



Curriculum plan **اللائحة الداخلية**
For **للمرحلة الدراسات العليا**
Postgraduate program **بنظام الساعات المعتمدة**
Credit hours system
2014 **٢٠١٤**

(بداية التطبيق ٢٠١٥)

قسم

الرى والهيدروليكا

Department
of Irrigation & Hydraulics



List of postgraduate courses

Department of Irrigation and Hydraulics

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	CEI	501	Hydrodynamics	70	30	0	100	3	3
02	CEI	502	Hydraulic Engineering	70	30	0	100	3	3
03	CEI	503	Open Channel Flow (1)	70	30	0	100	3	3
04	CEI	504	Sediment Transport (1)	70	30	0	100	3	3
05	CEI	505	Hydraulics of Pipelines	70	30	0	100	3	3
06	CEI	506	Advanced Engineering Hydrology	70	30	0	100	3	3
07	CEI	507	Groundwater Hydrology (1)	70	30	0	100	3	3
08	CEI	508	Surface Water Hydrology (1)	70	30	0	100	3	3
09	CEI	509	Water Resources Engineering	70	30	0	100	3	3
10	CEI	510	Information Systems and Water Resources (1)	70	30	0	100	3	3
11	CEI	511	Irrigation and Drainage Engineering	70	30	0	100	3	3
12	CEI	512	Advanced Irrigation and Drainage Engineering (1)	70	30	0	100	3	3
13	CEI	513	Modern Irrigation Systems and Management and Maintenance of Irrigation	70	30	0	100	3	3
14	CEI	514	Hydraulic Structures (1)	70	30	0	100	3	3
15	CEI	515	Dams Engineering (1)	70	30	0	100	3	3
16	CEI	516	Coastal and Harbour Engineering	70	30	0	100	3	3
17	CEI	517	Ocean Wave Mechanics and Basics of Shore Changes Processes	70	30	0	100	3	3
18	CEI	518	Inland Navigation	70	30	0	100	3	3
19	CEI	519	Water Environment Engineering and Water Quality	70	30	0	100	3	3
20	CEI	520	Environmental Impact Assessment of Water Resources Projects	70	30	0	100	3	3
21	CEI	521	Topics in Water Resources Management and Environment	70	30	0	100	3	3
22	CEI	522	Topics in Hydraulics Engineering and Water Structures	70	30	0	100	3	3
23	CEI	523	Topics in Irrigation and Drainage Engineering	70	30	0	100	3	3
24	CEI	524	Topics in Harbor and Coastal Engineering	70	30	0	100	3	3
25	CEI	525	Project	70	30	0	100	3	3
26	CEI	526	Basics of Water Quality	70	30	0	100	3	3
27	CEI	527	Experimental Fluid Mechanics	70	30	0	100	3	3
28	CEI	528	Hydrometry	70	30	0	100	3	3
29	CEI	529	Engineering Hydraulics Laboratory	70	30	0	100	3	3
30	CEI	530	Advanced Drainage Engineering	70	30	0	100	3	3
31	CEI	531	Pump Station Engineering	70	30	0	100	3	3
32	CEI	532	Management and Maintenance of Irrigation Systems	70	30	0	100	3	3
33	CEI	533	Computational Methods in Hydraulics Engineering	70	30	0	100	3	3

Department of Irrigation and Hydraulics

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
34	CEI	534	Statistical Methods in Water Resources	70	30	0	100	3	3
35	CEI	601	Advanced Fluid Mechanics	70	30	0	100	3	3
36	CEI	602	Topics in Fluid Mechanics and Hydraulics	70	30	0	100	3	3
37	CEI	603	Advanced Hydraulics	70	30	0	100	3	3
38	CEI	604	Open Channel Flow (2)	70	30	0	100	3	3
38	CEI	605	Hydraulic and Environmental Modeling	70	30	0	100	3	3
39	CEI	606	Sediment Transport (2)	70	30	0	100	3	3
40	CEI	607	River Engineering	70	30	0	100	3	3
41	CEI	608	Hydrologic Systems Analysis	70	30	0	100	3	3
42	CEI	609	Surface Water Hydrology (2)	70	30	0	100	3	3
43	CEI	610	Groundwater Hydrology (2)	70	30	0	100	3	3
44	CEI	611	River Nile Hydrology and Hydro politics	70	30	0	100	3	3
45	CEI	612	Management and Economics of Water Resources	70	30	0	100	3	3
46	CEI	613	Information Systems and Water Resources (2)	70	30	0	100	3	3
47	CEI	614	Participation in Water Resources Management	70	30	0	100	3	3
48	CEI	615	Water Resources Management Strategy in Egypt	70	30	0	100	3	3
49	CEI	616	Water, Energy, Food Security and Climate Change Nexus	70	30	0	100	3	3
50	CEI	617	Disasters, Environment and Risk Reduction	70	30	0	100	3	3
51	CEI	618	Advanced Irrigation and Drainage Engineering(2)	70	30	0	100	3	3
52	CEI	619	Planning and Hydraulic Analysis of Potable Water Network	70	30	0	100	3	3
53	CEI	620	Planning and Hydraulic Analysis of Sewage Collection Network	70	30	0	100	3	3
54	CEI	621	Irrigation of Green Areas and Belts in Urban Zones	70	30	0	100	3	3
55	CEI	622	Hydraulic Structures (2)	70	30	0	100	3	3
56	CEI	623	Dams Engineering (2)	70	30	0	100	3	3
57	CEI	624	Tunnels Engineering	70	30	0	100	3	3
58	CEI	625	Pump Stations and Hydropower Engineering	70	30	0	100	3	3
59	CEI	626	Wave Hydrodynamics	70	30	0	100	3	3
60	CEI	627	Sediment Process and Environmental Engineering in Coastal Zones	70	30	0	100	3	3
61	CEI	628	Port and Marine Offshore Structures	70	30	0	100	3	3
62	CEI	629	Integrated Sustainable Coastal Development	70	30	0	100	3	3
63	CEI	630	Stream Pollution Control	70	30	0	100	3	3
64	CEI	631	Numerical Models in Hydraulics and Water Resources	70	30	0	100	3	3
65	CEI	632	Hydroinformatics	70	30	0	100	3	3

COURSE SYLLABUSES

CEI 501 Hydrodynamics

Equations for conservation of mass, energy, Momentum, Vorticity and circulation. Stream function - Velocity potentials - Basic flow fields - Combining flows by superposition - Flow net - Free streamline application - Gravity effects - Introduction to wave motion - Computer applications.

CEI 502 Hydraulic Engineering

Introduction: - Pipelines: Hydraulics of steady flow in closed conduits, Analysis, Design and Optimal Design of water supply networks, Detailed Analysis of Networks, Extended Period Simulation, Hydraulics of unsteady flow in pipes: Water Hammer in Piping Systems, Analysis of Surge Tanks, Simplified Numerical Solutions of unsteady flow governing equations, the method of Characteristics, Review of steady flow in open channels - Computer applications - Type of hydraulic jump - Safe Apron length – Unsteady flow in open channel – Positive and negative surges – Dam failure – Terminal settling velocity.

CEI 503 Open Channel Flow (1)

Steady flow in open channels: Resistance and manning equation, Specific energy and critical depths, Hydraulic jump, Gradually varied flow, Additional transition consideration and flow measurements - Unsteady free surface flows: Definitions, Governing equations and applications - Computer applications.

CEI 504 Sediment Transport (1)

Introduction - Hydraulic properties of sediments - Modes of sediment transportation Movement of sediment in the bed - Suspended sediment load - Total sediment load - Bed geometry and flow resistance - Stable channels - Computer applications.

CEI 505 Hydraulics of Pipelines

Mechanics of liquid flow in pipes and pipe networks - Pipe transmission and distribution including flow control - Flow measurements - Steady and unsteady flow - Surge and water hammer problems. Pump selection – Cavitation - Computer applications.

CEI 506 Advanced Engineering Hydrology

Introduction to The hydrologic cycle - Hydrologic measurements - Atmospheric vapor (temperature, Humidity, wind, Evaporation, and Evapo-transpiration), Precipitation, average rainfall depth, types of storms, Infiltration, Interception, rainfall excess, catchment characteristics. Statistical analysis for max rainfall, Introduction to runoff computations, flow measurements, Introduction to flood routing, Groundwater resources - Darcy's law and measurement of hydraulic conductivity, governing equations for groundwater flow – Well hydraulics. Introduction to Models used in rainfall data analysis and rainfall-runoff simulation. Introduction of the use of Geographic Information System in Applied Hydrology.

CEI 507 Groundwater Hydrology (1)

Introduction to groundwater hydrology , types and characteristics of groundwater aquifers, Groundwater fluctuations , Reservoir yield, groundwater flow in porous media, wells' equations, solving steady state flow equations, Groundwater management -Solution of steady state problems by mathematical analysis and models Dupuit-Forchheimer assumptions Method of images, Boussinisq's equation for transient problems , Seepage under dams, Artificial recharge , Salt water intrusion for coastal aquifers, groundwater quality, sources of pollution, protection of groundwater resources.

CEI 508 Surface Water Hydrology (1)

Hydrometeorology , runoff depth, rainfall excess, catchment characteristics, Hydrologic data - Runoff process – Statistical analysis of rainfall data and design storm development - Hydrologic modeling with emphasis on Arid and semi arid regions (watershed modelling – flood routing) – Hydrologic models available - Catchment erosion and sediments load - Hydraulic simulations of flood accommodation structures.

CEI 509 Water Resources Engineering

Hydrologic cycle in terms of water quantity, quality, and management - Water quality of flowing water and ground water – Hydrology/ecology of impounded water - Water resources management (demand versus resources) - Water policies - Review of flood computations and flood forecasting - Water detention/retention methods – Reservoir simulations and management - Flood control measures - Economics of flood control.

CEI 510 Information Systems and Water Resources (1)

Introduction to water resources planning and analysis - Identification and evaluation of water management plans. Introduction to information systems - Recent technologies and data processing - Introduction to geographic information systems - Methods of data acquisition and processing. Coordinate systems and Projections. Vector and raster data – Spatial Interpolation. Applications of GIS in water resources fields. Application Projects: (1) Rainfall analysis using GIS. (2) Groundwater simulations in the GIS environment. Watershed analysis using GIS.

CEI 511 Irrigation and Drainage Engineering

Definitions and basic information, Review of Methods of on-farm irrigation (Surface irrigation - Sprinkler irrigation - Drip irrigation), Improving of surface irrigation using surges, Subsurface irrigation using perforated pipes, Subsurface trickle irrigation, Lining of irrigation canals. Design and alignment of agricultural drainage systems, Open drainage, Tile drains, Drainage water disposal and ability of treatment and reuse.

