

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR
SCHOOL OF TECHNOLOGY
COURSE STRUCTURE FOR B TECH IN CIVIL ENGINEERING

Semester VII			B TECH IN CIVIL ENGINEERING										
Sr No	Course code	Course name	Teaching Scheme					Examination Scheme					Total marks
			L	T	P	C	Hrs/wk	Theory			Practical		
								MS	ES	IA	LW	LE/Viva	
1.	CE 401T	Construction Equipments and Methods	3	--	--	6	3	30	60	10	--	--	100
	CE-401P		--	--	2	1	2	--	--	--	25	25	50
2.	CE 402T	Estimation and Cost Analysis	2	2	--	6	4	30	60	10	--	--	100
3.	CE 403T	Earthquake Engineering	3	1	--	7	4	30	60	10	--	--	100
4.	CE 404P	Seminar	--	--	4	2	4	--	--	--	25	25	50
5.	CE 405T	Department Elective-I*	3	--	--	6	3	30	60	10	--	--	100
6.	CE 406T	Department Elective-II*	3	--	--	6	3	30	60	10	--	--	100
7.	CE408P	Industrial Training	--	--	--	6	--	--	--	--	50	50	100
		Total	14	3	6	40	23						700

MS- Mid semester; ES- End semester; IA-Internal assessment; LW-Laboratory work; LE-Laboratory exam

CE405T Department Elective-I*

1. GIS and Remote Sensing
2. Traffic and Transportation Planning
3. Rock Mechanics
4. Advance Hydrology
5. Docks Harbour & Airport Engineering

CE406T Department Elective-II*

1. Advance Foundation Engineering
2. Pavement Analysis & Design
3. Operations Research Techniques in Civil Engineering
4. Energy Efficient Building Design
5. Water Power Engineering
6. Hydraulic Structures

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 401T Construction Equipments and Methods										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	--	--	100

UNIT I **10**

Construction Equipment Management : Identification – Planning - Equipment Management in Projects – Maintenance Management – Replacement – Unit Operating Cost - Cost Control of Equipment - Depreciation Analysis – Safety Management

UNIT II **9**

Equipment for Earthwork: Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Loaders, Hydraulic Excavators, Earth Movers, Soil compacting & stabilizing equipments.

UNIT III **8**

Equipment for production of Aggregate and Concreting : Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment – Transporters

UNIT IV **12**

Other Construction Equipments: Cranes (wheel mounted, crawler mounted, tower cranes), Trenching, Tunneling, Drilling, Blasting, Equipment for Dewatering and Grouting, Foundation and Pile Driving Equipment, Forklifts and related equipment , Portable Material Bins – Conveyors - Hauling Equipment.

APPROXIMATE TOTAL 39 Hours

References:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, 6th Edition, Tata McGraw-Hill, New Delhi, 2003
2. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.
3. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.
4. Dr.Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi. 1983

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 401P Construction Equipments and Methods										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
--	--	2	1	2	--	--	--	25	25	50

Lists of Experiments

1. Salient features and operating methodology of self-supported tower cranes (Height < 40 m)
2. Salient features and operating methodology of supported tower cranes(Height > 40 m)
3. Salient features and operating methodology of wheel mounted cranes with telescopic boom
4. Salient features and operating methodology of crawler mounted cranes
5. Salient features and operating methodology of tendon vibratory steel drum roller
6. Salient features and operating methodology of pneumatic tyred roller
7. Salient features and operating methodology of hydraulic excavators
8. Salient features and operating methodology of wheel loaders and bulldozers
9. Salient features and operating methodology of hydraulic boring rig
10. Salient features and operating methodology of concrete pumps and draglines
11. Salient features and operating methodology of clamshells and compressor

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 402T Estimation and Cost Analysis										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
2	2	--	6	4	30	60	10	--	--	100

UNIT I

07

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

UNIT II

06

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators, Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts.

UNIT III

08

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators

UNIT IV

05

METHODS OF MEASUREMENT: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismatic formula with and without cross slopes.

VALUATION- Definitions of various terms, method of valuation, Freehold & Leasehold properties, Sinking fund, depreciation and method of estimating depreciation, Outgoings.

