

**DR. A.P.J ABDUL KALAM TECHNICAL
UNIVERSITY, LUCKNOW**



**EVALUATION SCHEME & SYLLABUS
FOR
B. TECH. THIRD YEAR
(CIVIL ENGINEERING)**

(Effective from session 2020-21)

FIFTH SEMESTER

CIVIL ENGINEERING

SESSION 2020-21

S.No	Subject Code	Subject	Periods			Evaluation Scheme				End Semester		Total	Credi
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KCE 501	Geotechnical Engineering	3	1	0	30	20	50		100		150	4
2	KCE 502	Structural Analysis	3	1	0	30	20	50		100		150	4
3	KCE 503	Quantity Estimation and Construction Management	3	1	0	30	20	50		100		150	4
4		Departmental Elective-I	3	0	0	30	20	50		100		150	3
	KCE 051	Concrete Technology											
	KCE 052	Modern Construction Materials											
	KCE 053	Open Channel Flow											
	KCE 054	Engineering Geology											
5		Departmental Elective-II	3	0	0	30	20	50		100		150	3
	KCE-055	Engineering Hydrology											
	KCE-056	Sensor and Instrumentation Technologies for Civil Engineering Applications											
	KCE-057	Air and Noise Pollution Control											
	KCE-058	GIS and Advance Remote Sensing											
6	KCE-551	CAD Lab	0	0	2				25		25	50	1
7	KCE-552	Geotechnical Engineering Lab	0	0	2				25		25	50	1
8	KCE-553	Quantity Estimation and Management Lab	0	0	2				25		25	50	1
9	KCE-554	Mini Project or Internship Assessment*	0	0	2				50			50	1
10		Constitution of India/Essence of Indian Traditional Knowledge	2	0	0								
11		MOOCs (Essential for Hons. Degree)											
		Total	17	3	8							950	22

* The Mini Project or Internship (4 weeks) conducted during semester break after IV semester and will be assessed during V semester.

NOTE:

1. Regular classroom interaction with industry experts is to be ensured in all theory courses (minimum two expert talks from relevant Industry).
2. Working on experiments using virtual labs is to be ensured in lab courses.
3. Student's visit to Industry/Industry Expert's project site must be arranged as & when possible.

SIXTH SEMESTER**CIVIL ENGINEERING****SESSION 2020-21**

S.No	Subject Code	Subject	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KCE 601	Design of Concrete Structures	3	1	0	30	20	50		100		150	4
2	KCE 602	Transportation Engineering	3	1	0	30	20	50		100		150	4
3	KCE 603	Environmental Engineering	3	1	0	30	20	50		100		150	4
4		Departmental Elective-III	3	0	0	30	20	50		100		150	3
	KCE 061	Advance Structural Analysis											
	KCE 062	River Engineering											
	KCE 063	Repair and Rehabilitation of Structures											
	KCE 064	Foundation Engineering											
5		Open Elective-I	3	0	0	30	20	50		100		150	3
6	KCE 651	Transportation Engineering Lab	0	0	2				25		25	50	1
7	KCE 652	Environmental Engineering Lab	0	0	2				25		25	50	1
8	KCE 653	Structural Detailing Lab	0	0	2				25		25	50	1
9	NC*	Essence of Indian Traditional Knowledge/Constitution of India	2	0	0	15	10	25		50			
10		MOOCs (Essential for Hons. Degree)											
		Total	17	3	6							900	21

NOTE:

1. Regular classroom interaction with industry experts is to be ensured in all theory courses (minimum two expert talks from relevant Industry).
2. Working on experiments using virtual labs is to be ensured in lab courses.
3. Student's visit to Industry/Industry Expert's project site must be arranged as & when possible.

Course Outcomes: After completion of the course student will be able to:

CO-1 Classify the soil and determine its Index properties.

CO-2 Evaluate permeability and seepage properties of soil.

CO-3 Interpret the compaction and consolidation characteristics & effective stress concept of soil.

CO-4 Determine the vertical and shear stress under different loading conditions and explain the phenomenon of soil liquefaction.

CO-5 Interpret the earth pressure and related slope failures.

