATRICES(12Hrs)

Linear and Orthogonal transformations, Linear dependence of vectors, Characteristics equations, Eigen values and Eigen vectors. Reduction to diagonal form, statement and verification of Cayley Hamilton Theorem [without proof.] Sylvester's theorem, Quadratic form Transformation of co-ordinates ,Transformation of forces and couples, Association of matrices with linear differential equation of second order with constant coefficients.

UNIT – V: NUMERICAL METHODS(14Hrs)

Error in numerical calculations, Errors in series approximation, Rounding of errors, Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method and their convergence , Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordon method. Gauss Seidel method, Crouts method, Numerical solution of ordinary differential equation :Taylor's series method, Picard's method, Runge-Kutta 4th order method, Euler modified method. Milne's Predictor- Corrector method.

UNIT – VI: INTRODUCTION TO OPTIMIZATION TECHNIQUES (08Hrs)
Linear programming problem: Formulation, Graphical method, Simplex method.

Text Books

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
2. Advanced Engineering Mathematics by Erwin Kreysizig, 8th Edition, Wiley India
3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville,
4. Calculus of variation by Forrey

Reference Books

1. A Text Book of applied Mathematics, Volume I &II , by P.N. Wartikar& J.N. Wartikar, Poona VidyarthiGrihaPrakashan
2. Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
3. Mathematics for Engineers by Chandrika Prasad
4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication

BECVE 302 T STRENGTH OF MATERIALS

Objectives:

1. To make students learn and apply basic theories and concepts of equilibrium, shear force, bending moment in beams and frames, bending stress, shear stress, torsional stress and stress-strain laws to different materials for different conditions of loading.
2. To make students learn and understand the concept and theory of deflection of beams, frames, trusses.

Outcomes:

a. The students would be able to understand the behavior of materials under different stress and strain conditions.
b. The students would be able to draw bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading and calculate the deflection.

Syllabus :

Unit – I

Mechanical properties and uniaxial problems.
Types of force distribution, concept of stress and strain, Stress strain behavior of ductile and brittle material in uniaxial state of stress, elastic, plastic and strain hardened zones stress-strain relations, Elastic constants, relation between elastic constant, Uniaxial loading and deformation of simple cases of statically indeterminate problems under axial loading, temperature change etc., Thin wall pressure vessels cylindrical and spherical subjected to internal pressure.

Unit – II

Axial force, shear force and bending moment diagram
Concepts of free body diagrams, types of loads, Determination of axial forces, shear forces and bending moment at a section, axial force, shear force and bending moment in beams and simple frames, Differential relations between shear force and bending moment, Relation between load and shear force.

Unit – III : Stress in beams

Bending stresses in simple beams, Assumptions and derivation of simple bending theory relation between bending moment, bending stress and curvature of homogeneous and composite beams, Shear stresses in simple beams, Shear flow and shear stress distribution, shear stress in composite beams, combined effect of bending moment and axial force.

Unit – IV : Torsion

Torsion of circular section, assumptions and derivation of relations between torsional moment, shear stress and angle of twist, Torsional stress in solid and circular sections, Introduction to Torsion in rectangular section, Torsion in thin walled hollow section

Unit – V : Deflection of beams

Derivation of differential equation of moment curvature relation, Differential equation relating deflection and moment, shear and load, Deflection of simple beams by integration, Introduction to Deflection of linearly varying beams by integration.

Unit –VI : State of stress in two dimensions

State of stress in two dimensions, differential equation of equilibrium, Transformation of stresses, principal stresses, maximum shear stresses, Mohr's circle, Combined bending and torsion, Combined effect of torsion and shear, Shear flow in thin walled section, Concept of shear centre of thin wall sections, unsymmetrical bending.

BECVE 302 P : STRENGTH OF MATERIALS
(Any Eight practicals)

1. To study various types of Strain Gauge apparatus.
2. To determine the Tensile Strength of Steel specimen.
3. To perform Hardness test on various metals. (Brinell's hardness test & Dynamic hardness test)
4. To perform standard Torsion test on metals.
5. To perform the Impact test on metal (Izod/ Charpy).
6. Compression test on Bricks and Stones.
7. To determine the spring constant of Closely Coiled Spring.
8. To perform shear test on different metals.
9. To perform fatigue test on mild steel bar.
10. To perform the bending test on wooden beam and find its Flexural Rigidity.

Text Book:

Sr.No	Title	Publication
1.	Strenght of Materials by S.P. TimoShenko	Mc. Graw Hill
2	Mechanics of Materials by Ferdinand P. Beer, E. Russell John StonJr	Mc. Graw Hill

Refrence :

Sr.No	Title	Publication
1	**Strength of materials by Singer**	**Haper and Row**

BECVE 303 TENVIRONMENTAL ENGINEERING – I

Objectives:

1. To prepare students to apply basic knowledge of environmental engineering in conventional civil engineering practice involving water supply engineering in particular.
2. The course will provide students knowledge regarding the sources, of water demands, population forecasting, and conveyance of water.
3. To prepare students to analyze, plan, and design of various phases of water supply systems.
4. To provide the students the knowledge regarding the various characteristics of water, estimation of the quantity of water.
5. The course will provide students with fundamentals of solid waste management

Outcomes:

a. The students would be able to understand the importance and necessity of water supply.
b. The students would be able to determine the capacity of water supply scheme.
c. The students would have the basic knowledge related to the conveyance systems and the appurtenances used.
d. The students would have knowledge of characteristics of water, drinking water standards and necessity of treatment.
e. The students would be able to design various units of conventional water treatment plant.
f. The students would be equipped with the basic knowledge related to design of water supply system.
g. The students should be able to understand of necessity of treatment, types of treatment processes and disposal methods for solid waste.