APPROXIMATE TOTAL 26 Hours

References:

1. B. N. Dutta, Estimating & Costing, Chand Publisher
2. P.L. Basin S. Quantity Surveying, Chand : New Delhi.
3. S.C. Rangwala Estimating & Specification, Charotar publishing house, Anand.
4. G.S. Birde, Text book of Estimating & Costing- Dhanpath Rai and sons : New Delhi.
5. D.D. Kohli and R.C. Kohli ,A text book on Estimating, Costing and Accounts- S. Chand : New Delhi.
6. B. S. Patil, Contracts and Estimates, University Press, 2006.

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 403T Earthquake Engineering										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	7	4	30	60	10	--	--	100

UNIT I **10**

Introduction of Earthquake, Causes and seismic waves, Magnitude, Intensity and Energy release, Plate Tectonics, Characteristics of Earthquake, Types of Earthquakes, Basic Terminology, Attenuation of Earthquakes, Seismic Zoning practices in India, Seismic Codes

10

UNIT II

Measure of Earthquake Ground Motion, Characteristics of Ground Motion, Peak Ground Motion Parameters

UNIT III

Introduction of Structural Dynamics, Single degree of Freedom System, Equation of Motions, System Parameters, Damping, Introduction to multi-degree of freedom system.

10

UNIT IV

Concept of Response Spectra, Design Response Spectrum, Philosophy of Earthquake Resistance Design, Equivalent lateral load concept, Rigid floor diaphragm, Codal Provisions

09

APPROXIMATE TOTAL 26 Hours

References:

1. Earthquake: A Primer by B.A. Bolt
2. Elements of Earthquake Engineering by Jaikrishna and Chandra
3. Dynamics of Structures by A.K.Chopra
4. Structural Dynamics by Mario Paz
5. IS 456, IS 1893:2000, IS 4326, IS875, IS 13920

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 404P Seminar										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
--	--	4	5	4	--	--	--	25	25	50

Each student or a group of a student's is required to make a seminar presentation on any chosen topic connected with the field of specialization, preparation and presentation of a seminar is intended to investigate an in-depth review of literature, prepare a critical review and develop confidence to present the material by the student. The seminar shall be evaluated by a Department Committee constituted for this purpose, based on a report submitted by the candidate and a viva-voce conducted at the end of the semester.

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 405T Department Elective-I (GIS and Remote Sensing)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	-	-	100

UNIT I **12**

Geographical Information System

Introduction ,Basic GIS concepts, Representation of earth features, Map basics, Map projections, Raster and vector data models, representation of GIS, GIS data sources, Map and models, Methods of vector and raster inputs, Remote sensing inputs, Surveys and GPS inputs, Field surveys, Data storage and editing, Errors and corrections of errors.

UNIT II **10**

Spatial Analysis

Spatial analysis, Location and identifying spatial objects, Measurements, Surface mapping, Non topographical surfaces, Terrain analysis, Spatial arrangements, Map overlays, Cartographic modeling, Types of cartographic models, GIS design and applications.

UNIT III **08**

Remote Sensing

Basic principles of remote sensing, Electromagnetic energy and spectrum, Spectral characteristics, Laws of radiation, Interaction with atmosphere and surface, Data and image interpretation, Sensors and platforms, Visible and infrared sensors, IR and MW sensors, Resolutions, visual image analysis and processing, Supervised and unsupervised classifications.

UNIT IV **08**

Remote sensing types and applications

Urban sprawl, Water resources and environmental engineering, Thermal imaging, Global cycles and change detection. LIDAR remote sensing, Passive and active microwave remote sensing, Hyper spectral remote sensing, Improving the utilization of remote sensing data, Emerging issues.

APPROXIMATE TOTAL 38 Hours

References:

1. Principles of geographical information systems, by Peter A. Burrough, Rachel McDonnell
2. Introduction to geographical information systems, K.T. Chang
3. Remote sensing and image interpretation by Thomas M. Lillesand, Ralph W. Kiefer
4. Advances in land remote sensing system, Modelling, Inversion and application by Shunlin Liang
5. Geomatics by Barry F. Kavanagh
6. Fundamentals of GIS, M.N. Demers

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 405T Department Elective-I (Traffic &Transport Planning)*										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	--	--	100

UNIT I

09

Hierarchical levels of planning, passenger and goods transportation, general concept and process, Urban travel characteristics, private and public travel behavior analysis.

