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".

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
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4

Evaluation Scheme: (80/20)
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; preloading 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

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), reports, Incident reports, Investigative Maintenance manual for buildings

Lab reports, Feasibility reports / Recommendation reports, Technical Proposals, The Summary,

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
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4

Evaluation Scheme: (80/20)
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)

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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
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4

Evaluation Scheme: (80/20)
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