Unit 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, sensitivity and thixotropy, Particle size analysis, Unified and Indian standard soil classification system. [8]

Unit 2

Soil Hydraulics: Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, capillarity, critical hydraulic gradient and quick sand condition, uplift pressure, piping. [8]

Unit 3

Soil compaction, water content - dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

Consolidation: Primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation. [8]

Unit 4

Stress Distribution in soil: Elastic constants of soils and their determination, Boussinesq equation for vertical stress, The Westergaard equation, Stress distribution under loaded areas, Concept of pressure bulb, contact pressure.

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; pore pressure, Skempton's pore pressure coefficients, and Soil liquefaction. [8]

Unit 5

Earth pressure: Classical theories, Coulomb and Rankine's approaches for frictional and $c-\phi$ soils, inclined backfill, Graphical methods of earth pressure determination.

Stability of slopes - finite and infinite slopes, types of slope failure, Culmann's method & Method of slices, Stability number & chart, Bishop's method. [8]

Text & References Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, “Soil Mechanics & Foundation Engineering”, John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.
4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics
10. P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.
11. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
12. Gulati, S.K., “Geotechnical Engineering” McGraw Hill Education (India), Pvt. Ltd., Noida.

KCE502 STRUCTURAL ANALYSIS

(L-T-P 3-1-0) Credit – 4

Course Outcomes:

After completion of the course student will be able to:

- CO-1 Explain type of structures and method for their analysis.
 CO-2 Analyze different types of trusses for member forces.
 CO-3 Compute slope and deflection in determinate structures using different methods.
 CO-4 Apply the concept of influence lines and moving loads to compute bending moment and shear force at different sections.
 CO-5 Analyze determinate arches for different loading conditions.

Unit 1

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Effect of Temperature upon length of cable. **[8]**

Unit 2

Classification of Pin jointed determinate trusses, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses. **[8]**

Unit 3

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's theorems, Calculations of deflections: Strain Energy Method and unit load method for statically determinate beams, frames and trusses. Deflection of determinate beams by Conjugate beam method. **[8]**

Unit 4

Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principal & its applications for determinate structures. **[8]**

Unit 5

Arches, Types of Arches, Analysis of three hinged parabolic and circular Arches. Linear arch, Eddy's theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch. **[8]**

References

1. Hibbler, "Structural Analysis", Pearson Education
2. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
3. Ghali, "Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
4. T S Thandavmorthy, "Analysis of Structures", Oxford University Press
5. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
5. Temoshenko & Young "Theory of Structure" Tata Mc Grew Hill.
6. Reddy, CS, "Basic Structural Analysis", Tata McGraw Hill.
7. Jain, OP and Jain, BK, "Theory & Analysis of Structures ". Vol.I & II Nem Chand.
8. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers

9. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
10. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
11. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
12. S Ramamurtham "Theory of Structure" Dhanpat Rai.
13. Devdas Menon "Advanced Structural Analysis" Narosa
14. Wang, CK, "Intermediate Structural Analysis", Tata Mc-Graw Hill.
15. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
16. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis Group.
17. Bibek Kumar Mukherjee, "Theory and Analysis of Structures" Satya Prakashan, New Delhi.
18. Jacques Heyman, "Structural Analysis" Cambridge University Press.

KCE 503 QUANTITY ESTIMATION AND CONSTRUCTION MANAGEMENT

(L-T-P 3-1-0) Credit – 4

Course Outcomes:

After completion of the course student will be able to:

CO-1 Understand the importance of units of measurement and preliminary estimate for administrative approval of projects.

CO-2 Understand the contracts and tender documents in construction projects.

CO-3 Analyze and assess the quantity of materials required for civil engineering works as per specifications.

CO 4 Evaluate and estimate the cost of expenditure and prepare a detailed rate analysis report.

CO-5 Analyze and choose cost effective approach for civil engineering projects.