UNIT II

10

Travel demand estimation and forecasting, trip generation methods and there comparison, model split analysis, behavioral approach, two stage model splits models.

UNIT III

10

Trip distribution – Growth factor methods, gravity model, intervening opportunity and competing opportunity models, trip route assignment.

UNIT IV

10

Landuse and Transport: Lowry derivative models, Quick response techniques, Characteristics of urban structure, Town planning concepts.

Case studies of traffic engineering and transportation models

APPROXIMATE TOTAL 39 Hours

References:

1. Hutchinson B.G. , Principles of urban transport system planning. McGrawHill, New York.
2. Kadiyali L.R. , Traffic engineering and transport planning. Khanna Publishers New Delhi
3. Florian Michael. , Transportation planning models. Elsevier science Publishers, Netherlands.
4. Khanna SK and Justo STG , Highway engineering. Nemchand brothers, Roorkee.

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 405T Department Elective-I (Rock Mechanics)*										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	--	--	100

UNIT I **09**

Introduction, Rock materials, physical properties, shear strength behavior in uniaxial compression, tension and triaxial state, Laboratory testing methods, stress-strain relationships, Factors influencing strength

UNIT II **10**

Anisotropy, Failure Criteria, Coulomb, Mohr's, Griffiths and Modified Griffiths criteria and empirical criteria, Brittle and Ductile Transition, Post failure Behavior

UNIT III **10**

Strength and deformation behavior of discontinuities, Rockmass behavior, shear strength of jointed rockmass, roughness, peak and residual strengths, strength criteria for rock mass

UNIT IV **10**

Intact and rock mass classification, Terzaghi, RQD, RSR, RMR, Q classifications, Rating, Applications

APPROXIMATE TOTAL 39 Hours

References:

1. Introduction to Rock Mechanics by R.E.Goodman, John Wiley & Sons.
2. Engineering in Rocks for Slopes, Foundation and Tunnels, Editor T.Ramamurthy, Prentice Hall India Pvt. Ltd.
3. Fundamentals of Rock Mechanics, Fourth Edition, by Jaeger, Cook and Zimmerman, Blackwell Publishing.
4. Rock mechanics and the design of structures in rock, L. Obert and Wilbur I. Duvall, John Wiley & Sons, Inc.

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 405T Department Elective-I (Advance Hydrology)*										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	--	--	100

UNIT I **11**

Mechanism and Measurements of Precipitation and Evaporation : Hydrological processes - Reynolds's Transport Theorem, continuity equation, momentum equation, energy equation, discrete time continuity mechanism, Atmospheric water vapour, computation and measurement of precipitation, evaporation, evapotranspiration, abstraction from precipitation, spatial and temporal distribution of rainfall.

UNIT II **10**

Flow through Unsaturated Porous Media : Unsaturated flow models- Horton's equation, Philips equation and Green-Ampt model Computation of excess rainfall hyetograph from observed flood hydrograph, Green-Ampt infiltration equation and SCS-CN method

UNIT III **8**

Unit Hydrograph Theory : Unit hydrograph theory, derivation of instantaneous unit hydrograph and synthetic unit hydrograph, lumped and distributed flow routing

UNIT IV **10**

Hydrologic Statistics : Probabilistic treatment of hydrologic data, Statistical parameters, Frequency and probability function, Fitting a probability distribution, Probability distributions for a hydrologic variables, Frequency analysis, Reliability of analysis, case study: Storm Water Drainage Design, Flood plain analysis

APPROXIMATE TOTAL 39 Hours

References:

1. Chow V T, Maidment David R. and Mays Larry W. "Applied Hydrology", McGraw Hill International editions, New Delhi, 1988.
2. Mutreja K.N. "Applied Hydrology" Tata McGraw-Hill Publishing company Ltd., New Delhi, 1990.
3. Subramanya K, Engineering Hydrology, Third Edition - Tata McGraw-Hill Publishing company Ltd., New Delhi, 2012.
4. Singh Vijay. P, Elementary Hydrology Prentice Hall, INDIA, 1992.
5. Ojha C S P, Bhunya P and Berndtsson P, "Engineering Hydrology" Oxford University Press, Canada, 2008.

