Construction Engineering & Management

General Course Information:

Course Code: PCC-CVE402-T Course Credits: **3** Mode: Lecture (L) Type: PCC Contact Hours: 3 hours (L) Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks- class performance measured through percentage of lecture attended (4 marks)- assignments and quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination- nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Course outcomes

S. No.	**Course outcomes** At the end of the course students will be able to:	RBT* Level
CO1	Do basic planning for a construction project.	L2 (Understanding)
CO2	Draw networks and solve using CPM and PERT	L3 (Applying)
CO3	Analyze resource allocation for a project.	L4 (Analyzing)
CO4	Evaluate project monitoring and control.	L5 (Evaluating)
CO5	Perform quality assurance and control.	L6 (Creating)

*Revised Bloom's Taxonomy

Unit-I

Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution;

Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.

Unit-II

Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks.

PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

Unit-III

Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities

Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing;

Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction

Unit-IV

Project Monitoring & Control-Supervision, record keeping, periodic progress reports, and periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modeling (BIM) in project management;

Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

Text/Reference Books:

1. Varghese, P.C., "*Building Construction"*, Prentice Hall India, 2007.
2. *National Building Code*, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, PearsonEducationIndia, 2015
7. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, LaxmiPublications,2016.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	2	2	1	1	1
CO2	3	2	1	1	-	-	-	-	-	-	2	2	1	1	1
CO3	2	3	1	1	2	-	-	-	-	-	2	2	-	1	1
CO4	2	3	2	2	2	-	-	-	-	-	2	2	3	2	1
CO5	2	2	3	3	2	-	-	-	-	-	3	2	2	3	3

Design of Concrete Structures-II
Sem VIII

General Course Information

Course Code: PEC-CVE456-T Course Credits: 3 Mode: Lecture (L) Type: PE-IV Contact Hours: 3 hours (L) Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments and quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

S. No.	**Course outcomes** At the end of the course students will be able to:	RBT* Level
CO1	Explain design of special concrete structures like continuous/ curved beams, stair-cases, water tanks, domes, retaining walls and bridges.	L2(Understanding)
CO2	Employ the concepts of structural engineering for the construction of special structures.	L3(Applying)
CO3	Examine the structural aspects of special structures.	L4 (Analyzing)
CO4	Evaluate the structural condition of special structures	L5 (Evaluating)
CO5	Design special concrete structures like continuous/ curved beams, stair-cases, water tanks, domes, retaining walls and bridges.	L6 (Creating)

*****Revised Blooms Taxonomy

UNIT I

Continuous Beams: Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear, redistribution of moments for single and multi-span beams, design examples.

Stair- Cases: Type of stair-cases, Effective span of stairs, Distribution of loads on different types of stair cases, Design examples.

UNIT II

Water Tanks: Estimation of Wind and earthquake forces, design requirements, rectangular and cylindrical underground,Intze tanks, design considerations, design examples.

UNIT III

Design of curved beams in plan: Analysis and Design of curved beams fixed at both ends, ring beams

Design of Domes: Meridional and hoop stress in spherical and conical domes.

UNIT IV

Retaining walls: Design of cantilever and counter fort type retaining walls.

Introduction to Bridge Engineering: Definition, components of a bridge, classifications, importance of bridges. Need for investigations, selection of bridge site, I.R.C. loadings.

Text Books

1. Reinforced Concrete Structures, P. C. Varghese, Tata McGraw Hill
2. Advanced Reinforced Concrete Structures, P. C. Varghese, Tata McGraw Hill
3. Reinforced Concrete Design, M.L. Gambhir, Macmillan India Ltd., New Delhi
4. Limit State Design of Reinforced Concrete, A.K. Jain, Nem Chand and Bros., Roorkee
5. Behaviour, Analysis and Design of R.C.C. Structural Elements, I.C. Syal and Ummat, A.H. Wheelers, New Delhi
6. Elements of Bridge Engineering, D. Johnson Victor, Oxford and IBH Publishers, New Delhi.
7. Plain and Reinforced concrete, Vol. 2, O P Jain and J. Krishna, Nem Chand and Bros., Roorkee
8. Reinforced Concrete Design, S U Pillai and D Menon, Tata McGraw Hill

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	-	-	-	-	-	1	1	1	2	2
CO2	2	2	2	2	1	-	-	-	-	-	1	1	1	2	2
CO3	2	2	2	2	1	-	-	-	-	-	1	1	1	2	2
CO4	2	2	3	3	1	-	-	-	-	-	1	1	2	3	3
CO5	2	2	3	3	1	-	-	-	-	-	1	1	2	3	3

Groundwater Engineering
Sem VIII

General Course Information:

Course Code: PEC-CVE461-T Course Credits: **3** Mode: Lecture (L) Type: PE-V Contact Hours: 3 hours (L) Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks- class performance measured through percentage of lecture attended (4 marks)- assignments and quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination- nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Course outcomes

S. No.	**Course outcomes** At the end of the course students will be able to:	RBT* Level
CO1	Define the discharge in well for different aquifers.	L1(Remembering)
CO2	Learn the principles and dynamics of groundwater flow.	L2 (Understanding)
CO3	Use various methods for ground water exploration	L3 (Applying)
CO4	Examine the reasons of groundwater depletion and fluctuations	L4 (Analyzing)
CO5	Appraise the principles of well hydraulics and methods of well construction.	L5 (Evaluating)

*Revised Bloom's Taxonomy

Course Contents

UNIT I

Principles of Ground water flow: Definition and occurrence of ground water flow- Role of ground water in a hydrologic cycle- Mechanical energy and fluid potential- Hydraulic head- Darcy's law- Heterogeneity and anisotropy- Range and validity of Darcy's law- Types of aquifer and its properties- Compressibility- Specific storage- Storativity- Ground water flow equation- Solution of flow equation- Analytical solutions- Steady flow in a confined and unconfined aquifer- Graphical solutions- Flow lines and Equipotential lines- Flow net- Refraction of flow lines.