Syllabus :

Unit – I

Introduction: Importance and necessity of water supply scheme.

Water Demand: All types of water demand, empirical formulae, factors affecting per capita demand, variation in demand, design period, population forecasting methods and examples.

Sources of water: Rain water, Ground water-springs, infiltration galleries, Dug wells, tube wells, Surface water-stream, lake, river, impounding reservoirs, ponds & sea.

Intake structures: Location, types river, lake, canal, reservoir etc.

Unit – II

Conveyance of water: Types of pipes, joints, fittings, valves & appurtenances.

Hydraulic design aspects: Friction, Manning's, DarcyWeishbach& Hazen Williams equationand problem.

Rising main and pumps: Concept of rising main, Classification, working, merits and demerits, selection of pumps.

Unit – III

Water quality: Physical, Chemical and bacteriological characteristics of water, Health effects of various water characteristics, Standards of drinking water. (WHO 2011, CPHEOO, IS 10500). Water born diseases

Water treatment: Objective of treatment, unit operations and processes, house hold & community based rural water treatment, decentralized water treatment, flow sheet of conventional water treatment plant.

Aeration: Purpose, types of aerators, design of cascade aerator.

Coagulation and Flocculation: Definition, Principles, types of coagulants and reactions, coagulant doses, types of mixing and flocculation devices.

Unit – IV

Sedimentation: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank.

Clariflocculators: Principles and operation.

Filtration: Mechanism of filtration, types of filters-RSF, SSF, Pressure filters, elements of filters sand specification, operational problems in filtration, Design of SSF and RSF, Membrane filtration technique of water treatment.

Unit – V

Disinfection: Purpose, Mechanism, criteria for good disinfectant, various disinfectants, their characteristics, disinfection by chlorination using different forms of chlorine. Types of chlorination.

Distribution systems: Requirements of a good distribution system, methods of distribution systems and layouts, Leakage and leak detector, Study of fire hydrants.

Storage reservoirs for treated water: Types, capacity of reservoir, mass curve.

Unit – VI

Municipal solid waste management : Generation sources, composition, Methods of Collection, transportation, disposal, Recycle, Reuse.

Examples on simple hydraulic design of pipes, estimation of population and water quality, plain sedimentation tanks, cascade aerators, filters, pumps, dose of chlorine). Visit to Water treatment plant (compulsory).

BECVE 303 PPRACTICAL ENVIRONMENTAL ENGINEERING – I

Any TEN (Total)

I. Any Seven

1. Determination of pH
2. Determination of Conductivity
3. Determination Chlorides
4. Determination of Solid's (Suspended & dissolved)
5. Determination of Turbidity
6. Determination of Acidity
7. Determination of Dissolved Oxygen
8. Determination of Membrane filtration technique.
9. Determination of Available Chlorine
10. Determination of Residual Chlorine
11. Jar Test
12. Bacteriological Plate count and MPN tests.
13. Determination of Alkalinity.

II. Only demonstration of COD, BOD.
III. Design of WTP using software.
IV. Brief Report on WTP Visit.

Text book

Sr. No.	Title	Publication
1.	**Water supply & Sanitary Engineering by B.C. Punmia**	**Laxmi Publication**
2.	**Water supply and Sanitory Engineering by Birdie G.S.**	**DhanpatRai Publication**
3.	Environmental Engg. I by P. N. Modi,	Std. Publication
4.	Environmental Engg.(Water supply Engg)by S.K.Garg	Khanna Publication

Refrence book

Sr. No.	Title	Publication
1	CPHEOO manual, New Delh, Ministry of Urban Development	G.O.I.
2	Water supply and sewage by M.J.Mcghee	Mc. Graw Hill
3	Environmental Pollution Control Engg. By C.S.Rao	Mc. Graw Hill

B.E. III SEM (CIVIL ENGINEERING)
SUBJECT: ENGINEERING GEOLOGY

UNIT-I: General Geology

Definition and scope of Geology, Internal structure of the earth.Introduction to continental drift and plate tectonics.Volcanoes type and their products.Principles of stratigraphy, Geological Time Scale, Physiographic and tectonic divisions of India.Introduction to Indian stratigraphy. (4)

Geomorphology: Weathering and erosion, Geological action of Wind, River and Ground water and resulting land forms. Geomorphic forms and their consideration in civil engineering works. (3)

UNIT-II:Mineralogy:

Definition and classification of minerals, Physical properties of Minerals, introduction to common rock-forming minerals (3)

Petrology: Rock cycle, **Igneous rocks:** Formation of Igneous rocks, textures and structures, forms and tabular classification of Igneous rocks. Common Igneous rocks and their uses. **Sedimentary rocks:** formation of sedimentary rocks, classification of sedimentary rocks. Common Sedimentary rocks and their uses.**Metamorphic rocks:**Definitions, agents of metamorphism, types of metamorphism, zones of metamorphism, Common Metamorphic rocks and their uses. (6)

UNIT-III: Structural Geology:

Introduction, outcrops, dip and strike of beds. Problems on dip, strike, thickness and three bore hole problems. **Folds**: parts of fold, classification, effects on outcrops, their identification in field, Importance of folds in civil engineering projects .**Joints**: definition, nomenclature and classification, Importance of joints in civil engineering projects. **Faults**: terminology, classification, mechanics of faulting, recognition of faults in the field, Importance of faults in civil engineering projects. **Unconformity**: Formation of unconformity, Types of unconformity. (10)

UNIT-VI: Earthquake Engineering:

Introduction, Terminology, Earthquake waves, Causes and effects, Intensity, MMI and MSK intensity scale and magnitude, magnitude scales, Liquefaction, location of epicenter, Tsunami, Seismograph and seismogram, Classification of earthquake, Earthquake zones of India, Aseismic structures.(3)

Landslides and Subsidence: Introduction, Terminology, Causes of landslides, classification of landslides, stable and unstable slopes, Control of landslides, causes of land subsidence, subsidence hazard mitigation.(3)

UNIT-V: Geohydrology:

Introduction, Hydrologic cycle, Origin of groundwater, Occurrence and distribution of ground water, water table and water table contour maps, Aquifer, Aquitard, Aquiclud and aquifuges, confined and unconfined aquifers, perched aquifer, Artesian and flowing wells, Importance of groundwater studies in Civil Engineering works. (3)

Site Investigations: Surface and sub-surface investigation: Geological mapping, Drilling, Bore hole logs, geophysical methods: Electrical Resistivity and Seismic methods. (3)

UNIT-VI: Application of geology to civil engineering works:

Engineering properties of rocks. Engineering classification of rocks based on compressive strength. RQD, Rocks as a construction material: Building stone, Road metal, Railway ballast. (3)

Dams: Parts and terminology, Classification of dams, geological problems at dam site, dam location on different rocks and their stability, Reservoirs study,(2)

Tunnels: Terminology, soft ground tunneling, rock tunneling and their stability. (2)

Text Books

1. Geology for Engineers: FGH Blyth
2. Engineering and General Geology: Parbin Singh
3. Engineering Geology: B.S. SathyaNarayanswami
4. Principles of Engineering Geology: K.M. Bangar
5. Basic Geotechnical Earthquake Engineering: Kamalesh Kumar
6. Rock Mechanics for Engineers: B.P. Verma

Laboratory Work

1. Megascopic study of common rock-forming Minerals.
2. Megascopic study of common Rocks.
   a) Igneous Rocks
   b) Sedimentary Rocks
   c) Metamorphic Rocks
3. Geological Maps: Drawing of geological cross sections with civil engineering projects.
4. Field visit to civil engineering construction sites with reference to geological studies.

BECVE 305T CONCRETE TECHNOLOGY

Objectives:

1. To prepare the students to understand constituents of concrete and their effect on quality of concrete.
2. The course will prepare students to apply basic rules for manufacture of plastic concrete and its mechanization.
3. To prepare students to apply various methods for testing of plastic and hard concrete.
4. To prepare students to analyse behavior of concrete structure under different environmental conditions.
5. The course will prepare students to analyse and design various basic concrete building components.

Outcomes:

a. The students would be able to check and recommend different constituent of concrete.
b. The students would be able to control method of manufacture of concrete.
c. The students would be able to test strength and quality of plastic and set concrete.
d. The students would have the understanding of application admixture and its effect on properties of concrete.
e. The students would be able to understand the effect of process of manufacturing on different properties of concrete.
f. The students would be able to understand various environmental factors which affect durability of concrete, analyse cause of deterioration of concrete components and to suggest various preventive measures to it.
g. The students would be able to test various strength of concrete by destructive and nondestructive testing methods.

Syllabus:

Unit – I Cement

Chemistry of Cement, Main constituents of cement Hydration of cement, Water required, Physical properties and testing of cement, Soundness test. Hardening and compressive strength Grades and different types of cements. Ordinary Portland cement, Rapid Hardening Cement, B.B. Blast furnace slag cement, Low heat Portland cement, Portland pozzolones cement, Portland flyash cement, Sulphate resisting cement. Field test,

Aggregates : Sources of aggregates, classification and nomenclature. Coarse and fine aggregate, normal weight (light and heavy weight aggregates). Aggregate characteristics and their significance in strength, workability, placement and compartion of concrete.Sampling. Particle shape and texture, Bond of aggregate, size & grading of aggregate strength of aggregates Mechanical properties and test-Specific gravity, Bulk density, porosity absorption of aggregates, moisture content of aggregate, bulking of sand abrasion test, impact value. Sieve analysisDeleterious substances in aggregates, organic impurities class and other fine material etc.

Water : Quality of water for concrete mixing, suitability.

Unit – II

Fresh concrete : Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing. Workability Measurement – Slump cont test, compacting factor test, flow table, Vee-Bee consistometer, Factor affecting workability, setting time. W/C Law Significance of w/c ratio cohesiveness.Segregation, bleeding,

voids, permeability.Hot weather concreting.Underwater concreting, Conveyance of concrete, Placing of concrete.Compaction-vibrators. Curing of concrete Significance, methods of curing, Temperature effect on

during& strength gain. IS code on curing.Maturity of concrete.

Unit - III

Strength of concrete-

Gain of strength, Wet ratio, Factor affecting compressive strength w/c ratio. Type of cement, air entrainment, aggregates, mixing water, Admixtures, curing conditions. Tensile and flexural strength.Relation between cracking in compression.Impact strength fatigue strength. Shear strength, Bond between concrete & reinforcement. Modulus of elasticity, Poison's ratio.