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 405T Department Elective-I (Docks, Harbor and Airport Engineering)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	-	-	100

UNIT I **10**

Elements of Harbor: Water Transportation, Harbors: artificial, natural and semi-natural, natural and artificial roadsteads, accessibility, size and shape of harbours, Harbours depth, Features of a harbor, Defects in harbours, Ports: Classification, design and requirements of a good port.

Break Water, Breakwaters, Alignments, Forces acting, Classification, classification and breakwaters, Breakwater height and failures, comparison of mound type and wall type breakwaters

UNIT II **10**

Docks: General, Open berths, Approaches to basins and docks, depth of docks and basins, Location and internal arrangement, design and construction of basin or dock walls, Dock entrances, Sizes of dock entrances, Wet docks, Dry docks

Berthing Structures: Jetties, Piers, Wharves, Quays and its construction
 Navigational Aids: Lighthouse, Buoys, anchors, moorings

UNIT III **10**

Terminal Area and Airport Layout: Terminal area, Vehicular circulations and parking area, apron, hangar, blast considerations

Airport Capacity and Configuration: Airport capacity, runway capacity, gate capacity, taxiway capacity

UNIT IV **09**

Design of Airport Elements: Runway design, runway intersection design, taxiway design
 Air Traffic Control, Visual aids at Airport

APPROXIMATE TOTAL 39 Hours

References:

1. Docks and Harbour Engineering by Oza and Oza
2. Airport Planning and Design by Khanna, Arora and Jain
3. Airport Systems and Planning by Richard De Neufville

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 406T Department Elective-II (Advance Foundation Engineering)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	-	-	100

UNIT I **07**

Shallow Foundation – Isolated Footing: Bearing capacity theories overview, Case Studies on Ultimate Bearing Capacity, Effect of Soil Compressibility, Ultimate Bearing Capacity under Eccentric Loading—One-Way Eccentricity and Two Way Eccentricity, Allowable Bearing Capacity and Settlement, Vertical Stress Increase in a Soil Mass Caused by Foundation Load, Elastic Settlement, Consolidation Settlement.

UNIT II **09**

Shallow Foundation – Combined Foundation: Introduction, Combined Footings, Bearing Capacity of a Continuous Foundation Subjected to Eccentric Inclined Loading, Common Types of Mat Foundations, Bearing Capacity of Mat Foundations, Differential Settlement of Mats, Field Settlement Observations for Mat Foundations, Compensated Foundation, Geotechnical Design of Mat Foundations, Rigid and Flexible design as per ACI and Winkler Models.

UNIT III **09**

Pile Foundation: Introduction, Types of Piles, Estimating Pile Length, Installation of Piles, Load Transfer Mechanism, Equations for Estimating Pile Capacity, Meyerhof’s Method for Estimating Q_p , Vesic’s Method for Estimating Q_p , Correlations for Calculating Q_p with SPT and CPT Results, Frictional Resistance (Q_s) in Sand, Frictional (Skin) Resistance in Clay, Pile Load Tests, Elastic Settlement of Piles, Pile-Driving Formulas, Pile Capacity For Vibration-Driven Piles, Negative Skin Friction, Group Piles, Group Efficiency, Ultimate Capacity of Group Piles in Saturated Clay, Elastic Settlement of Group Piles, Consolidation Settlement of Group Piles, Suitability and design of Under-reamed Pile.

UNIT IV **07**

Machine Foundation: Introduction, types of machine foundation, basic definition, degree of freedom of block foundation, General criteria for design of machine foundation, free vibration, forced vibration, vibration analysis of a machine foundation, Determination of natural frequency, Design criteria for foundations of reciprocating machine, Reinforcement and construction details, vibration isolation and control.

UNIT V **07**

Soil Liquefaction and Remedial Measures: Introduction, liquefaction related phenomena, Susceptibility, liquefaction potential, problematic ground conditions, dewatering and drainage systems, Liquefaction mitigation: Vibro techniques, dynamic compaction, blasting, compaction grouting and reinforcement techniques, drilled inclusions.