CEI 512 Advanced Irrigation and Drainage Engineering (1)

Modern principles for water distribution and control, Automatic control: theory and selection, Field Canals (Mesqa): types and designs (Low Mesqa - Left Mesqa – Pipe Mesqa), Introduction for evaluation of irrigation and drainage systems and performance indicators, Economics of irrigation projects and socio-economic aspects, Environmental impacts of drainage projects, Wetlands and drainage water treatment, Design of wetlands with respect to indicators and limitations of drainage water reuse in irrigation..

CEI 513 Modern Irrigation Systems and Management and Maintenance of Irrigation Projects

Introduction for field modern irrigation systems, Specific characteristics and limitations of sprinkler and drip irrigation systems and components, Data and aspects to determine appropriate irrigation systems, Principles and design methods for different cases, Definitions and explanations for Management of field modern irrigation systems, Defining management objectives, Principles for operation, control methods and maintenance, Farm economics and cost calculation, Monitoring and evaluation of field modern irrigation systems, Maintenance types and methods, Tables of maintenance and inspection methods, Training and human resources, Examples and applications.

CEI 514 Hydraulic Structures (1)

Classification and functions of hydraulic structures – Culvert Hydraulics – Spillways Hydraulics – Control Gates – Bridges Scour – River Training Works – Hydraulic Structures Models.

CEI 515 Dams Engineering (1)

Plan formulation - Environmental considerations - Flood hydrology studies - Selection of type of dam - Foundations and construction materials - Earth dams - Concrete gravity dams - Aspects of design - Analysis of seepage and reduction measures including grouting - Design of filters Determination of slope stability - Construction aspects.

CEI 516 Coastal and Harbour Engineering

Historical background of coastal engineering - Wind waves and swells - Long period sea waves - Near-shore currents - Coastal sediment - Field survey - Beach erosion control - Coastal dikes and sea-walls - Groin systems - Detached breakwater - Artificial nourishment works - Pollution problems in the near-shore area - Pollution control - Near shore area development - Shoreline changes modeling - Harbor and marine structures - Laboratory model - Waves - Planning of ports - Planning of coastal engineering structures - Terminals.

CEI 517 Ocean Wave Mechanics and Basics of Shore Changes Processes

Wind - Tides - Currents - Wave theory and application to engineering problems - Linear and non-linear theories of regular gravity waves - Wave properties and transformation in shoaling waters - Wave action on walls and piles - Wave statistics - Wave forces on structures - Spectral analysis of regular waves. Coastal sand transport - Radiation stress and its components - Wave set-up - Radiation shear stress gradient - Near-shore currents - Cross-shore sediment transport - Long-shore sediment transport - Mud coasts - Formation - Deltas - Early coastal transport formulas - Coastal changes with single line theory - Coastal protection structures.

CEI 518 Inland Navigation

Types of navigation channels - Inland ports - Ship characteristics - Ship movements Hydraulic phenomena - Ship-induced water motion - Design of water section - Side slopes revetments - Depth of channels - Units towing - Maneuverability at low speed Design of curves - River training - Navigation aids - Mooring accessories - Dredging - Sounding - Navigation locks - Bridges.

CEI 519 Water Environment Engineering and Water Quality

Ecosystem - Basic principles of mass balance and energy - Water quality parameters - Sources of water pollution - Principles of water treatment processes - Wetlands - Principles of pollutants transfer in different water systems - Modeling of pollutants transfer in water systems - Computer applications.

CEI 520 Environmental Impact Assessment of Water Resources Projects

Terminology - Environmental Systems and Environment Balance - Planning and management studies of environmental impacts - Environmental indicators and indices - Methods of impacts identification and evaluation - Impacts assessment of water engineering projects - Mitigation measures of impacts - Environmental monitoring - Major water resources projects in Egypt and their impacts - EIA reporting - Case studies.

CEI 521 Topics in Water Resources Management and Environment

Selected topics in the field of water resources engineering - The course title and outline of what is required will be submitted before the students register for the course - A copy of this information will be placed in the student file.

CEI 522 Topics in Hydraulics Engineering and Water Structures

Selected topics in the field of hydraulics - The course title and outline of what is required will be submitted before the students register for the course - A copy of this information will be placed in the student file.

CEI 523 Topics in Irrigation and Drainage Engineering

Selected topics in the field of irrigation and drainage. The course title and prerequisites will be submitted before the students register for the course. A copy of this information will be placed in the student file.

CEI 524 Topics in Harbor and Coastal Engineering

Selected topics in the field of harbor and coastal protection and inland navigation engineering - The course title and outline of what is required will be submitted before the students register for the course - A copy of this information will be placed in the student file.

CEI 525 Project

Independent work leading to writing an extensive article - Preparing a theoretical study or experimental work with complete analysis in topic relevant to the diploma field of study.

CEI 526 Basics of Water Quality

Hydrologic cycle and water availability - Water chemistry - Standards of water supplies for different uses - Types and sources of water pollution - Sampling and principal testing - Assessment of water quality - Water quality monitoring and management - Simulation of surface and ground water pollution - Application on computer programs - Field and laboratory measurements.

CEI 527 Experimental Fluid Mechanics

Theoretical background for fluid mechanics and measurements - Range of variables - Scientific approach and types and sources of errors in measurements - Standardization and devices' calibration- Measurements of fluid properties (Density - Viscosity - Surface tension - Thermal conductivity - Electrical conductivity) - Static pressure - Pressure measuring devices - Pressure measurements - Measurement of velocity using pitot tubes and current meters, Instrumentation and recent technology.

CEI 528 Hydrometry

Field measurements - International standards in field measurements - Laboratory calibration of field measuring devices - Metrological measurements (Temperature - Humidity - Wind speed - Rainwater depth) - Instrumentation, Stream measurements (Discharge - Velocity - Levels) - Relations between discharge, velocity, and levels.

CEI 529 Engineering Hydraulics Laboratory

Dimensional analysis - Similarity laws - Hydraulic simulation - Theoretical background for fluid dynamics - Laboratory experiments and demonstration of flow measurements - and recent technology, Measurement of pipe discharge (Orifice meter - Venturi meter) - Measurement of pipe velocity - Measurement of pipe pressure - Laboratory experiments (Flow through orifices - Under pressure flow - Flow through Venturi meter - Notches and weirs - Uniform flow in open channels - Calibration of gates - Characteristics of hydraulic jump).

CEI 530 Advanced Drainage Engineering

Measures and parameters of ground water table, Need for drainage: Drainage and crop production - Drainage to control (Ponding, Water-logging, Salinization), Components of a drainage system, Design and construction of field drainage systems, Factors related to drainage: Drainage discharge - Water table -

Dissolved salts in groundwater - Measuring groundwater salinity - Hydraulic conductivity - Topography - Impermeable layers, Design considerations: Drainage as part of an agricultural development project - Layout of field drainage systems - Surface and subsurface drainage systems - Outlet of a field drainage system - Design discharge - Slopes of field drains, Operation and maintenance: "As-built" data of drainage works - Monitoring – rehabilitation -Land surface - Open drains - Pipe drains – Structures, Drainage water recycle.

CEI 531 Pump Station Engineering

Station configuration and design (Sump – Suction pipes – Entry valves and special pieces – Exit valves and special pieces – Header – Pump Safety devices - Pump types – Pump systems - Pump selection - Flow and pressure measurements, Pumps and Dimensional Analysis, Specific Speed calculations, Pump testing and calibration, Pumps stations and pipelines.

CEI 532 Management and Maintenance of Irrigation Systems

Principles for operation, control methods and maintenance, Types and calculations of costs, BMS and setting of management objectives and performance indicators (PIs), Participatory irrigation management and irrigation water associations, Monitoring of project PIs, Project maintenance (Regular check schedules - Discharge and pressure measurements – Regular maintenance for Pump station electromechanical and civil parts), Inspection methods for malfunctioning, Special maintenance for structures and equipment, Sustainability and durability of irrigation projects, Performance measures with time, Applications and examples.

CEI 533 Computational Methods in Hydraulics Engineering

Theoretical and Analytical Study of Iterative Methods in Matrix Algebra, Eigenvalues, Nonlinear Equations, Numerical Differentiation and Integration, Initial-Value Problems for Ordinary Differential Equations, Boundary Value Problems for Ordinary Differential Equations, Numerical Solution of Partial Differential Equations, Application of These Methods to Practical Problems of Special Interest, Computer Implementation.

CEI 534 Statistical Methods in Water Resources

Basic statistics, data visualization, data management, principles of statistical inferences, the estimation theory, tests of hypotheses, analysis of variance (ANOVA), multiple linear and non-linear regressions, correlation, optimization techniques, introduction to uncertainty analysis, filters, introduction to spatial statistics, applications in water resources.

CEI 601 Advanced Fluid Mechanics

Fundamentals of fluid motion: Kinematics, Lagrangian formulation, Eulerian formulation, conservation of mass and flow mapping. Dynamics of non-viscous fluid motion: Lagrangian and Eulerian equations of motion - Irrotational motion of an incompressible fluid- Basic analysis of viscous fluid motion - Boundary layer theory – Laminar flow - Turbulent flow – Hydrodynamics – Laminar boundary layer - Turbulent boundary layer.

CEI 602 Topics in Fluid Mechanics and Hydraulics

Selected topics in the fields of fluid mechanics and hydraulics. The course title and outline of what is required will be submitted before the students register for the course. A copy of this information will be placed in the student file.

CEI 603 Advanced Hydraulics

Advanced methods of analyzing hydraulics and water resources systems - Computation of unsteady flow in open channels - Abrupt waves - Flood waves - Tidal propagation Method of characteristics - Mathematical modeling of river and coastal currents - Modern concepts of control volume and laminar - Turbulent flows.

CEI 604 Open Channel Flow (2)

Revision of basic equations - Rapidly varied flow - Drops and hydraulic jump in nonprismatic and sloping channels - Design of stilling basins - Sub-critical flow in curves High velocity flow. Gradually varied flow in regular and natural channels - Unsteady free surface flows - Spatially varied flow - Air entrained flow- Computer applications.

CEI 605 Hydraulic and Environmental Modeling

Review of similarity mechanics and model laws - River models for transport of matter and heat: Basic concepts and Case studies (Basin and reservoir models - Tidal models with fixed or movable bed - Models of hydraulic structures) Discharge conditions-energy dissipation, Erosion, Vibration and cavitation - pipeline models - Models for groundwater flow - Special models - Computer applications.

Concepts of mathematical modeling and simulation in environmental and water resources engineering - Simulation techniques - Introduction to stochastic modeling - Time series analysis and synthesis - Application for some situations using available software.