Testing of Hardnessof Concrete: Compression test-cube strength & cylinder strength their relation, effect of aspect ratio on strength. Flexural strength of concrete, Determination of tensile strength.Indirect tension test.Splitting test.Abrasion resistance.Accelerated curing test.

Unit – IV

Mix Design – Process, Statistical relation between mean & characteristic strength, Variance, Standard deviation. Factor affection mix properties. Grading of aggregate, aggregate/ cement ration etc. Degree of quality control. Design mix by Road note no. 4 (BS). IS:10262:2009.

Additives and Admixtures: Types of admixtures, Natural products-DietomaceousearthBy products-Pozzolones. Fly ash, silica fume, rice husk ash, , G.G. blast furnace slag. Admixturers-air encraining, water reducing, acceletors, retarders, plasticizers & Super plasticizers, permeability reducing,surface harderners.Corrosion inhibitors & water proofing agents.

Unit – V

Special concrete : Self compacting concrete, High performance concrete, fiber reinforced & polymer concrete, Ferro cement, Shortcrete pumped concrete, Free flow concrete.

Shrinkage-Early volume changes, drying shrinkage, mechanism of shrinkage.Factor affecting shrinkage. Influence of curing & storage conditions. Differential shrinkage.Carbonation shrinkage.Creep-Factors influencing.Relation between creep & time, nature of creep, effect of creep.

Unit – VI

Durability of concrete-significance water as an agent of deterioration. Permeability of concrete, Efflorescence.
Distress in concrete structures and its causes, cuses of deterioration of concrete.
Cracks in concrete: Causes, types, prevention, repairs of craqcks – materials and methods
Non Destructive tests.

BECVE 305 PLIST OF EXPERIMENTS

1.To determine the Normal consistency of cement .
2. To determine initial and final setting times of cement.
3. To determine soundness of cement.
4.To determine compressive strength and tensile strength of cement.
5. To determine particle shape , texture and elongation/ flakiness index of aggregate .
6.Sieve analysis and particle size distribution of aggregate.
7. To determine crushing value test, Impact value and Abrasion value of given aggregate.
8. To determine Bulk Density, Specific Gravity, Absorption & Moisture Content of Aggregate.
9. To determine Bulking and Percentage silt in sand.
10. To determine Workability - Slump test, Compaction factor of concrete.
11. Concrete mix design Road note 4 method, I.S. Method and ACI Method.
12. To determine Compressive strength of concrete cube.
13 To determine the quality of concrete by using Rebound hammer/ Ultrasonic Pulse Velocity Instrument.

Text Book

Sr.No	Title	Publication
1	Concrete Technology by GambhirMc. Graw Hill	
2	Concrete Technology by A.M. Neville	Pearson Education

RefrenceSr.No	Title	Publication
1	Properties of Concrete by A.M. Neville	Pearson Education

BECVE 306 THYDROLOGY AND WATER RESOURCES

Objectives:

1. To provide the students with the fundamentals of hydrology and hydrological cycle in water resource engineering.
2. To provide the students with the knowledge of interrelationship between various hydrological parameters and its effect on the design and analysis of hydrological structures.
3. To impart knowledge to the students to understand the importance of surface water and ground water resource management.
4. To provide the students knowledge of the processes and the methods of the determination of yield of a given basin.

Outcomes:

a. The students would demonstrate the capability to establish correlation between the various hydrological parameters.
b. The students would have the knowledge of measurements of various parameters and its importance in water resource management.
c. The students would be able to understand the hydrograph theory in the analysis of runoff and determination of design discharge for various hydrological projects.
d. The students would be able to exhibit the various statistical methods used in hydrological analysis.
e. The students would have the knowledge of importance of groundwater recharging and its methodology.

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Syllabus:

Unit – I

1. Introduction: definition, and its importance, development of hydrology and allied science, hydrological cycle, hydrological equation and brief description of its components, , importance of temperature, humidity and wind in hydrological study.
2. Precipitation: Definition ~~anticipation,~~ artificial rains, types of precipitation- orthographic, conventional and cyclonic, factors affecting precipitation~~.~~
   Measure of precipitation: automatic and non-automatic rain gauges, selection of site, adequacy of rain gauge stations, optimal number of rain gauge, radar measurement of rainfall, mass curve, missing records, intensity duration frequently and depth area duration curves.

Unit - II

3. Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement
4. Evaporation and transpiration: definition, mechanism and factors affecting evaporation, evaporation estimations by pan, water budget, energy budget and empirical formula, control of evaporation. Evapotranspiration and its measurement. Interception and its measurement.

Unit - III

5. Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area-velocity method.
6. Hydrographics: Definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph theory, S-curve and its use, instantaneous Unit Hydrograph.

Unit - IV

7. Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, , Analysis of time series, frequency analysis.
8. Floods: causes and effects, factors affecting peak flows and estimation of peak flows, basin flood, flood routing and flood forecasting

Unit - V

9. Geohydrology: Introduction, occurrence and distribution of ground water, -, aquifer, aquiclude, aquitard and aquifuge., electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test (Numericals).

Unit - VI

10. Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, spreading method, induced recharge method, recharge well method, sub-surface dams, waste water recharge, recharge by urban storm runoff, recharge through rain water harvesting.
11. Recent trends in Hydrology: Software use in Hydrology such as HYMOS, MIKE-II, HECRAS, HYDROCAD and SWAT

Assignments:

1. Based on Watershed Management.
2. Based on Soft Computing for statistical Data Analysis.
3. Visit to Hydrological station.

