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| 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

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UNIT I


UNIT II


UNIT III


UNIT IV


APPROXIMATE TOTAL 39 Hours

References:
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
UNIT I

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

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

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

METHODS OF MEASUREMENT: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal 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
PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

CE 403T Earthquake Engineering

Teaching Scheme

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UNIT I
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 10

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

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

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

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

UNIT IV
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:
# CE 405T Department Elective-I (Rock Mechanics)*

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**UNIT I**
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**
Anisotropy, Failure Criteria, Coulomb, Mohr’s, Griffiths and Modified Griffiths criteria and empirical criteria, Brittle and Ductile Transition, Post failure Behavior

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

**APPROXIMATE TOTAL 39 Hours**

**References:**
2. Engineering in Rocks for Slopes, Foundation and Tunnels, Editor T.Ramamurthy, Prentice Hall India Pvt. Ltd.
PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

CE 405T Department Elective-I (Advance Hydrology)*

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

UNIT IV

APPROXIMATE TOTAL 39 Hours

References:
PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR
SCHOOL OF TECHNOLOGY

CE 405T Department Elective-I (Docks, Harbor and Airport Engineering)

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

Break Water, Break waters, Alignments, Forces acting, Classification, classification and break waters, Breakwater height and failures, comparison of mould type and wall type break waters

UNIT II
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, Peirs, Wharves, Quays and its construction
Navigational Aids: Lighthourse, Buoys, anchors, moorings

UNIT III
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
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
UNIT I

UNIT II

UNIT III

UNIT IV
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
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
5. Soil Dynamics and Machine Foundation – Swami Saran
6. Geotechnical Earthquake Engineering – Steven L. Kramer
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**UNIT I**


**UNIT II**


**UNIT III**

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**


**APPROXIMATE TOTAL 39 Hours**

References:
UNIT I
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
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
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
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
UNIT I
Design procedure for irrigation channels, Irrigation outlets 09

UNIT II
Canal masonry works, - principles of design, use of flow net, Khosla’s theory, 10

UNIT III
Regulation works - Falls, Distributory head regulators, Cross regulators, Cross drainage works,
Canal head Works, 10

UNIT IV
Earth Dams, Gravity Dams, Spillways and Energy dissipators, Escapes, Trench weirs, Supply
channel and head regulator. 10

APPROXIMATE TOTAL 39 Hours

References:
   & Brothers ,Roorkee, 1992.
   Delhi, 1984.
   Distributors, Delhi, 2002.