CEI 606 Sediment Transport (2)

Regime approach -Turbulent theories - Suspended sediment - Tractive force method - Bed forms - Einstein method - Design of mobile bed channels - Channel degradation and Lane theory - Sediment transport calculations.

CEI 607 River Engineering

Open channel flow - Basic principals - Natural rivers - System in river parameters Stream forms - Channel adjustment and river metamorphosis - Hydraulic relations for alluvial streams - Stage discharge predictors - Sediment discharge formulas - Sediment measurements techniques - Channel stability - Regime theory - River training and control structures - River stabilization - Bank protection - Scour around bridge piers Hydraulic and environmental effects of highway crossings and large dams on river.

CEI 608 Hydrologic Systems Analysis

Statistics and probability analysis of hydrologic data - Frequency analysis - Regression and correlation analysis – Spatial Statistics - Time series - generation of missing hydrologic information – Developing data driven hydrologic models - Processes and systems applications to flood and stream flow studies – the role of system engineers in ecological and water quality studies.

CEI 609 Surface Water Hydrology (2)

Introduction to Meteorology – Atmospheric circulations - rainfall excess– catchment characteristics - stream flow hydrographs - geomorphologic and long term hydrologic simulations of stream basins – remote sensing of the hydrologic variables - hydrologic forecasting – Weather scenarios and global warming and their hydrologic effects.

CEI 610 Groundwater Hydrology (2)

Flow in fractured rocks - Thermal reservoirs - Flow in the unsaturated zone - Multiphase flow in porous media - Quality of ground water. Water quality standards - Transport processes (non-reactive and reactive constituents) Hydrodynamic equations for advection and diffusion in saturated and unsaturated media Hydro-chemical behavior of contaminants - Measurement of parameters - Sources of contamination -

Remediation measures -groundwater and contaminant transport modeling using different mathematical models and applicable case studies.

CEI 611 River Nile Hydrology and Hydro politics

History of the Nile, flows and levels, water regulation structures from source to mouth, river management in Egypt, water situation in the basin countries and demands for development, challenges and opportunities for cooperation, Nile agreements and recent political tensions, the story of the Renaissance dam in Ethiopia.

CEI 612 Management and Economics of Water Resources

Review of water resources management techniques - Case studies and their applications to local conditions - Identification of major problems - Implications of development alternatives - Legal - Environment - Economical and social aspects - Structuring and solution of mathematical models - Decision analysis - System simulation - Application of system analysis techniques to the solution of civil engineering problems. Principles of engineering economics - Mathematics of economic analysis: Defining alternatives, Discounting factors and discounting techniques and Efficient resource allocation - Benefit-cost analysis: Project evaluation, Feasibility tests, Defining benefits and costs, Categories - Measurements of benefit-cost, Benefit cost variations and Examples for different cases.

CEI 613 Information Systems and Water Resources (2)

Methods of water resources planning and management. Introduction to geographic information systems - Methods of data acquisition and processing. Coordinate systems and Projections. Vector and raster data – Spatial Interpolation. Applications of GIS in water resources fields. Application Projects: (1) Rainfall analysis using GIS. (2) Groundwater simulations in the GIS environment (3) Analysis of the Upper Nile Catchment area using GIS. Water resources management in Egypt and future planes. Use of GIS in decision support systems. Advanced Visual Basic programming and customization of GIS. Looping, optimization, and advanced techniques using GIS. Example project on GIS programming (Dewatering Project).

CEI 614 Participation in Water Resources Management

Introduction to participation and basic definitions, Water and culture, Water use, management and governance, participation and irrigation water, participation and water supply, Egyptian and regional case studies, the Public Engagement in Water Management Project.

CEI 615 Water Resources Management Strategy in Egypt

Water Resources in Egypt and Opportunities and Challenges, current and future water usage in terms of geographical and seasonal distribution, High Aswan dam and control on water distribution, Role of different sectors in defining the water policy and impacts on environmental, economical, social and political issues,

Development and analysis of previous water strategies in Egypt, Future of the Egyptian water strategy under the growing population, climate change and increasing development demands in upper Nile countries, Role of decision support systems in developing water strategies, Building capacity in for proper water management, Mainstreaming of water strategies

CEI 616 Water, Energy, Food Security and Climate Change Nexus

Introduction, The nexus sectors, Interactions across the nexus, Climate change and the nexus, International and geopolitical aspects of the nexus, Knowledge gaps in the nexus, Examples from the Arab region and the Nile Basin countries.

CEI 617 Disasters, Environment and Risk Reduction

Introduction and definitions, Challenges and gaps in implementing ECO-DRR, Elements of Disaster and risk reduction, Eco-DRR instruments and approaches, Case Studies, Mainstreaming Environment and DRR in development.

CEI 618 Advanced Irrigation and Drainage Engineering (2)

Stages of irrigation and drainage projects (Pre-project studies – Design stage – Bidding stage – Execution stage – Stage of operation and maintenance), Follow up and evaluation of irrigation and drainage projects, Economics and management of irrigation and drainage projects, Asset management in the fields of irrigation and drainage, Stages for evaluation and rehabilitation (Data collection – Data base under the umbrella of GIS – Data analysis – The use of DSS programs – Setting of HPP – Financing and scheduling), Mutual effects between projects, Reporting and master planning.

CEI 619 Planning and Hydraulic Analysis of Potable Water Network

Review to the Hydraulic Basis (Under pressure flow – Types of Heads – Hydraulic losses – Parallel and series pipe connection – Pipe support and replacement), Components of PWN, Pre-design studies, Calculation of design discharges, Ground and elevated storage, Use of urban planning drawings and plans and cross section of roads in network planning, Problems in hydraulic mapping, Skeletal planning and Skelton planning, Simulation of PWN using computer programs in steady and unsteady states (Design of PWN – Evaluation of existing PWN – Rehabilitation of PWN), Available on-market computer programs, Examples and cases of studies.

CEI 620 Planning and Hydraulic Analysis of Sewage Collection Network

Review to the Hydraulic Basis (Open channel flow – Types of cross section – Design equations – Geometric characteristics of sections – Sewage pipe support and replacement), Components of SCN, Types of SCN (Pressurized sewers and Grinder pumps – Open channel sewers and manholes), Pre-design studies, Calculation of design discharges, Use of urban planning drawings and plans and cross section of roads in network planning, Problems in hydraulic mapping, Skeletal planning and Skelton planning, Simulation of SCN using computer programs in Dry and Wet states (Design of SCN – Evaluation of existing SCN – Rehabilitation of SCN), Available on-market computer programs, Examples and cases of studies.

CEI 621 Irrigation of Green Areas and Belts in Urban Zones

Environmental importance of green areas and belts in urban zones, Conditions for reuse of treated sewage in irrigation, Types of Urban Green Areas (Private gardens - Public gardens – Green belts – Tree forests), Irrigation methods for green areas and belts in urban zones (Permanent sprinkler irrigation – Trickle irrigation – Subsurface irrigation – Subsurface trickle

CEI 622 Hydraulic Structures (2)

Description, function, and principles of hydraulic design & calculations for several hydraulic structures, Construction and Operation and Maintenance consideration for main water structures, Storage structures - Dams and reservoirs - Conveyance structures - Energy dissipation structures - Flow measurement structures - Control structures - Sediment and chemical control structures - Collection and diffusion structures - Intakes - Surface drainage inlets - Spillways - Gates - Stilling basins - Culverts – Flow nets - Water stabilization structures - Navigation locks – Pumping stations, hydropower structures.

CEI 623 Dams Engineering (2)

Rockfill dams – Design considerations – Settlement calculations – High Aswan Dam – Reinforced concrete dams - Arch dams - Aspects of design – Stress analysis – Plan formulation - Construction aspects – Design of Spillways – Design of Stilling Basins.

CEI 624 Tunnels Engineering

Introduction and history of tunnels - Use of tunnels in water works - Classification of tunnels - Main elements in alignment and design of tunnels - Field investigations and soil tests Tunneling methods - Ground treatment in tunneling - Support of tunnels - Stresses and displacements associated with excavation of tunnels - Design of tunnels - Considerations in civil engineering - Design methods: Soft ground and Tunnel design in relation to shield loading and ground loading.

CEI 625 Pump Stations and Hydropower Engineering

Station capacity - Inflow hydro-graph - Combined flow systems - Station configuration and design - Pump systems - Pump types - Pump selection - High static head systems - Large pump station systems - Piping systems - Fittings - Suction piping arrangements - Valves - Flow and pressure meters. Practical approach in the planning and design of water power installations - Fundamental theory of water availability and demand - Flow - Power and load duration curves Classification of power sources - Project planning: Economic and financial analysis including cost and benefits - Special features of hydro plants - Plant maintenance Operation and appurtenances for hydro plants. Ecological effects of hydropower facilities.

CEI 626 Wave Hydrodynamics

Natural phenomena - Basic equations of wave motion - Small amplitude wave theory Finite amplitude wave theory - Wave transformation - Ocean wave characteristics - Wind wave generation development and prediction - Wave action on walls and piles - Wave pressure on vertical walls - Wave forces on structure - Theory of long period wave - Oscillation in lakes and bays tide - Storm surge - Near-shore currents - Radiation stress - Wave set-up long-shore current - Rip currents - Near-shore current system.

CEI 627 Sediment Process and Environmental Engineering in Coastal Zones

Transport modes - Sediment properties - Critical bed shear stress - Bed load transportation - Coastal sand transport - Cross-shore sediment transport - Long-shore sediment transport - Mud coasts - Coastal formations - Deltas - Early coastal changes with multiple line theory inlet stability - Beach erosion control - Storm surge countermeasures.

Shoreline morpho-dynamics - Tides and lakes - Long term development of coasts - Effect of sea-level change on shorelines - Beach ecosystems - Coastal dunes - Coastal wetlands - Man activities on the coast dredging operations and waste disposal - Coastal water management - Management of coastal lands and sediments - Management of coastal ecosystem - Coastal hazard - Legal issues in environmental engineering.

CEI 628 Port and Marine Offshore Structures

Port planning - Breakwaters - Quay walls – Design of Sheet Pile Walls - Fenders – Mooring Systems- Types of marine offshore structures- Fabrication and installation of offshore platforms- Environmental loading on offshore platforms - Wave theories – Morison's equation- wave and current loading on fixed offshore structures - case histories of offshore platform failure due to extreme wave loading

CEI 629 Integrated Sustainable Coastal Development

Introduction to coastal systems and relevant natural processes, coastal environment hazards and vulnerability, principles of environmental urban planning, elements of integrated coastal zone

management, theories and techniques of marine spatial planning, sustainable development & integrated planning of coastal zones, good governance in coastal management, participatory planning and management, environmental impact assessment of coastal development, socio-economic impacts of coastal development, environmental management of coastal zones, impact of climate changes on coastal development, urban and rural case studies of coastal development.