UNIT II

Well Hydraulics: Introduction- Drawdown due to abstraction from well- Steady and unsteady abstraction from well- Well interference- Pumping test analysis- Infiltration wells and gallery.

Well Construction: Method of construction of shallow and deep well- well log- well completion- horizontal well

UNIT III

Groundwater Conservation: Regional groundwater budget- Resource assessment- Estimation of recharge- artificial recharge.

Groundwater quality: Indian and international standards- Pollution of groundwater sources- Advection and dispersion- sorption and diffusive mass transfer- remedial and preventive measures.

UNIT IV

Exploration: Geophysical- Electric resistivity method- Seismic refraction method- Saline water intrusion in aquifers- Groundwater levels fluctuation.

REFERENCE BOOKS:

1. Raghunath H M- Groundwater- New Age International(2007).
2. David Keith Todd- Groundwater Hydrology- Wiley India Edition(2007).
3. Franklin W. Schwartz and Hubao Zhang- Fundamentals of Groundwater- John Wiley(2003).
4. Bear- J. Hydraulics of Groundwater- McGraw-Hill(1979).
5. Freeze- R.A. and Chery- J.A- Groundwater. Prentice Hall-Inc- Englewood Cliffs- New Jersey(1979)

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	1	2	1	1	2
CO2	2	2	1	2	1	-	-	-	-	-	1	2	1	2	2
CO3	2	2	1	2	2	-	-	-	-	-	1	2	2	2	2
CO4	2	2	1	1	1	-	-	-	-	-	1	2	2	2	2
CO5	2	2	3	2	2	-	-	-	-	-	2	2	2	3	3

Hydrology And Water Resources

Sem -VIII

General Course Information

Course Code: PCC-CVE404-T Course Credits: **3** Mode: Lecture (L) Type: PCC Contact Hours: 3 hours Examination Duration: 03 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments and quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Course outcomes

S. No.	**Course outcomes** At the end of the course students will be able to:	RBT* Level
CO1	State and outline the concepts of Irrigation Engineering	L1 (Remembering)
CO2	Understand the basics of groundwater and hydraulics of subsurface flows.	L2 (Understanding)
CO3	Illustrate abstractions from precipitation	L3 (Applying)
CO4	Analyze the water requirement of crops, capacities of Distributaries and Canal.	L4 (Analyzing)
CO5	Plan and design Irrigation System (Canal network, irrigation structures, diversion head works, spillways and energy dissipations works etc.)	L6 (Creating)

*Revised Bloom's Taxonomy

Course Content

Unit I

HYDROLOGY: Hydrologic cycle, Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation, selection of rain gauge station. Hyetograph and mass curve of rainfall, Evaporation: Definition, factors affecting, measurement, evaporation control. Evapo-transpiration, Infiltration.

Definition, components of hydrographs, unit hydrograph, base flow separation, Prepositions of unit hydrograph-problems.

Types of Aquifers – Darcy's Law – Dupuit's Assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation Test – Transmissibility – Specific Capacity – Pumping Test – Steady Flow Analysis Only.

Unit II

Soil-water relationship and irrigation methods: Soil-water relationship, root zone soil water, infiltration, consumptive use, field capacity, wilting point, available moisture in soil, Gross Command Area, Culturable

Command Area, intensity of irrigation, delta, base period, Kor depth, core period, frequency of irrigation, duty of water, relation between delta, duty and base period, irrigation requirement, **Methods of Irrigation-**flooding methods, border strip method, check basin and furrow method, assessment of irrigation water, sprinkler irrigation system.

Canal irrigation:Component of canal distribution system, alignment of channels, losses in irrigation channels, design discharge, silt theories and design of alluvial channels, comparison of Kennedy's and Lacey's theories, canal section and design procedure, Garrets and Lacey's diagrams.

Unit III

Cross Drainage Works: Classification and their selection, Hydraulic Design Aspects of Aqueducts, Syphon Aqueducts, Super Passage, Canal Syphon and Level Crossing, Design of Canal Transitions.

Diversion Canal Headworks: Various components and their functions, layout plan, selection of site for diversion headworks, Causes of failure of weir/barrages on permeable foundation, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections..

Unit IV

Regulation works: Canal falls-necessity and location, development of falls, design of cistern element, roughening devices.Design of Sarda type fall.Design of straight Glacis fall. Off-take alignment, Cross-Regulator and DistributoryHeadRegulators, devices to control silt entry into the off-taking channel and Silt Ejector, Canal Escapes.**Dams:** Design principles for gravity and earthen dams

Reference Books

1. Irrigation, Water Resources and Water Power Engg. byP.N.Modi.
2. Fundamentals on Irrigation Engg. by Bharat Singh
3. Irrigation Engg& Hydraulic Structures by S.K.Garg.
4. Irrigation Engg. byS.K.Sharma.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	2	2	1	1	1
CO2	3	2	1	1	-	-	-	-	-	-	2	2	1	1	1
CO3	2	3	1	1	2	-	-	-	-	-	2	2	-	1	1
CO4	2	3	2	2	2	-	-	-	-	-	2	2	3	2	1
CO5	2	2	3	3	2	-	-	-	-	-	3	2	2	3	3