Unit 1

Quantity Estimation for Buildings Measurement units for various building materials, Centreline method, Long and short wall method of estimates, Types of estimates, PWD schedule of rate. [8]

Unit 2

Rate Analysis, Specification and Tenders Analysis of rates knowing cost of material, labour, equipment, overheads, profit, taxes etc, Specifications – Preparation of detailed and general specifications, Legal aspects of contracts, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items. [8]

Unit 3

Elements of Management & Network Techniques Project cycle, Organization, planning, scheduling, monitoring, updating and management system in construction, Bar charts, milestone charts, work break down structure and preparation of networks. Network Techniques like PERT & CPM in construction management. Project monitoring and resource allocation through network techniques. [8]

Unit 4

Equipment Management Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipment for earth moving, earth compaction, Hauling Equipment, Hoisting Equipment, Conveying Equipment, Concrete Production Equipment, Tunnelling Equipment [8]

Unit 5

Project Cost Management Budgeting, Cost planning, Direct Cost, Indirect cost, Total Cost Curve, Cost Slope. Time value of money, Present economy studies, Equivalence concept,

financing of projects, economic comparison, present worth method Equivalent annual cost method, discounted cash flow method, Depreciation and its type, depletion, Arbitration, and break even cost analysis. [8]

References:

- 1.Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2003
- 2.Srinath, L.S., “PERT and CPM Principals and applications” Affiliated East-West Press Pvt. Ltd., New Delhi.
- 3.Patil, B.S., “Civil Engineering Contracts and Estimates” University Press India, Pvt. Ltd. Hyderabad –500 004
- 4.Construction Management by Ojha
- 5.Srivastava, U.K., “Construction Planning and Management”, Galgotia Publications Pvt. Ltd., New Delhi.
- 6.Construction Technology by Sarkar, Oxford
- 7.Delhi Schedule of Rates (latest version)

KCE-551 CAD LAB**(L-T-P 0-0-2) Credit- 1**

1. Working on latest version of geotechnical engineering software (Open source/commercial software)
2. Working on latest version of surveying software (Open source/commercial software)

NOTE:-

For open source software the following link of FOSSEE may be used apart from other available resources:

<https://fossee.in>

FOSSEE: (Free/Libre and Open Source Software for Education), National mission on education through ICT, MHRD, Govt. of India.

KCE-552 GEOTECHNICAL ENGINEERING LAB**(L-T-P 0-0-2) Credit- 1****PART -A (To be performed in lab)**

1. Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Determination of shear strength of soil by Direct shear test.
8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remoulded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remoulded soil sample by an odometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Triaxial Compression Machine.
12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

Note: Any 8 experiments are to be performed from the list of experiments.

PART B

It is mandatory to perform experiments using virtual lab where ever applicable.

References:

1. Bowles, Joseph E., “Engineering Properties of Soil and Their Measurement” Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.

KCE - 553: QUANTITY ESTIMATION AND MANAGEMENT LAB

(L-T-P 0-0-2) Credit- 1

1. Study of DSR, CPWD specifications and NBC.
2. Estimation of quantities for any one of the following: Building/ Septic tank/Water supply pipe line/road/bridge.
3. Preparation of Bill of Quantities (BOQ) for above project.
4. Practice on open source project management software / MS Project/Primavera software for same problem.
5. Study of any full set of tender documents (Institute shall provide the set from ongoing/ completed tenders).

NOTE:-

1. Suitable software must be used to complete above exercises in 8-10 hours.
2. For open source software the following link of FOSSEE may be used apart from other available resources:

<https://fossee.in>

References:

1. FOSSEE: (Free/Libre and Open Source Software for Education), National mission on education through ICT, MHRD, Govt. of India
2. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2003
3. Srinath, L.S., “PERT and CPM Principals and applications” Affiliated East-West Press Pvt. Ltd., New Delhi.
4. Patil, B.S., “Civil Engineering Contracts and Estimates” University Press India, Pvt. Ltd. Hyderabad –500 004
5. Construction Management by Ojha
6. Srivastava, U.K., “Construction Planning and Management”, Galgotia Publications Pvt. Ltd., New Delhi.
7. Construction Technology by Sarkar, Oxford

8. S V Deodhar and SC Sharma, "Construction engineering and Management", Khanna Publishing House.
9. Delhi Schedule of Rates (latest version)

KCE 051 CONCRETE TECHNOLOGY

(L-T-P 3-0-0) Credit – 3

Course Outcomes:

After completion of the course student will be able to:

- CO-1 Understand the properties of constituent material of concrete.
CO-2 Apply admixtures to enhance the properties of concrete.
CO-3 Evaluate the strength and durability parameters of concrete.
CO-4 Design the concrete mix for various strengths using difference methods.
CO-5 Use advanced concrete types in construction industry.