CEI 630 Stream Pollution Control

Water quality standards - Physical and chemical pollution - Bacterial contamination of surface waters. Effects of specific types of pollution such as thermal - Point and non-point sources - Stream self-purification - Effects of lake eutrophication - Pollution surveys and methods of control.

CEI 631 Numerical Models in Hydraulics and Water Resources

Introduction for physical and mathematical models, Governing equations for several water flow and mass transport in different applications, Review for methods of computational hydraulics for the solution of algebraic ordinary and partial differential equations and basic numerical solutions, Basic elements of numerical modeling, Generation of numerical modeling - One- and Multi dimensional diffusion equations, Numerical models in different fields (Pipe networks - Open channels - Ground water – Hydrology....) – Application of geographic information systems in numerical modeling – Analysis and presentation of results and application of numerical modeling.

CEI 632 Hydroinformatics

Introduction, the databases and GIS covered in the integration of application and data management aspects, theory and practice of numerical methods applied generally to the water field, computational hydraulics. Introduction to differential equations in fluid mechanics for free-surface flow and transport system used for unsteady flows simulation. Exercises the most widely used modeling approaches such as method of characteristics, finite differences and finite elements. Apply through case studies the major modeling packages for hydrological catchments modeling, drinking network design and optimization, sewage network design and management, 1D and 2D hydrodynamic modeling.

قسم
الاشغال العامة
Department
of Public Works

List of postgraduate courses

Public Works

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	CEP	500	Modern Methods of Railway Stations Planning	70	30	0	100	3	3
02	CEP	502	Digital Terrain Models and Applications	70	30	0	100	3	3
03	CEP	503	Non-Topographic Photogrammetric Surveying	70	30	0	100	3	3
04	CEP	504	Map Production	70	30	0	100	3	3
05	CEP	505	Techniques for Surveying Data Collections	70	30	0	100	3	3
06	CEP	506	Cartography and Cadastral Surveying	70	30	0	100	3	3
07	CEP	507	Digital Mapping Technology	70	30	0	100	3	3
08	CEP	508	Digital Image Processing	70	30	0	100	3	3
09	CEP	509	Photo Interpretation	70	30	0	100	3	3
10	CEP	510	Geometric Geodesy	70	30	0	100	3	3
11	CEP	511	Adjusting Surveying Measurements	70	30	0	100	3	3
12	CEP	512	Positions Determination Systems	70	30	0	100	3	3
13	CEP	513	Surveying For Engineering Projects	70	30	0	100	3	3
14	CEP	514	Principles of Remote Sensing	70	30	0	100	3	3
15	CEP	515	Surveying Computations and Drawing	70	30	0	100	3	3
16	CEP	516	Physical Geodesy	70	30	0	100	3	3
17	CEP	517	Analysis of Deformation Measurements in Constructions	70	30	0	100	3	3
18	CEP	518	Design and Processing of Surveying Measurements	70	30	0	100	3	3
19	CEP	519	Applications of Astronomy in Surveying	70	30	0	100	3	3
20	CEP	520	Land Information System (LIS)	70	30	0	100	3	3
21	CEP	521	Principles of Hydro-Graphic Surveying	70	30	0	100	3	3
22	CEP	522	Dynamic Geodesy	70	30	0	100	3	3
23	CEP	523	Map Projection and Coordinate Systems	70	30	0	100	3	3
24	CEP	524	Writing Surveying Reports	70	30	0	100	3	3
25	CEP	525	Management of Surveying Projects	70	30	0	100	3	3
26	CEP	526	Topographic Photogrammetric Surveying	70	30	0	100	3	3
27	CEP	530	Highway Planning and Feasibility Studies	70	30	0	100	3	3
28	CEP	531	Highway Geometric Design	70	30	0	100	3	3
29	CEP	532	Highway Construction Materials	70	30	0	100	3	3
30	CEP	533	Hydrological Studies of Highways	70	30	0	100	3	3
31	CEP	534	Structural Design of Highway Pavements	70	30	0	100	3	3
32	CEP	535	Principals of Highway Construction Documentation	70	30	0	100	3	3
33	CEP	536	Airport Planning and Design	70	30	0	100	3	3
34	CEP	537	Highway Construction Technology and Quality Control	70	30	0	100	3	3
35	CEP	538	Highway Maintenance	70	30	0	100	3	3
36	CEP	539	Highway Construction Management	70	30	0	100	3	3
37	CEP	540	Railway Capacity	70	30	0	100	3	3
38	CEP	541	Railway Alignment	70	30	0	100	3	3
39	CEP	542	Metro – Lines Alignment and Operating	70	30	0	100	3	3

Public Works

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
40	CEP	543	Railway Track Elements Design	70	30	0	100	3	3
41	CEP	544	Rapid Speed Train Technology	70	30	0	100	3	3
42	CEP	545	Railway Turnouts Design	70	30	0	100	3	3
43	CEP	546	Railway Station Planning	70	30	0	100	3	3
44	CEP	547	Railway Signals	70	30	0	100	3	3
45	CEP	548	Railway Maintenance and Renewal	70	30	0	100	3	3
46	CEP	549	Advanced Technology of Railway Signals	70	30	0	100	3	3
47	CEP	550	Introduction to Urban Transportation Planning	70	30	0	100	3	3
48	CEP	551	Urban Transportation Planning	70	30	0	100	3	3
49	CEP	552	Public Transportation	70	30	0	100	3	3
50	CEP	553	Statistical Applications in Transportation	70	30	0	100	3	3
51	CEP	554	Freight Transportation System	70	30	0	100	3	3
52	CEP	555	Transportation Systems Analysis	70	30	0	100	3	3
53	CEP	556	Computer Applications in Transportation	70	30	0	100	3	3
54	CEP	557	Transportation Economics	70	30	0	100	3	3
55	CEP	558	Expert Systems for Transportation	70	30	0	100	3	3
56	CEP	559	Transportation Network Equilibrium	70	30	0	100	3	3
57	CEP	560	Sanitary Chemistry	70	30	0	100	3	3
58	CEP	561	Bacteriology of Water and Wastewater	70	30	0	100	3	3
59	CEP	562	Environmental Engineering and Pollution Control (1)	70	30	0	100	3	3
60	CEP	563	Water Treatment	70	30	0	100	3	3
61	CEP	564	Wastewater Treatment	70	30	0	100	3	3
62	CEP	565	Sludge Treatment	70	30	0	100	3	3
63	CEP	566	Introduction to Computer Applications in Traffic & Transportation	70	30	0	100	3	3
64	CEP	567	Projects Management and Operation	70	30	0	100	3	3
65	CEP	568	Industrial Water Supply	70	30	0	100	3	3
66	CEP	569	Industrial Wastewater Treatment	70	30	0	100	3	3
67	CEP	570	Solid Wastes	70	30	0	100	3	3
68	CEP	571	Traffic Impact Studies	70	30	0	100	3	3
69	CEP	572	Wastewater Collection Systems	70	30	0	100	3	3
70	CEP	573	Water Collection Works	70	30	0	100	3	3
71	CEP	574	Environmental Engineering and Pollution Control (2)	70	30	0	100	3	3
72	CEP	575	Master Planning for Sanitary Projects	70	30	0	100	3	3
73	CEP	576	Water Pollution	70	30	0	100	3	3
74	CEP	577	Soil Pollution	70	30	0	100	3	3
75	CEP	578	Noise & Vibrations	70	30	0	100	3	3
76	CEP	579	Air Pollution	70	30	0	100	3	3
77	CEP	580	Railway Environmental Effects	70	30	0	100	3	3
78	CEP	581	Traffic Flow Theories	70	30	0	100	3	3
79	CEP	582	Traffic Studies and Analysis	70	30	0	100	3	3
80	CEP	583	Traffic Management and Control	70	30	0	100	3	3
81	CEP	584	Traffic and Roads Impact on Environment	70	30	0	100	3	3
82	CEP	585	Traffic Systems Analysis	70	30	0	100	3	3
83	CEP	586	Traffic Flow Theories and Engineering	70	30	0	100	3	3

Public Works

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
84	CEP	587	Statistical Applications to Traffic Operations	70	30	0	100	3	3
85	CEP	588	Traffic Accidents and Roads Safety	70	30	0	100	3	3
86	CEP	589	Advanced Traffic Control Devices	70	30	0	100	3	3
87	CEP	590	Reuse & Recycling	70	30	0	100	3	3
88	CEP	591	Engineering Economics	70	30	0	100	3	3
89	CEP	592	Environmental and Social Studies	70	30	0	100	3	3
90	CEP	593	Properties & Evaluation of Environmental Quality	70	30	0	100	3	3
91	CEP	594	Plants Performance Evaluation	70	30	0	100	3	3
92	CEP	595	Public Health	70	30	0	100	3	3
93	CEP	596	Transportation Policy and Planning	70	30	0	100	3	3
94	CEP	597	Transportation and Traffic Planning (1)	70	30	0	100	3	3
95	CEP	598	Transportation and Traffic Planning (2)	70	30	0	100	3	3
96	CEP	599	Traffic Engineering	70	30	0	100	3	3
97	CEP	602	Photo Interpretation and Digital Image Processing	70	30	0	100	3	3
98	CEP	603	Photogrammetry	70	30	0	100	3	3
99	CEP	604	Digital Maps and Map Production	70	30	0	100	3	3
100	CEP	605	Hydro-Graphic Surveying	70	30	0	100	3	3
101	CEP	606	Surveying Data Collections and Computations	70	30	0	100	3	3
102	CEP	607	Physical and Dynamic Geodesy	70	30	0	100	3	3
103	CEP	608	Geometric Geodesy and Position Determination Systems	70	30	0	100	3	3
104	CEP	609	Construction Deformation Measurements	70	30	0	100	3	3
105	CEP	610	Adjustment and Analysis of Surveying Measurements	70	30	0	100	3	3
106	CEP	611	Cartography and Map Production	70	30	0	100	3	3
107	CEP	612	Land Information Systems and Digital Terrain Models	70	30	0	100	3	3
108	CEP	613	Remote Sensing	70	30	0	100	3	3
109	CEP	614	Management and Reporting of Surveying Projects.	70	30	0	100	3	3
110	CEP	615	Infra Structure Utilities and Surveying	70	30	0	100	3	3
111	CEP	616	Application of GIS in Utilities Projects	70	30	0	100	3	3
112	CEP	617	Legal Registration and Cadastral Surveying	70	30	0	100	3	3
113	CEP	618	Digital Maps From Mobile Sensors	70	30	0	100	3	3
114	CEP	619	Quantity Survey and Its Applicants in Civil Engineering	70	30	0	100	3	3
115	CEP	630	Advanced Highway Planning and Feasibility Studies	70	30	0	100	3	3
116	CEP	631	Advanced Highway Geometric Design	70	30	0	100	3	3
117	CEP	632	Advanced Soil and Materials Studies For Road Construction	70	30	0	100	3	3
118	CEP	633	Advanced Hydrological Studies of Highways	70	30	0	100	3	3
119	CEP	634	Advanced Structural Design of Highway Pavements	70	30	0	100	3	3
120	CEP	635	Highway Management Systems	70	30	0	100	3	3
121	CEP	636	Advanced Airport Planning and Design	70	30	0	100	3	3