Text Book

Sr.No	Title	Publication
1	Hydrology & Water Resources Engg by ReddyLaxmi Pub.	
1	Hydrology by SubramanyamMc. Graw Hill	

RefrenceSr.No	Title	Publication
1	Hydrology & Water Resources Engg by S.K.GargKhanna Pub.	
2	Text book of Hydrology by P. Jaya Rami ReddyLaxmi Pub.	

BECVE 401 T STRUCTURAL ANALYSIS – I

Objectives:

1 To make students understand the determinate and indeterminate structures, their method of analysis And construction of influence lines.

2 To make students understand the behavior of beams and frame using, Column Analogy Method, strain energy method, slope deflection method etc.

Outcomes:

a. The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, frames, trusses and columns under various loading conditions using different analysis methods.
b. The student would be able to apply knowledge to determine forces in determinate and indeterminate structures by the force and matrix method.
c. The students would be able to perform ILD analysis of determinate beams and trusses.

Syllabus:

Unit – I

Introduction of Statically indeterminate Structures : Concept of Static indeterminacy,
Analysis of fixed and continues beams by theorem of three moments, effects of sinking of support.

Unit – II

Rolling loads on simply supports beams with concentrated and uniformly distributed loads, maximum B.M. and S.F. Influence lines for reactions, bending moments and shear forces in simply supported beam, cantilevers and beams with overhangs. Influence lines for forces in members of simple trusses and for BM and SF in panels of simple trusses.

Unit – III

Strain energy method as applied to the analysis of redundant frames and redundant truss up to two Degrees, Determination of deflection of trusses. Castiglinos theorems. Maxwells reciprocal theorem. Bettis theorem.

Unit – IV

Bucking of columns and beams. Eulers and Rankines formula.
Analysis of Two-Hinged arches. Three Hinged Arch, S.F. and normal thrust, parabolic arches.

Unit – V

Slope defection method as applied to indeterminate beams & continues beams portal frames. Frame with inclined legs upto 3 degree of freedom.
Approximate method: Analysis of multi-stored frame, portal,cantilever and substitude frame methods.(max. three bay three storey).

Unit – VI

Introduction to flexibility method upto two DOF, Column Anology Method.

BECVE 401 P PRACTICALS: STRUCTURAL ANALYSIS – I

Minimum TEN of the following :

1. To find the slope and deflection of continuous beam.
2. To find the value of Flexural rigidity (EI) for a given beams and compare with theoretical value.
3. To determine the moment required to produce a given rotation at one end of a beam when the other end is i) Pinned ii) Fixed
4. To study the behavior of different types of struts and to calculate the Eulers Buckling load for each case.
5. To verify the Maxwell's reciprocal theorem for beam.
6. To measure the strain in the cantilever beam with the help of acoustic strain gauge.
7. Study of various types of strain gauges.
8. Plotting of influence lines by making use of Muller-Breslau principle.
9. Determination of deflection of trusses by Willot-Mohrs diagram.
10. Determination of material fringe value.
11. Determination of stress in beam by photoelastic method.
12. To find horizontal thrust and to draw the influence line for horizontal thrust for two hinge arch.
13. To calculate horizontal deflection at roller end in two hinged arch.
14. To measure the strain in the cantilever beam with the help of electrical resistance strain gauge.
15. To determine horizontal thrust for indeterminate portal frame
16. Study of Poloriscope

Text Book

Sr.No	Title	Publication
1.	**Theory of Structure by S P Timoshenko**	Mc. Graw Hill
2.	Intermediate Structural Analysis by C K Wang	Mc. Graw Hill
3.	Plain and Reinforced concrete Structures, Vol.-II by Jain, Jai Krishna	Laxmi Publication
4.	Theory of Elasticity by S P Timoshenko	Mc. Graw Hill
5.	Experimental Stress Analysis by Rally & Dally	Mc. Graw Hill

Refrence

Sr.No	Title	Publication
1	Structural Analysis by C.S.Reddy	Mc. Graw Hill
2	Structural Analysis by R.C. Hibbler	Pearson Education

BECVE 402 T GEOTECHNICAL ENGINEERING-I

Objectives:

1. To impart knowledge about origin and classification of soils.
2. To impart knowledge about index properties and their determination.
3. To impart knowledge about engineering properties and their determination.
4. To impart knowledge about stress distribution in soil mass.

Outcomes:

a. Students would be able to determine the index and engineering properties of the soil.
b. Students would be able to determine the suitability of foundation for a particular type of soil.
c. Students will be able to classify the soils.
d. Students would be able to evaluate the stresses in the soil mass.

Syllabus :

Unit I

1. Introduction : Formation of soil, residual & transported soil, major deposits found in India, soils generally used in practice such as sand, gravel, organic soil, clay, Betonies, , black cotton soil etc. Introduction to clay mineralogy.
2. Phases of soil: Various soil weight & volume inter-relationship. Density index, methods of determining in situ density.

Unit II

Index Properties & Their Determination, Water content, specific gravity, sieve analysis, particle size distribution curve, sedimentation analysis, Differential and free swell value, Consistency of soil, Atterberge's limits . Classification of Soil : Particle size classification, Textual classification, Unified & I.S. classification system, field identification of Expansive soil, Swelling pressure.