Unit 1

Cement : types and cement chemistry. Aggregates: mineralogy, properties, test and standards.
Quality of water for use in concrete. **[8]**

Unit 2

Introduction & study of accelerators, retarders, water reducers, air entrainers, water proofers, super plasticizers. Study of supplementary cementing materials like fly ash, silica fume , ground granulated blast furnace slag, metakaoline and pozzolana; their production, properties and effect on concrete properties . **[8]**

Unit 3

Concert production: batching, mixing and transportation of concrete. Workability test: slump test, compacting factor test and Vee Bee test. Segregation, bleeding and Laitance in concrete, curing of concrete and its methods. Determination of compressive and flexural strength as per BIS. Mechanical properties of concrete: elastic modules, poisson's ratio, creep, shrinkage and durability of concrete. **[8]**

Unit 4

Principle of mix proportioning, properties related to mix design, Mix design method (IS method and ACI method). Mix design of concrete, Rheology, mix design examples **[8]**

Unit 5

Study and uses of high strength concrete, self-compacting concrete, fibre reinforced concrete, ferro cement, ready Mix Concrete, recycled aggregate concrete and status in India. **[8]**

References

1. Neville, A.M. and Brooks, J.J., " CONCRETE TECHNOLOGY", ELBS .1990.
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
3. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.
4. Santhakumar, A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007.
5. Gupta B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
6. Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS".EDT BY L. Holliday. Elsevier Publishing Company. 1966.
7. Popovics. S., "FUNDAMENTALS OF PORTLAND CEMENT CONCRETE: A Quantitative Approach VOL 1 FRESH CONCRETE" JOHN WILEY & SONS.1982.
8. P.K. Mehta and Paulo J.M. Monteiro, "Concrete: microstructure, properties and materials", The Mc GrawHill Companies.
9. Jayant D. Bapat (2013), Mineral admixtures in cement and concrete, Taylor and Francis group.
10. Concrete mix proportioning as per IS 10262:2009 – Comparison with IS 10262:1982 and ACI 211.1-91 M.C. Nataraja and Lelin Das
11. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
12. IS456-2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi, 2000.

KCE 052 MODERN CONSTRUCTION MATERIALS

(L-T-P 3-0-0) Credit – 3

Course Outcomes:

After completion of the course student will be able to:

- CO-1 Understand the use of modern construction materials.
- CO-2 Use geosynthetics and bituminous materials in constructions.
- CO-3 Apply knowledge of modern materials in production of variety of concrete.
- CO-4 Apply knowledge of composites and chemicals in production of modern concrete.
- CO-5 Use modern water proofing and insulating materials in constructions.

Unit 1

Introduction, properties and uses of modern building materials: fly ash bricks, soil – cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC) , glass reinforced gypsum. **[8]**

Unit 2

Introduction , properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals ,paints ,tiles ,bricks, glass),metals, light - weight concrete, mass concrete, waste material based concrete. **[8]**

Unit 3

Introduction , properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, Nuclear concrete, heat resisting & refractory concretes, prefabricated systems. **[8]**

Unit 4

Introduction , properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), sulphur concrete and sulphur - infiltrated concrete. **[8]**

Unit 5

Introduction , properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials(thermal, sound and electrical insulating materials).Concept of polymer floor finishes. **[8]**

Reference Book:

- 1) GhambhirM.L."Concrete Technology" Tata McGraw Hill education private Limited.