Public Works

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
122	CEP	637	Advanced Highway Construction Technology	70	30	0	100	3	3
123	CEP	638	Advanced Highway Maintenance	70	30	0	100	3	3
124	CEP	639	Advanced Highway Construction Management	70	30	0	100	3	3
125	CEP	640	Rapid Speed Train Technology	70	30	0	100	3	3
126	CEP	641	Advanced Railway Alignment	70	30	0	100	3	3
127	CEP	642	Railway Track Design and Analysis	70	30	0	100	3	3
128	CEP	643	Modern Turnouts Technology	70	30	0	100	3	3
129	CEP	644	Advanced Technology of Railway Signals	70	30	0	100	3	3
130	CEP	645	Modern Methods of Railway Station Planning	70	30	0	100	3	3
131	CEP	646	Modern Methods of Construction, Maintenance and Renewal of Railway Lines	70	30	0	100	3	3
132	CEP	647	Railway Environmental Effects	70	30	0	100	3	3
133	CEP	648	Railway Simulation and Modeling	70	30	0	100	3	3
134	CEP	649	Railway Freight Transport Systems	70	30	0	100	3	3
135	CEP	651	Urban Transportation Planning	70	30	0	100	3	3
136	CEP	652	Advanced Transportation Systems	70	30	0	100	3	3
137	CEP	653	Transportation Networks Equilibrium	70	30	0	100	3	3
138	CEP	654	Transportation Economics	70	30	0	100	3	3
139	CEP	660	Hydraulics of Networks & Plants	70	30	0	100	3	3
140	CEP	661	Chemistry of Water	70	30	0	100	3	3
141	CEP	662	Microbiology of Water	70	30	0	100	3	3
142	CEP	663	Advanced Water Treatment	70	30	0	100	3	3
143	CEP	664	Advanced Domestic Wastewater Treatment	70	30	0	100	3	3
144	CEP	665	Industrial Wastewater Treatment	70	30	0	100	3	3
145	CEP	666	Advanced Studies for Solid Wastes	70	30	0	100	3	3
146	CEP	667	Impact of Pollution on Environment	70	30	0	100	3	3
147	CEP	668	Advanced Sludge Treatment	70	30	0	100	3	3
148	CEP	669	Water Treatment Modeling	70	30	0	100	3	3
149	CEP	670	Wastewater Treatment Modeling	70	30	0	100	3	3
150	CEP	671	Water Supply Systems Modeling	70	30	0	100	3	3
151	CEP	672	Sewerage Systems Modeling	70	30	0	100	3	3
152	CEP	673	Special Topics in Environmental Engineering	70	30	0	100	3	3
153	CEP	674	Networks Operation & Maintenance Programs	70	30	0	100	3	3
154	CEP	675	Sea Water Desalination	70	30	0	100	3	3
155	CEP	676	Reuse Of Treated Wastewater	70	30	0	100	3	3
156	CEP	677	Reuse Of Solid Wastes	70	30	0	100	3	3
157	CEP	678	Sludge Disposal & Reuse	70	30	0	100	3	3
158	CEP	679	Industrial Water Supply	70	30	0	100	3	3
159	CEP	681	Traffic Flow Theory and Engineering Applications	70	30	0	100	3	3
160	CEP	682	Traffic Operations and Control	70	30	0	100	3	3
161	CEP	683	Statistical Applications to Traffic Operations	70	30	0	100	3	3
162	CEP	684	Traffic Studies and Analysis	70	30	0	100	3	3
163	CEP	685	Transport Logistics	70	30	0	100	3	3

Public Works

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
164	CEP	686	Public Transport Systems	70	30	0	100	3	3
163	CEP	690	Utilities Networks Planning & Its Economy	70	30	0	100	3	3
164	CEP	691	Engineering Economics	70	30	0	100	3	3
165	CEP	692	Advanced Environmental and Social Studies	70	30	0	100	3	3
166	CEP	693	Railway Economic and Management	70	30	0	100	3	3
167	CEP	P99	Project	70	30	0	100	3	3



COURSE SYLLABUSES

CEP 500 Modern Methods of Railway Stations Planning

Architectural, Aesthetic, Operational Requirements for Station Design –Railway Station Layout and Elements, Freight Station and Cranes Types, Locomotive, Stabling and Marshalling Yards Automization, How to Improve Urban (Underground Metro) and Rural Station Capacity.

CEP 502 Digital Terrain Models and Applications

Introduction to DTM, Methods of Creating DTM from Different Sources, e.g. Conventional Surveying, Aerial Photogrammetry, Satellite Imagery, Accuracy of DTM as a Function of The Used Data, Mathematical Models Used in DTM Creation, Identifications of DTM, Application of DTM in Surveying Projects, Computation of Cut and Fill, Planing of Highways and Irrigation Canals.

CEP 503 Non-Topographic Photogrammetric Surveying

Introduction to NTPS, Types of Analog and Digital Cameras Used in NTPS, Calibration of Cameras, 3D Computation from Close Range Photogrammetric Systems, Multi Station Close Range Photogrammetric Systems, Application of NTPS in Engineering and Non Engineering Projects, Application of NTPS in Mobile Mapping Systems (MMS).

CEP 504 Map Production

Introduction to Software Packages Used in Map Production, Techniques of Manipulating Raster Images, Radiometric and Geometric Correction of Raster Images, Raster to Vector and Its Errors, Production of Orthophoto: Methods Display Enhancement, Merging DTM with Digital Maps, Printing and Color Separation of Orthophoto, Printing and Manipulating Digital Maps.

CEP 505 Techniques for Surveying Data Collections

Kinds of Surveying Data, Different Methods of Collecting Surveying Data, Study of Computability and Homogeneously of Methods of Collecting Data, Data Preparation for Computer Handling, Data Storage on Computers, Methods of Data Recalling, Methods of Updating Data.

CEP 506 Cartography and Cadastral Surveying

Kinds of Cadastral Maps (Paper Copy and Digital Maps), Map Key and Arrangement of Maps, Design of Symbols and Features Library, Extraction of Maps with Different Scales from Surveying Data Collected from Cadastral Purposes, Relation Between The Cadastral Surveying and The Laws of Ownership and Heritage, Land Subdivision of Cities, Municipalities and Schist, Cultivated Land Subdivisions and Their Relations with Sources of Water Drainage Systems and Roads, Documentation for Ownership, Taxes and Land Registration.

CEP 507 Digital Mapping Technology

Introduction to Digital Mapping, Techniques of Creating and Updating 2D, 2.5D, and 3D Digital Maps and Its Link with Digital Topographic Databases (DTDB), Superimposition of Digital Maps on Raster Imagery and Back Projection Techniques, Updating Geographic Information Systems (GIS) Using Digital Maps, Wide Area Digital Mapping Systems, Application of Digital Mapping in Navigation and Automatic Vehicle Location (AVL).

CEP 508 Digital Image Processing

Types of Digital Imagery, Radiometric and Geometric Corrections of Digital Imagery, Georeferencing of Digital Imagery, Different Filtering, Sharpening and Enhancement, Information Extraction Techniques and Applications, Raster to Vector, Storage and Compression of Digital Imagery, Multi Resolution Digital Imagery Techniques.

CEP 509 Photo Interpretation

Principles and Applications of Photo Pattern Analysis, Geologic and Geomorphologic Patterns, Terrain Studies and Land Use Suitability and Capability Mapping, Energies of The Natural and Cultural Environment, Current Remote Sensing Systems and Histories of Applications in Measuring Environmental Energy, Information Environment, Land Information Systems (LIS), Methods of Photogrammetry and Digital Cartography, Photo Interpretation Applications in Urban Development, Dams, Construction Materials, Highway Engineering.

CEP 510 Geometric Geodesy

Overview of All Possible Geodetic Positioning Techniques, Establishment of First Order Geodetic Datum, Ellipsoid Geometry, Reduction of Terrain Measurements to The Ellipsoidal Surface, Coordinate Systems in Geodesy, Two- and Three-Dimensional Computations, Coordinate Computation in The Mapping Plane and Related Coordinate Transformations Between Different Involved Systems.

CEP 511 Adjusting Surveying Measurements

Review of The Theory of Errors, Review of Matrix Algebra, Univariate and Multi Variate Error Propagation, General Mode Model of Combined Least Squares Adjustments, Parametric and Condition Adjustments as Special Techniques of The General Mode Combination of Different Adjustment Models, Step By Step Adjustment Techniques, Selected Methods of Solving Large Systems of linear Algebraic Equation, Selected Techniques for Prediction, Approximation and Filtering.

CEP 512 Positions Determination Systems

Basic Idea of Positioning By Satellites, Satellite Orbital Space Geometry, Satellite Coordinates and Associated Transformations, Review of Different Satellite Positioning Systems (Photographing, Ranging, Doppler, GPS), Description of The Global Positioning GPS System, Types of GPS Observable, GPS Error Analysis, GPS Observing Techniques, GPS Alternative Solutions and Adjustment, GPS Application in Surveying and Geodesy.

CEP 513 Surveying for Engineering Projects

Surveying Techniques Suitable for Small Projects, Surveying Techniques Suitable for Medium Projects, Surveying Techniques Suitable for Big Projects, Surveying Techniques Suitable for Projects Related to Special Mechanical and Steel Constructions, Coordination Between Surveying Works and The Civil and Engineering Works of The Project, Continuity of Surveying Works Needed for The Project Before, During, and After The Establishment of The Project.

CEP 514 Principles of Remote Sensing

Fundamental Considerations, Electromagnetic Energy, Electromagnetic Spectrum, Image Characteristic, Vision, Sources of Remote Sensing Information, Aerial Photography, Interactions Between Light and Matter, Characteristics of Aerial Photographs, Black and White Photography, Infra-Red Color Photography, Spectral Reflectance, Multi Spectral Photography and Imagery, Sources of Aerial Photographs, Satellite Imagery, Landsat Imagery, Spot Imagery, Other Remote Sensing Systems, Thermal Infra-Red Imagery, RADAR Imagery, Digital Image Processing, Information Extraction, Strategy and Hardware for Image Processing, Applications in Civil Engineering.