Unit III

3. Permeability: Darcy's law & its validity, Discharge & seepage velocity, factors affecting permeability, Determination of coefficients of permeability by Laboratory and field methods, permeability of stratified soil.
4. Seepage : Seepage pressure, quick sand condition, characteristics & uses of flownets, Preliminary problems of discharge estimation in homogeneous soils, Effective, Neutral and total stresses in soil mass.

Unit IV

5. Stress Distribution : Stress distribution in soil Mass, Boussinesque equation, point load and uniformly distributed load over rectangular & circular areas, Use of Newmarks charts.

Unit V

6. Consolidation : Compression of laterally confined soil, Terzaghis 1-D consolidation theory (formation of Differential equation), Determination of coefficient of consolidation, Degree of consolidation. Determination of preconsolidation pressure, Settlement, Rate of settlement.
7. Compaction : Mechanism of compaction, factors affecting compaction, standard & modified proctor Tests, field compaction equipments, quality control, Advance compaction Techniques, Nuclear density meter.

Unit VI

8. Shear Strength : Introduction, Mohr Coulombs theory, Drainage condition, Measurement of shear strength by direct shear test, triaxial test, unconfined compression test, vane shear test, sensitivity.

BECVE 402 P PRACTICAL: GEOTECHNICAL ENGINEERING - I

These shall comprise ~~of~~ ten experiments and terms work to be presented in the form of journal for assessment of sessional and practical examination.

A. List of Experiments : Any 10

1. Moisture content and Specific gravity of soil.
2. Grain size Analysis – (Sieve Analysis).
3. Consistency limit, plastic limit and liquid limit of soil.
4. Hydrometer Analysis.
5. Constant Head Permeability test ~~of~~ or Falling Head Permeability test.
6. Consistency limit of soil (shrinkage limit).
7. Field Density by sand replacement method.
8. Field Density by core cutter method.
9. Unconfined compression test.
10. Direct shear Test.
11. Triaxial shear test (Demonstration).
12. Proctors compaction Test and Proctor needle test.

B. One field visit or one case study included in journal.

C. Use of plasticity Chart or Newmarks Chart.

Text book

Sr. No.	Title	Publication
1	Soil Mechanics & Foundation Engg. by K.R. Arora	Std. Publisher
2	Soil Mechanics & Foundation Engg.by B.C.Punmia	Laxmi Publication
3	Basic & Applied Soil Mechanics by Gopal Rajan & Rao	Newage international Pub.
4	Geotechnical Engg.by P. Raj	Dorling Kindersley Pvt. Ltd
5	Geotechnical Earthquake Engg. by Steven L. Kramer	Prentice Hall

Refrence book

Sr. No.	Title	Publication
1	Soil Mechanics & Foundation Engg by Modi	Std. Publisher
2	Soil Mechanics & Foundation Engg by V.N.S.Murthy	CBS Publisher

BECVE 403 T TRANSPORTATION ENGINEERING – I

Objectives:

1. To educate the students on the various components of Highway Engineering and Bridge engineering.
2. To expose the students to highway planning, engineering surveys for highway alignment, Design of Geometric Elements of Highways and Urban roads, Flexible and Rigid pavements design, Traffic Engineering, traffic safety analysis, transportation planning and Highway material testing.
3. To make them understand desirable properties and testing procedures of highway materials as per BIS standard and Indian Roads Construction (IRC) for various practices adopted for construction.
6. To educate students on the various components of Pavements.
7. It exposes the student to learn types of pavements, components and functions of pavements, types of highway vehicles and aircrafts, IRC loadings, equivalent axle loading and load factors, Flexible and Rigid design methods, etc.

Outcomes:

a. A person with broad vision and complete knowledge of design and construction practices in highway engineering and pavement.
b. The student will be able to test highway materials and draw appropriate conclusion.
c The student will be able to maintain and propose measurement.
d. The student will be able to undertake Traffic studies.

Syllabus:

Unit -I

Highway Development & Planning: Principles of Highway planning, Road development in India Classification of roads, network patterns, Planning, Surveys.
Highway Alignment: Requiremnts, Engineering Surveys.
Highway Materials: Properties of sub grade and pavement component materials, Tests on sub grade soils, aggregates and bituminous materials. Application of Geosynthetics.

Unit - II:

Highway Geometric Design: Cross Section elements, carriageways, camber, stopping & overtaking sight distances Horizontal alignment- Curves, design of super elevation, widening, transition curves, vertical curves.

Unit- III

Pavement Design: Types of pavements & characteristic, Design parameters, Axle & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & IRC method of flexible pavement design. Analysis of load & temperature stresses of rigid pavement, joints

Highway Construction & Maintenance: Earthen/Gravel road, Water Bound Macadam, Wet Mix macadam, Bituminous pavement, Cement Concrete pavement. Pavement failures, Pavement evaluation, Maintenance and strengthening measures.

Unit-IV

Traffic Engineering: Traffic characteristics (Road User, Driver and Vehicular characteristics)
Traffic Studies (Volume studies, speed studies, parking studies and accident studies.)
Traffic Safety (Causes and types of accidents, Use of intelligent transportation system)

Unit- V

Bridge Engineering: Classification, identification and site selection.
Flood discharge, waterways, scour depth, economic span.
IRC classification of Loads, Forces, Stresses: IRC Specification & code of practices, Critical combinations.

Unit-VI

Sub-Structure: Types of foundations & their choice, Open, Pile and well foundation, pneumatic Caissons, cofferdams. Abutment, Piers & Wing walls, Their types general design principles (empirical.)