APPROXIMATE TOTAL 39 Hours

References:

1. Principles of Foundation Engineering – B. M. Das

2. Foundation Analysis and Design – Joseph E. Bowles
3. Soil Mechanics and Foundation Engineering – V. N. S. Murty
4. Basic and Applied Soil Mechanics – Gopal Ranjan
5. Soil Dynamics and Machine Foundation – Swami Saran
6. Geotechnical Earthquake Engineering – Steven L. Kramer

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 406T Department Elective-II (Pavement Analysis & Design)*										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	--	--	100

UNIT I

14

Planning & Forecasting Future Traffic Flows: Background, Planning Strategies, Transportation Studies, Decision Making Process in Highway & Transport Planning, Basic Principles of Traffic Demand Analysis, Demand Modelling, Landuse – Transport Interaction, Trip Generation (Regression Models), Trip Distribution Models, Mode Choice Analysis (Logit Models, BL, MNL), Traffic Assignment, Field problems on Travel Demand Modelling.

UNIT II

08

General Principles of Pavement Design: Desirable Characteristics of Pavement, Components of Pavement, Pavement types and Comparison, Factors Affecting Pavement Design, Types & Comparison of Vehicular Loading Pattern, Effect of Tyre Pressure and Total Load, Equivalent Wheel and Axle Loads, Climatic and Environmental Factors, Stress Distribution in Layered System, Environmental impact on pavements.

UNIT III

08

Design of Flexible Pavements: CBR Approach, IRC Method, U.S. Navy Method, Boussinesq's and Burmister's Analysis, AASHTO Method, Design of Shoulders, Case studies

UNIT IV

09

Design of Rigid Pavements: Wheel Load Stresses, Liquid and Elastic Soil Subgrade, Westergaard's Analysis, Bradbury's Approach, IRC Method, AASHTO Method, Continuous Reinforced Concrete Pavements, Design of Shoulders, Design of Joints, Dowel Bar and Tie Bars, Case studies.

APPROXIMATE TOTAL 39 Hours

References:

1. Huang Y H (2003) Pavement Analysis and Design, 2nd Edition, New Delhi, Pearson Education Publishers
2. Das A (2013) Analysis of Pavement Structures, CRC Press, Taylor & Francis Group, London
3. Highway Engineering - L R Kadiyali, Khanna Publishers, New Delhi

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 406T Department Elective-II (Water Power Engineering)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	-	-	100

UNIT I **09**

Water power utilization principles, power from flowing streams, demand for power, role of storage and pondage in water power development, firm power and secondary power.

UNIT II **10**

Types of water power developments: Run-off River, storage, pumped storage, tidal and others, characteristics and layout of low, medium and high head hydropower developments.

UNIT III **10**

Conveyance of water: Channels, Penstocks, flumes and tunnels. Surges in open channels and water hammer and surges in closed conduits following rapid load changes in the hydro-power plant. Forebays and surge tanks.

UNIT IV **10**

Water turbines: Selection of water turbines, scroll castings and draft tubes, Speed regulation and governing of turbines. Power house: Types of power house, substructure and superstructure. General arrangement and space requirements for standard power house facilities.

APPROXIMATE TOTAL 39 Hours

References:

4. W.P. Creager and J.D. Justin, 'Hydro-electric Hand Book', John Wiley.
5. M.M. Dandekar and K.N. Sharma, 'Water Power Engineering', Vikas Publishing House, New Delhi.
6. P.N. Modi, 'Irrigation, Water Resources and Water Power Engg.', Standard Book House, New Delhi.

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR										
SCHOOL OF TECHNOLOGY										
CE 406T Department Elective-II (Hydraulic Structures)*										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	6	3	30	60	10	--	--	100

UNIT I **09**

Design procedure for irrigation channels, Irrigation outlets

UNIT II **10**

Canal masonry works, - principles of design, use of flow net, Khosla's theory,

UNIT III **10**

Regulation works - Falls, Distributory head regulators, Cross regulators, Cross drainage works, Canal head Works,

UNIT IV **10**

Earth Dams, Gravity Dams, Spillways and Energy dissipators, Escapes, Trench weirs, Supply channel and head regulator.

APPROXIMATE TOTAL 39 Hours

References:

1. R.S. Varshney, S.C. Gupta and R.L. Gupta; Theory and Design of Irrigation Structures, Nemchand & Brothers ,Roorkee, 1992.
2. R.k. Sharma; Irrigation Engineering and Hydraulic Structures, Oxford and IBH Publishing Co., New Delhi, 1984.
3. Arora, K.R. "Irrigation water power and Water Resources engineering", Standard Publishers Distributors, Delhi, 2002.