CEP 515 Surveying Computations and Drawing

Basic Definitions, Uses of Coordinates in Surveying Computation: Justification, Coordinate Systems and Associated Term, Basic Calculation, Checking of Observations and Computations, Computation of Point Coordinates from Data Acquired By Different Methods: Offset, Polar, Intersection, Resection, Transformation of Coordinates Between Different Cartesian Coordinates Systems, Available Software, Drafting: Manual, Computer-Aided.

CEP 516 Physical Geodesy

Fundamentals of The Earth's Gravity Field (Gravity, Potential, Level Surfaces), Gravity Measurements and Reduction, (Absolute and Relative Measurements, Gravity, Gravity Anomalies), The Three Main Boundary Value Problems of Physical Geode and Their Solutions, Geode Determination Techniques (Astro-Geodetic, Gravimetric, Satellite), High Systems (Orthometric, Dynamic, Normal), Gravimetric Effect of Geodetic Measurements, Techniques of Gravity Prediction and Applications of Gravity Anomalies.

CEP 517 Analysis of Deformation Measurements in Constructions

Causes of The Structural and Terrain Deformation, Internal and External Factors Affecting The Deformation of Structures and Their Relation with The Stress Strain Theory, Methods for Measuring The Vertical Movements, Methods for Measuring The Horizontal Movements, Methods for Measuring The Movements in 3D, Analysis of The Field Measurements, Statistical Theories for Deformation Data Analysis, Concluding The Results and Writing The Reports.

CEP 518 Design and Processing of Surveying Measurements

Fundamentals of The Theory of Probability, Fundamentals of The Theory of Statistics, Univariate Probability Distribution Functions, Internal Estimation and Hypothesis Testing, Measures of Quality of Geodetic Networks (Precision, Reliability, Sensitivity, Outliners Detection), Optimization Methods, Techniques of Pre Analysis and Design of Surveying Measurements, Technique of Post Statistical Analysis of Survey Adjustment Results.

CEP 519 Applications of Astronomy in Surveying

Celestial Bodies, Celestial Spare and Celestial Coordinate Systems, Astronomic Triangle and Its Solutions, Special Star Positions, Concept of Time Systems (Sidereal, Solar, Atomic), Variations in The Celestial Catalogues and Epheinerids, Deferent Techniques for Astronomic Latitude Determination, Deferent Techniques for Astronomic Azimuth Determination, Applications of Astronomic Measurements in Surveying and Geodesy.

CEP 520 Land Information System (LIS)

Information Systems (Features, Administration, Decision), Geo Information Systems (GIS LIS) Processing (Classification, Transformation, Programming) Data Input and Data Output Format and Management (Traditional Filing Systems, Architectural of Data Base Systems, Standard and Non-Standard Approaches) Distributed Systems (Computer Networks, Data Communication Technology) Project Selection, Design and Implementation.

CEP 521 Principles of Hydro-Graphic Surveying

Scope of Hydro-Graphs, Kinds of Hydro-Graphic Projections, Physical Environmental Effects and Operations (Observation of Water Flow, Waves, Fides,...), Planning of Matinee Surveying Projects, Survey Techniques on Shore, Survey Techniques OFF Shore: Vertical Measurement of Depth By Sounding, Horizontal Control of The Sounding Positions, Reduction of Sounding to a Datum, Data Processing, Establishment of Marine Surveying Maps, Construction of Engineering Marine Projects (Pipelines,

Charting Data Handling and Liability, Marine Environmental Operation Studies), Different Procedure for Vat Sampling and Bottom Sampling and Location Determination.

CEP 522 Dynamic Geodesy

Earth Dynamic, Earth Rotation, Earth Polar Motion, Earth Tides, Crystal Movements Measurements, Satellite Dynamic and Perturbation, Satellite Orbital Analysis, Inertial Survey System and Its Integration with Other Physical Tenestrial and Space Systems, Satellite Altimeter and Sea Surface Variation and Topography, Earth Orientation Parameters.

CEP 523 Map Projection and Coordinate Systems

Coordinate Reference Systems on Plane and Sphere (Geographical and Cartesian), Some Basic Ideas About The Mathematics of Map Projection, Classification and Naming of Map Projection (Plane, Conical, Cylindrical), Choosing a Suitable Map Projection, The Transverse Macerator Projection, Applications of Map Projection in Surveying.

CEP 524 Writing Surveying Reports

Conception of The Report Subject, Data Gathering, Classification and Storage, Classification of Reports, Qualities of Effective Reports, Report Format, Basic Writing Principles, Contents of Format Reports, Graphic and Tabular Presentation of Results, Documentation, Filing and Storage Security.

CEP 525 Management of Surveying Projects

Parameters of Surveying Engineering Projects, Power and Instrumental Resources Needed for The Projects, Study of The Surveying (Electrical, Mechanical, Environmental), Analysis for The Required Surveying Works Before, During, and After The Constriction. Design of The Project Time Table, Design of The Time Table of The Revision Supervision, Quality Control Software Packages, Applications.

CEP 526 Topographic Photogrammetric Surveying

Geometry of Air Photographs, Classical Methods of Photogrammetric Mapping, Derivation of Height Information from Parallax Measurements, Cameras, Processing, Plotting Instruments, Analog Aerial.

CEP 530 Highway Planning and Feasibility Studies

Reconnaissance Studies, Route Selection, Economic Analysis and Feasibility Studies-Preliminary Engineering Studies.

CEP 531 Highway Geometric Design

Highway Classification, Traffic Characteristics, Geometric Design Controls and Criteria Horizontal and Vertical Alignment, Planning and Design of Highway Intersections and Interchanges, Traffic Control Devices.

CEP 532 Highway Construction Materials

Soil Characteristics for Highway Construction, Base and Sub-Base Materials, Asphalt Concrete Materials, Asphalt and Cement Concrete Mixtures.

CEP 533 Hydrological Studies of Highways

Meteorological Information, Morphological Computations of Wadis and Basins, Determination of Water Discharge Flow, Hydraulic Design of Storm Water Drainage Structures, Highway Protection Techniques Against Storm Water.

CEP 534 Structural Design of Highway Pavements

Vehicle Characteristics and Traffic Loading, Stress Analysis in Flexible and Rigid Pavements, Structural Design of Pavements.

CEP 535 Principals of Highway Construction Documentation

Technical Specifications for Highway Construction, Conditions of Contract, Bills of Quantities and Basis of Payment, Construction Documents.

CEP 536 Airport Planning and Design

Airport Components, Aircraft Types and Characteristics, Airport Planning, Geometric and Structural Design of Airfield Strips and Aprons, Marling Signs Navigation Aids and Lighting.

CEP 537 Highway Construction Technology and Quality Control

Highway Embankment Construction Technology, Pavement Construction Technology, Management of Production of Asphalt Mixture, Quality Control and Quality Assurance.

CEP 538 Highway Maintenance

Pavement Distress and Condition Evaluation, Maintenance Operations for Pavements, Drainage Structures and Highway Furniture Elements, Pavement Recycling, Maintenance Management Systems.

CEP 539 Highway Construction Management

Highway Project Management Procedures and Methodology, Application of Highway Project Management, Application of Value Engineering in Highway Projects.

CEP 540 Railway Capacity

Definitions, Trains Running with Uniform Speed, Trains Running with Variable Acceleration, Brake System Dynamics, Signals Systems, Factor Affecting Railway Capacity, Railway Capacity Improvement Priorities, Line Capacity, Car Capacity and Station Capacity.

CEP 541 Railway Alignment

Railway Alignment Rules, Factors Affecting Alignment, Surveying, Vertical and Horizontal Curves Design and Adjustments, Construction Limits (Gaparite), Schedule Time Table Design to Execute Railway Constriction Project.

CEP 542 Metro, Lines Alignment and Operating

Metro Lines Types, Characteristics As Geometric and Structural Point of View, Metro Stocks Characteristics, Metro Gates to Or From Station, Special Requirements for Underground Metro, Signals and Automatic, Centralized Traffic Control Systems, Metro Line Capacity and Factors Affecting It, Operating Cost and Pricing Policy Study.

CEP 543 Railway Track Elements Design

Mechanical Characteristics of Track Subgrade and Stabilization Methods, Railway Defects: Measurement and Maintenance, Railway Track Static and Dynamic Studies, Wheel–Rail Contact, Swaying and Derailment, Railway Vibration, Sleeper and Ballast Design, Rail Design, Welding Rail, Fatigue, Passenger Comfort, Rail Sleeper Fastening, Fishplates and Anticreeper, Railway Gaparite and Right of Way, Concrete Sleeper Production and Consumption.

CEP 544 Rapid Speed Train Technology

Rapid Speed Train Characteristics, Technical Demandes and Requirements for Geometric Alignment and Structural Design of Lines, Turnouts, Station, Signals and Traffic Control System for Rapid Speed Trains Lines, Maintenance and Renewal of Rapid Train Lines. Economical & Feasibility Study for Rapid Speed Trains Lines Operations.

CEP 545 Railway Turnouts Design

Turnouts: Types and Function, Switches Types in The Railway, Switch Design, Diamond Crossing, Cross-Over, Scissor Crossover, Slip-Double -Junction, Rapid Speed Turnouts, Level Crossing Between Railway and Roads, Level Crossing: Specifications and Types, Special Conditions for Turnouts Execution, Turnouts Safety and Operating, Turnouts Maintenance and Renewal, Turnouts Development Technology.

CEP 546 Railway Station Planning

Stations Types, Passenger Stations Design, Station Components: (Station Parking, Building, Platform, Tracks, Turnouts, Subway and Footbridge, and Signal Cabin), Freight Stations, Marshaling Yards, Car Turnaround, Container Stations, Passenger and Freight Stations.

CEP 547 Railway Signals

Signal Systems: Mechanical, Electrical, Partial Interlocked & Non Interlocked Signals, Main & Secondary Signals Turnouts & Signal Safety Methods, Signal Cabins, Centralized Traffic Control Design, Mechanical Interlocking, Light Signals, Automatic Block Section, Train Driver Cabin Indicators, Centralized Traffic Control (C.T.C) & Automatic Train Control (A.T.C), Signal System Effects on Operating, Line, Car and Station Capacity.