- 2) A.R. Santhakumar, Concrete Technology, Oxford University Press.
- 3) Building Materials, P.C. Varghese, Prentice-Hall India.
- 4) Shetty, M. S., "Concrete Technology" S. Chand Publication.
- 5) Krishnaraju .N., Advanced Concrete Technology, CBS Published.
- 6) Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
- 7) Neville. A.M., Concrete Technology, Prentice Hall, Newyork.
- 8) Dr. U. K. Shrivastava, Building Materials Technology, Galgotia Publication pvt.ltd.
- 9) Materials Science and Engineering, V. Raghavan, Prentice Hall.
- 10) Properties of Engineering Materials, R.A. Higgins, Industrial Press.
- 11) Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press.
- 12) The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess,R.J. Gray & A. Bentur, Prentice Hall.
- 13) Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann.
- 14) The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin.
- 15) Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill.
- 16) S K Sharma, "Civil Engineering and construction material," Khanna Publishing House.
- 17) Properties of concrete, A.M. Neville, Pearson.

Course Outcomes:**After completion of the course student will be able to:**

CO-1 Apply knowledge of fluid flow for designing of channel sections.

CO-2 Analyze the gradually varied flow in channel section.

\CO-3 Analyze the rapidly varied flow in channel sections.

CO-4 Apply numerical methods for profile computation in channels.

CO-5 Design channels for sub critical and super critical flows.

Unit 1

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections [8]

Unit 2

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. [8]

Unit 3

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, [8]

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free over fall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge, [8]

Unit 4

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, low over side-weir and Bottom-rack. [8]

Unit 5

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert.

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International

3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International
7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

Course Outcomes:**After completion of the course student will be able to:**

CO-1 Understand the scope of geological studies.

CO-2 Understand the rocks and its engineering properties.

CO-3 Understand the minerals and constituents of rocks.

CO-4 Understand the rock deformations, their causes effects and preventive measures.

CO-5 Understand the ground water reserves, Geophysical exploration methods and site selection for mega projects.

Unit 1

Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work- GSI, Granite Dimension Stone Cell, NIRM. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, SEM, XRD., Rock forming minerals, mega scopic identification of common primary & secondary minerals. [8]

Unit 2

Study of Rocks: Introduction and importance of Geological knowledge. Rocks: their origin, structure and texture. Classification of igneous, sedimentary and metamorphic rocks and their suitability as engineering materials, Weathering and erosion of rocks, Stratification, Lamination bedding. Outcrop-its relation to topography. Dip and Strike of bed. Overlap, outlier and Inlier. Building stones and their engineering properties. [8]

Unit3

Study of Minerals: Physical properties of minerals. Detailed study of certain rock forming minerals. Alkaliaggregate reaction. Grouting. Pozzolonic materials. [8]

Unit4

Rock Deformation & Earthquake Folds, Faults, Joints and unconformities: Their classification, causes and relation to engineering behavior of rock masses. Landslides, its causes and preventive measures. Earthquake, its causes, classification, seismic zones of India and its geological consideration. [8]

Unit5

Geophysical Exploration and Geological Investigation: Geophysical exploration methods for sub-surface structure. Underground water and its origin. Aquifer & Aquiclude. Artesian wells. Underground provinces and its role as geological hazard. Site selection for dam, reservoir, tunnel, bridge and highway. [8]

References:

1. D Venkat Reddy: Engg. Geology, Vikas Publication
2. Tony Waltham: Foundations of Engg. Geology, Spon Press
3. Tony Waltham: Foundations of Engineering Geology, SPON Press.
4. D Venkat Reddy: Engineering Geology, Vikas Publishing House Pvt. Ltd.
5. J M Treteth: Geology of Engineers, Princeton, Von. Nostrand.
6. K V G K Gokhale: Text book of Engineering Geology, B S Publication.
7. Prabin Singh: Engg. and General Geology, Katson Publishing House.
8. D S Arora: Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
9. F G Bell: Fundamental of Engineering Geology, B S Publication.
10. Leggot R F: Geology and Engineering, McGraw Hill, New York.
11. P K Mukerjee: A Text book of Geology, Calcuta Word Publishers.
12. B S Sathya Narayanswami: Engineering Geology, Dhanpat Rai & Co.
13. Prakash Rao : Engineering Geology, Nirali Prakashan, Pune.