Super Structure: Different structural forms
Rating and Maintenance: Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention, Aesthetics.

PRACTICAL : BECVE 403 P TRANSPORTATION ENGINEERING - I

Every student must carry minimum of 10 (Ten) experiments from the following:

1. Sub grade Soil: CBR test
2. Sub grade Soil: AASHO Classification
3. Aggregates: crushing value test.
4. Aggregates: Los Angeles abrasion value test.
5. Aggregates: impact test.
6. Aggregates: shape test.(Elongation Index, Flakiness index and Soundness test)
7. Aggregates: Specific Gravity and Water absorption test.
8. Bitumen: Penetration Value.
9. Bitumen: Ductility Test.
10. Bitumen: Softening point test.
11. Bitumen: Flash and Fire point test.
12. Bitumen: Specific gravity.
13. Bitumen: Adhesion Test.
14. Short Field Visit

Text book

Sr. No.	Title	Publication
1.	Highway Engineering: Khanna and Justo.	Nem Chand
2.	Bridge Engineering by S. P. Bindra.	**Dhanpat Rai Publication**
3.	Bridge Engineering by S. C. Rangwala.	Charotar Publishing House Pvt. Limited
4.	Principles and practices of Highway Engineering by S. K. Sharma	Khanna Publication

Refrence book

Sr. No.	Title	Publication
1	. Pavement Design: Yoder and Witzak	Wiley
2	Traffic Engineering: L.R.Kadiyali	Khanna Publishers

BECVE 404 T SURVEYING – I

Objectives:

1. To make the students aware of various surveying instruments, operating principles and their suitability.
2. To make the students understand various calculation methods used for converting field data to required format for plotting.
3. To develop skills of handling instruments and plotting various maps.
4. To prepare the students read the various maps.

Outcomes:

a. The students would be able to do temporary and permanent adjustments.
b. The students would be able to measure distances and angles.
c. The students would be able to orient and draw the various maps.
d. The students would be able to calculate areas and volumes of the Civil Engg. work.
e. The student would be able to undertake various civil engineering surveys work.

Syllabus:

UNIT - I: Chain and Compass Traversing

a) Classification, Principle of Survey, tape survey, cross staff survey, construction, use and testing of optical square, line ranger.

b) Compass Traversing: Prismatic and Surveyor's Compass, true and magnetic bearing, local attraction, and magnetic dip, inclination, compass traversing adjustment of traverse.

UNIT - II: Leveling and Contouring

a) LEVELLING: different types of Levels, Study of Dumpy Level, temporary adjustment, principle of levelling, reduction of levels, classification of levelling, Profile Levelling, Longitudinal Section And Cross Sections, Reciprocal Levelling, Corrections for Curvature and Refraction, distance to the visible horizon.

UNIT – III: Adjustment of Dumpy Level & Trignometrical Levelling

a) Adjustment of auto level: principle axes of auto level, relationship, testing and adjustment of bubble axis and line of collimation.

b) Trignometrical Levelling: Indirect levelling, elevation of point with base of an object accessible inaccessible in the same vertical plane.

c) Contours : Defination, characteristics, uses, methods of locating contours.

UNIT – IV: THEODOLITE TRAVERSING :

a)Theodolite : Introduction, Type of Theodolite ; Modern Theodolite Temporary adjustment, Principle Axes and relationship , permanent adjustment, Measurement of Horizontal & vertical angles, Magnetic Bearings, prolonging a line, lining in.

b) Traverse Computation: Consecutive and independent coordinates, adjustment of closed traverse, Gales traverse table, area calculation by coordinates.

UNIT- V: Plane Table Surveying & Computation of Area & Volume

a) Plane Table Surveying: Equipments, Advantages and Disadvantages, Orientation, methods of plane tabling, two point and three point problems in plane tabling. Telescopic Alidade.

b) Computation of area and volume: Trapezoidal and Simpsons Rule. Digital planimeter, construction and use.

UNIT- VI: Hydrographic Surveying, Underground Surveying and Surveying Equipments.
a) Hydrographic Surveying: Shore Line Survey, River Survey, Soundings, equipments, methods of locating soundings, three point problems.
b) Underground Surveying: Correlation of underground and surface survey, transferring the levels underground.
c) Surveying Equipments: Optical Theodolite, EDM, GPS.

BECVE 404 P PRACTICAL: SURVEYING – I

(Minimum 15 practical should be performed out of the following:
1. Demonstration of metric chain.
2.Measurement of distance by ranging and tape.
3. Locating various objects by tape & cross staff survey.
4. Determination of area of given polygon by tape and cross staff survey.
5. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angles.
6. Locating given building by tape and compass traversing (One full size drawing sheet)
7.Determination of elevation of various points with dumpy level by collimation plane method and rise & fall Method.
8. Fixing bench mark with respect to temporary bench mark with ~~A~~uto level by fly levelling and check levelling.
9. L- Section and cross section of road (0ne full size drawing sheet each for L-section and cross section)
10.Measurement of horizontal angles using Theodolite by method of repetition-
11.Measurement of vertical angles with Theodolite.
12. Determination of horizontal distance between two inaccessible points with Theodolite.
13. Locating given building by Theodolite traversing (One full size drawing sheet)
14. Locating given building by plane table traversing (One full size drawing sheet
15. Determination of elevation of point by trigonometric levelling.
16. To draw Contour map of given area (0ne full size drawing sheet)
17. Determination of area of a irregular figure by using Planimeter
18. Study of Optical Theodolite, EDM, GPS.
19.To give site Layout for given plan of building.