CEP 548 Railway Maintenance and Renewal

Rolling Stock Maintenance, Railway Track Elements Examine and Measurements, Track Maintenance and Renewal Methods, Tolerance and Specifications, Rail Defects Measurements Devices, Maintenance Types, Renewal and Construction Equipments, Speed Limits for Track Under Maintenance, Maintenance and Renewal Turnouts and Signals, Periodic and Seasonal Schedule for Maintenance, Economic Effect Study for Railway Maintenance and Renewal.

CEP 549 Advanced Technology of Railway Signals

Automatic and Light Signals Development Study for Both Urban (Underground Metro) Or Rural Trains, Train Driver Cabin Signals, Centralized Traffic Control (C.T.C) and Automatic Train Control (A.T.C) Study, Remote Sensing System for Train Operating, Line, Car, Station Capacity Improvements By Using Developed Signal System.

CEP 550 Introduction to Urban Transportation Planning

Transportation Planning Stages, Data Collection for Urban Studies, Analysis and Collaboration of Data, Study Sectors and Zoning System, Trip Generation and Distribution, Mode Choice, Road Network Planning and Evaluation, Public Transport on Road Network.

CEP 551 Urban Transportation Planning

Transportation Planning Stages, Transportation Problems Definition, Data Collection, Trip Generation, Trip Distribution, Modal Choice, Network Planning and Trip Assignment, Transportation Projects Evaluation.

CEP 552 Public Transportation Planning

Overview of Transportation Planning, Introduction to Transit Planning, Transit Networks, Time Transfer Network, Transit Route Planning, Transit Schedule Planning, Transit Revenue.

CEP 553 Statistical Applications in Transportation

Introduction to Sampling Techniques, Probability and Probability Distributions, Discrete and Continuous Models, Applications of Statistical Procedures, Estimation with Small Samples, Fitting Procedure, Statistical Analysis of Before and After Studies.

CEP 554 Freight Transportation System

Framework of Transportation Planning, Data Sources and Collection, Aggregate Demand Models, Application to Commodity Flow.

CEP 555 Transportation Systems Analysis

Principles of System Analysis, Traditional Transportation Demand Model, Critique of The Four Step Model, Travel Budget and Levels of Choice, Behavior Modeling, Land Use Models.

CEP 556 Computer Applications in Transportation

Techniques of Analytic and Simulation Modeling, Steps in Developing a Simulation Model, Simulation Methodology Including Generation of Random Numbers and Variables, Validation and Analysis of Simulation Modeling and Results, Computer Simulation Models, Signalized Intersections, Arterial Network and Freeway Corridors.

CEP 557 Transportation Economics

Annual Cost Formulas, Motor Vehicles Operation Cost and Economic Analysis, Economic Theory and Behavior of Large Transportation Systems, Urban and Intercity Passengers and Freight, Estimation and Application of Production Costs, Demand Functions, Evaluation of Governmental Transportation Policies, Economic Regulations, Infrastructure Investments, Pricing and Financing Costs, Benefit Analysis Impact Upon Economic Efficiency.

CEP 558 Expert Systems for Transportation

What is an Expert System, Expert Systems Versus, Conventional Software, Problem Solving Using Expert System Techniques, Attributes and Characteristics of Expert Systems, Knowledge Representation, Matching and Search as Problem Solving Methods, Uncertain and Inaccurate Knowledge, Tools for Building Expert Systems, Applicability of Pavement Maintenance and Rehabilitation Expert System, Site-Impact Analysis Expert System, Traffic Signal Expert System, Class Project.

CEP 559 Transportation Network Equilibrium

Network Representation, Network User Equilibrium, Basic Concepts in Minimization Problems, Formulating The Assignment Problem as a Mathematical Problem, Review of Some Optimization Algorithms, Solving of User Equilibrium, User Equilibrium with Variable Demand, Combination of Trip Distribution, Traffic Assignment, Modal Split Models.

CEP 560 Sanitary Chemistry

Water Quality and Methods of Measurements, Design of Water Quality Measurement Program, Physiological and Physical Properties Such as pH, Hardness, Nitrogen, Phosphorus, Phosphate, Sulfate, Chlorides, Dissolved Oxygen, Chlorine, Iron and Manganese, Water Pollution with Pesticides, Methods of Removal of Dissolved Organic Matter, Methods of Determination of BOD, COD, and TOC.

CEP 561 Bacteriology of Water and Wastewater

Major Groups of Micro Organisms, Advantages of Algae and Its Role in Sewage Treatment, Bacterial Physiology and Metabolism Including Growth Requirements, Action of Micro Organisms Especially Bacteria on Different Substrates, Pollution of Water By Different Microbes, Value and Significance of The Bacteriological Examination, Factors That Influence Bacteria in Water, Indication of Water Pollution By Bacteria, Different Microbial Indicators of Water Pollution and Its Detection, Water Borne Diseases.

CEP 562 Environmental Engineering and Pollution Control (1)

Main Parameters of Environment Impacts on The Projects, Environmental Impacts of The Project on The Human, Environmental Impacts of The Project on The Animals, Environmental Impacts of The Project on The Plants, Environment Impacts of The Project on The Birds, Environmental Impacts of The Project on The Rest of Components of The Environment, Environmental Impacts of The Project During The Construction, Environmental Impacts of The Project After Construction, Governing Laws.

CEP 563 Water Treatment

Coagulation and Flocculation, Sedimentation, Filtration, Disinfecting and Its Different Application, Adsorption, Iron and Management Removal, Water Desalination, Softening Organic Matter Removal, Heavy Metals Removal, Sludge Treatment, Fluoridation Water Quality Regulations.

CEP 564 Wastewater Treatment

Quantity and Quality of Wastewater, Primary Treatment, Suspended Growth Biological Treatment, Attached Growth and Dual Biological Treatment, Nitrification, Identification, Phosphorus Removal, Chemical Treatment, Anaerobic Treatment, Oxidation Ponds, Aerated Lagoons, Land Application, Disinfecting, Upgrading of Existing Wastewater Treatment Plants.

CEP 565 Sludge Treatment

Characteristics and Volume of Sludge, Sludge Handling, Sludge Stabilization, Thermal Processing of Sludge, Ultimate Disposal and Utilization of Sludge, Sludge Denaturing.

CEP 566 Introduction to Computer Applications in Traffic & Transportation

Identification of Some Transportation and Traffic Software, Use of Some Statistical Software in Transportation, Using of Some Software in Analyzing Traffic and Speed Data.

CEP 567 Projects Management and Operation

Process Optimization, Performance Evaluation of The Projects, Economics of Water Projects, Project Follow Up, Process Auditing, Real Time Control, Project Maintenance.

CEP 568 Industrial Water Supply

Treatment of Boiler Water, Cooling Water Circuits, Problems Associated with Industrial Water Supply, Industrial Water Supply for Metallurgical Industry, Paper Industry, Food Industry, Agricultural Industry, Textile Industry, Chemical and Pharmaceutical Industry and Other Industries, Reuse and Recycling of Industrial Water.

CEP 569 Industrial Wastewater Treatment

Effect of Industrial Wastes on Sewerage System and Wastewater Treatment Plant, Methods of Industrial Wastes Produced from Paper Industry, Textile, Feed Industry, Pharmaceutical Industry, Steel Industry, Reuse of Treated Industrial.

CEP 570 Solid Wastes

Source, Composition, Properties and Quantities of Solid Wastes Handling and Storage at The Source, Methods of Solid Wastes Collection, Methods of Solid Wastes Collection and Methods of Disposal, Separation and Processing Technologies, Recycling of Solid Wastes, Planning and Operation of Solid Wastes Management System.

CEP 571 Traffic Impact Studies

Determination of The Affected Area Around The Activities, Traffic Data Collection for The Adjacent Transportation Network, Assessment of The Current Situation, Determination of The Trip Generation, Trip Distribution, Modal Split, and Trip Assignment for The Activity, Assessment of The Future Situation, Proposals for Solving The Traffic Problems Resulted From The New Activity.

CEP 572 Wastewater Collection Systems

Sources and Wastewater Flow, Types of Collection System, Planning of Collection System, Hydraulic Design of Gravity Sewers, Sewers Materials, Appurtenance of Sewers, Biological Decomposition in Sewers, Pumping Stations, Design of Force Mains, Water Hammer in Force Mains, Test of Sewers.

CEP 573 Water Collection Works

Types of Intake, Choice of Proper Location, Hydraulic Design of Pipe Intakes, Design of Low Lift Pump and Water Transmissions Lines, Types and Design of Water Screens, Ground Water, Types of Wells, Hydraulic Design of Wells, Types of Pumps Used to Lift Ground Water.

CEP 574 Environmental Engineering and Pollution Control (2)

Polluted Water and Its Environmental Impact, Reuse of Domestic Wastewater and Its Environmental Impact, Reuse of Industrial Wastewater and Its Environmental Impact, Pollution of Ground Water and Surface Water, Engineering Works to Protect Natural Water Against Pollution.

CEP 575 Master Planning for Sanitary Projects

Basic Studies, Population, Rate of Water Consumption, Rate of Sanitary Wastewater Disposal, Climatic Condition, Topographical and Surveying Studies, Geotechnical Studies, Feasibility and Economic Studies, Optimization and Deign, Environment Consideration.

CEP 576 Water Pollution

Characteristics of Water, Pollutants of Water and Its Sources, Dangerous of Water Pollution, Methods of Measuring Water Pollution, Controlling of Water Pollution, Treatment of Polluted Water.

CEP 577 Soil Pollution

Soil Properties, Pollutants of Soil and Its Sources, Dangerous of Soil Pollution, Methods of Measuring Soil Pollution, Controlling of Soil Pollution, Treatment of Polluted Soil.

CEP 578 Noise & Vibrations

Hearing Pollution Definitions & Dangerous, Noise & Vibrations Causes, Sources of Noise & Vibrations, Methods of Measuring of Noise & Vibrations, Controlling of Noise & Vibrations, Treatment of Noise & Vibrations Problems.

CEP 579 Air Pollution

Composition of Air, Pollutants of Air and Its Sources, Dangerous of Air Pollution, Methods of Measuring Air Pollution, Controlling of Air Pollution, Treatment of Polluted Air.

CEP 580 Railway Environmental Effects

Importance of Environmental Studies, Air Pollution, Main Air Pollutants, Mathematical Air Pollution Models, Noise: Railway Noise Problems, Specifications and Mathematical Models, Vibrations Effects on Both Track and Adjacent Buildings, Mathematical Models for Vibrations Value and Their Effects.

CEP 581 Traffic Flow Theories

Traffic for Elements, Traffic Measurements and Distributions, Traffic Stream Models, Supply, Demand Modeling, Fundamental Traffic Stream Modeling, Car Following Models, Shock Wave Analysis and Hydrodynamic Models, Queuing Analysis, Simulation of Traffic Behavior.