Text Book

Sr.No	Title	Publication
1	Surveying and Levelling by Kanetkar and Kulkarni (Vol.I)	Pune Vidhati grihan Prakashan
2	Surveying and Levelling by Dr. B.C. Punmia (Vol. I & II)	Laxmi Pub.

Refrence

Sr.No	Title	Publication
1	Advance Surveying - Total Station, GIS and Remote Sensing by Satheesh Gopi & R.Sathikumar & N. Madhu	Pearson Education

BECVE 405 T BUILDING CONSTRUCTION & MATERIAL

Objectives:

1. To prepare the students to understand components of buildings and their functions.
2. To prepare students to understand execution of various constructions activities and material.
3. To prepare students to analyse behaviour of structure under different environmental conditions.
4. To prepare students to identify & suggest rectification the various defects in civil engineering works.

Outcomes:

a. The students are able to identify components of a building.
b. The students are able to differentiate and identify types of building materials.
c. The students are able to select appropriate material for building construction.
d. The students are able to plan various construction related activities and their quality control.

Syllabus :

Unit-I :

Foundations: Necessity and types of R.C.C. foundations, Detail of Deep foundation and precast foundation in general, Details shallow foundations. Bearing capacity of soils and its assessment. Preumptive bearing capacity values from codes. Loads on foundations. Causes of failures of foundations and remedial measures, Foundation on black cotton soils Setting out foundation trenches, excavation timbering of foundation trenches. Load bearing and framed structures.

Unit-II

Brickwork :Qualities of good bricks, classification of bricks tests on bricks as per as codes.
Terms used in brickwork, commonly used types of bonds in brickwork such as header, stretcher, English and Flemish bonds, principles of construction. Reinforced brickwork, brick knogging.
Parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls.
Masonry construction using cement concrete blocks and clay walls, load bearing and partition walls.
Masonry construction using cement concrete blocks and clay blocks.
Precest construction : Introduction to method and materials. Precast elements likes poles, cover, jallies, steps corbets, truss element etc.

Unit-III:

Stone Work : Stones, cutting and dressing, selection of stones types of stone masonary, principles of construction joints in masonary. Lifting heavy stones, common building stones in India.
Arches and Lintels : Terminology in contraction, types chajjas and canopies, pre cast Lintels & Arches.
Damp Proofing : Causes and effect of dampness. Various methods of damp proofing
Damp proofing in plinth protection, New Techniques of Damp Proofing Damp Proofing in Plinth Protection, New Techniques of Damp proofing. Epoxy etc.

Unit-IV

Floors and Roofs : Floors : General principals, types and method of construction, floors finished quality, ~~testing floor tiles,~~ synthetic & Ceramic Tiles.
Roofs : Flat and pitches roofs, roof coverings, types AND their constructional features. Thermal Insulation

Unit-V :

Stairs : Types of stairs, functional design of stairs.
Doors and Windows : Purpose materials of construction and types.

Unit-VI :

Plastering and Pointing : Necessity, types and methods
Temporary Timbering : Centering and formwork shoring, underpining and scaffolding.
Painting : White washing, colour washing and distempering new materials & Techniques.

Text book

Sr. No.	Title	Publication
1	Building Construction by Rangwala	Charotar Pub. House

BECVE 406 P COMPUTER APPLICATIONS IN CIVIL ENGINEERING

(underline means newly added content while strikeout words means deleted)

Objectives:

1. To prepare student to understand basic computational technique and concept of developing flow chart and algorithm for engineering problems.
2. To make the students understand the techniques of handling huge practical data.
3. To prepare students to gain knowledge and necessary skills required to work as a team member or team leader in the development of large computer and software systems covering a broad range of engineering and scientific applications.
4. To prepare student to do advanced studies in computer applications.

Outcomes:

a. The student would be able to analyze, identify and define computing requirement for engineering problems.
b. The student would be able to develop and execute computer program for solving mathematical and engineering problems.
c. The student would be able to deal with various types of solution errors occurred during cyclic computations.
d. The student would be able to develop tool for solving various engineering problems
e. The student would be able to work as an effective team member or team leader to accomplish common goal.
The students would be able to debug the program for common errors.

PRACTICAL: COMPUTER APPLICATIONS IN CIVIL ENGINEERING

Minimum sixteen computer program development, minimum one from each of the following field using ~~FORTRAN 95/~~ C language. At least four programs in C language. It is recommended to have at least four programs based on numerical methods and two assignments in application software's such as spreadsheets, database management programs, etc.

1. Engineering mechanics
2. Strength of material
3. Transportation engineering
4. Geotechnical engineering
5. Hydraulic engineering
6. Irrigation and water resources engineering
7. Surveying
8. Estimating and costing
9. Structural analysis
10. Structural design
11. Environmental engineering
12. Matrix algebra, solution techniques
13. Numerical integration
14. Table generation from IS: 456
15. Earthquake force calculation

Text Book

Sr.No	Title	Publication
1	The complete reference C by Schildt	Mc. Graw Hill
2	Programming with C by Balagurusamy	Mc. Graw Hill

Refrence

Sr.No	Title	Publication
1	Programming with C by Ramkumar	Mc. Graw Hill
2	Programming with C by Gottfried	Mc. Graw Hill