CEP 582 Traffic Studies and Analysis

Traffic Data, Nature and Needs, Data Types and Relevant Statistical Theory, Traffic Analysis Process, Presentation of Data and Descriptive Statistics, Experimental Design and Sample Theory, Vehicle Progression, Hypothesis Testing and Non-Parametric Testing, Distribution Fitting, Vehicle Counting and Classification, Speed, Travel Time and Delay Surveys, Origin Destination Surveys, Vehicle Impact, Traffic Generation Surveys, Parking Surveys and Safety Surveys, Environmental and Energy Impacts, Modern Technology in Traffic Data Collection, Technology of Vehicle Detection, Traffic Data Logging Video Based Traffic Data Collection, Data Analysis and Interpretation, Model Development, Optimization and Information Theory.

CEP 583 Traffic Management and Control

Objectives of Traffic Management, Procedures for Implementing TSM, Environmental Protection and Enhancement, Measures Influencing Vehicle Speed, Facilities for Pedestrians, Facilities for Buses, Management of Heavy Goods Vehicles, Economic Returns of Traffic Management.

CEP 584 Traffic and Roads Impact on Environment

Introduction on Socio-Economic Impact of Transportation Projects, Requirements of Environmental Studies, Environmental Impact Statements, Air Pollution Sources and Composition, Mathematical Models, Noise and Attenuation Measures, Visual Intrusion and Impact.

CEP 585 Traffic Systems Analysis

Introduction to Systems Analysis, Linear and Non-Linear Models, Traffic Characteristics and Composition, Traffic Measures of Performance, Interaction Among Transport Systems, Evaluation of Traffic Operations, Systems Economics and Finance, Environmental Considerations.

CEP 586 Traffic Flow Theories and Engineering

Deterministic Models, Capacity, Differential and Integral Equations, Shock Wave Theory, Traffic Flow Parameters Measurements, Stochastic Models, Queuing Theory, Vehicles and Pedestrian Delays, Maximum Probability Theory for Gap Acceptance Estimation, Engineering Applications, Optimum Usage of Traffic Signals, Buses Unloading, Determination of Critical Zones, Cycle Time Calculation and Green Allocation, Actuated Traffic Signals Systems.

CEP 587 Statistical Applications to Traffic Operations

Introduction to Statistical Distributions, Sampling Procedures and Sample Size, Fitting Procedures, Speed Distribution, Volume Distribution, Time Headway Distribution, Statistical Significance of Traffic Improvement Measures.

CEP 588 Traffic Accidents and Roads Safety

Accidents Incidents and Conflicts, Types of Accidents, Identification of High Accidents Locations, Human Factors and Behavior, Vehicular and Pedestrian Safety Requirements, Data Collection Procedure, Computerized Recording of Data Collection, Accidents Statistics, Accidents Rates and Their Usage, Statistical Analysis of Before and After Accidents Data, Accidents Prediction Models, Site Analysis Environmental, Geometric and Physical Conditions of The Site, Evaluation of Safety at Site, Approaches to Highway Safety, New Techniques in Safety Analysis, Traffic Conflict Techniques.

CEP 589 Advanced Traffic Control Devices

Simulation of Traffic at Junction and on Corridors, Calibration of Traffic Movement, Advanced Traffic Control Systems at Junctions, Optimization and Coordination of Signals, Freeway Traffic Control, Central Traffic Control Systems, Intelligent Transport Systems.

CEP 590 Reuse & Recycling

Types of Wastes, Sources of Wastes, Wastes Treatment Processes, Recycling, Solid Wastes Reuse, Wastewater Reuse, Gas wastes Reuse, Conditions of Reuse.

CEP 591 Engineering Economics

Equivalence, Interest Factors and Problems, Annual Cost Method, Present Worth Method, Rate of Return Method, Benefit to Cost Ratio Method, Income Tax, Depreciation, Choice of Growth Factors, Multiple Alternatives, Sensitivity Tests, Expected Cost, Increment Cost, Sunk Cost, Source of Funds, Cost Effectiveness Method.

CEP 592 Environmental and Social Studies

Main Factors Officiating The Environment, Environment Problems, Socio-Economic, Physical Characteristics for Study Area, Methods for Population Prediction in The Future, Environment Impacts of Infrastructure Projects, Environmental Law and Their Suitability for The Protection of The Environment.

CEP 593 Properties & Evaluation of Environmental Quality

Sampling and Analysis Techniques, Data Requirements for Pollution Control, Archiving Data, Importance of Flow Measurement, Sampling Techniques, Data Handling and Presentation, Assessment Quality Models, Describing Uncertainty, Hypothesis Testing, Simple Linear Regression Models, Problems of Projects Auditing in Egypt and Their Solutions, Examples of Auditing Projects.

CEP 594 Plants Performance Evaluation

Sampling and Analysis Techniques, Data Requirements for Plant Control, Archiving Data, Importance of Flow Measurement, Sampling Techniques, Data Handling and Presentation, Assessment Quality Models, Describing Uncertainty, Hypothesis Testing, Evaluation & Follow up Programs, Examples of Evaluating Plants Performance.

CEP 595 Public Health

Responsibilities of Public Health Engineer, Vital Statistics Communicable Discuses, Methods of Infection and Prevalence and Etiologic Agents, Control of Commercial Diseases, Public Health Haggard of Solid Waste System, Public Health and Water Supply, Public Health and Sanitary Waste Water, Public Health and Air Pollution, Occupational Health, Supervision of Recreational Activities, Public Health Education.

CEP 596 Transportation Policy and Planning

Role of Transportation in The Country Planning Policy, Basics and Role of Different Modes of Transport, Interaction Between Land Uses and Persons and Freight Transport, Transportation Planning Process, Fundamentals of Transportation Economics, Planning and Operation of Public Transport. Different Policies in Freight and Pass Transport for The Urban and Regional Level.

CEP 597 Transportation and Traffic Planning (1)

Systems of Transportation Planning, Relation to Planning Urban Design, Study of a Site and The Possibilities of Reaching It Through Different Traffic Networks (Hand Transportation, Trains, Water Air Transportation), Relation of Local Traffic Networks (In The Framework of Urban Projects) with Regional Networks, Systems of Calculation of Traffic Flow in to Developing Areas.

CEP 598 Transportation and Traffic Planning (2)

Ways and Systems of Transportation in World Cities, Comparing with The Resent Condition in Egypt, Different Transportation Systems in Egypt and Assessing Their Performance and Understanding The Administrative and Economic Factors, The Environmental Effect of The Transportation Present, Systems of Upgrading and Its Competence, Transportation from a Planning Perspective and The Neutral Relationship Between Planning on The Local Regional and National Level and Between Systems of Transportation on The Previous Levels, The Basis of The Design of a Transportation Network, Factors Affecting The Norms and Different Levels of Planning.

CEP 599 Traffic Engineering

Introduction: What is Traffic Engineering?, Traffic Problems, Characteristics of Driver, Pedestrian, Vehicle, and Road, Traffic Flow Characteristics: Traffic Flow Elements, Volume, Speed, Travel Time and Delay Studies, Capacity and Level of Service, Weaving at Intersections, Freeways, and Expressways: Traffic Control Devices: Definition, Types and Purposes of Devices, Installation Requirements, Uniformity of The Devices, Intersection Control: Conflict Points at Intersections, Types of Intersection Control, Pedestrian Control, Bicycles Control, Traffic Signals: Warrant for Use of Traffic Signals, Phasing, Vehicular and Pedestrian Safety Requirements, Saturation Flow, Cycle Time Calculation, Green Allocation, Parking: Types of Parking Facilities, Parking Characteristics, Parking Surveys, Design Principles of Parking Spaces, Accidents and Road Safety: Factors Involved in Accidents, Accidents Report, Accident Statistics, Types of Accidents and Trends, Studies of High-Parking, Safety Studies.

CEP 602 Photo Interpretation and Digital Image Processing

Principals of Photo Interpretation, Image Quality, Factors Affecting Image Quality and Interpretation, Pattern Recognition and Analysis, Geologic and Geomorphologic Applications, Types of Digital Imageries, Radio Metric Properties of Digital Images, Processing Techniques of Digital Images, Enhancement, Filtering, Classification, Applications.

CEP 603 Photogrammetry

Aerial Surveying, Types of Aerial Photo, Geometry of Overlapping Aerial Photos, Determination of 3D Coordinates from Planning of Aerial Surveying Projects, Modern Techniques in Photo Grammetry, Types of Terrestrial Cameras, Calibration of Cameras, Determination of Three Dimensional Coordinates from Terrestrial Photos, Applications.

CEP 604 Digital Maps and Map Production

Techniques for 2D and 3D Digital Maps, Digital Topographic Database, DTDB, Superposition of Digital Map and Raster Image Application in GIS and Navigation, Software Used in Map Production, Updating of Raster Images, Vectorization of Raster Images, Merging of DTM and Digital Maps, Printing.

CEP 605 Hydro-Graphic Surveying

Scope of Hydro-Graphs, Types of Hydro-Graphic Projections, Physical Parameters effects, Hydro-Graphic Survey, Planning for Marine Surveying Projects, On-Shore Surveying Techniques, Off-Shore Surveying Techniques, Data Processing, Marine Maps Applications.

CEP 606 Surveying Data Collections and Computations

Types of Surveying Data, Techniques of Surveying Data Collection, Integration and Computability of Surveying Data, Data Preparation for Computer Processing, Use of Coordinates in Surveying Computations, Types of Surveying Coordinate Systems, Determination of Point Coordinates from Different Surveying Measurements, Transformation of Coordinates, Available Software for Computations and Drafting.

CEP 607 Physical and Dynamic Geodesy

Fundamentals of The Earth Gravity Field, Gravity Measurements and Reductions, Geodesy Determination Techniques, High Systems, Gravimetric Effect on Geodetic Measurements, Celestial Bodies, Spheres and Coordinate Systems, Concept of Time Systems, Determination of Astronomical Coordinates and Azimuth, Earth Rotation and Tides, Crystal Movement Measurements, Satellite Dynamics, Inertial Surveying System and Its Integration with Other Systems.

CEP 608 Geometric Geodesy and Position Determination Systems

Geodetic Datum, Ellipsoid Geometry, Reduction of Terrain Measurements, Geodetic Coordinate Systems and Transformation, Position Determination in 2D and 3D Systems, Satellite Geodesy, Stiletto Coordinates and Transformation, Types of GPS Observations, GPS Error Analysis, GPS Measuring Techniques, Application.

CEP 609 Construction Deformation Measurements

Surveying for Buildings, Route Surveying, Tunnel Surveying, Surveying for Infra-Structure Projects, Surveying for Machines Installations and Fittings, Sources and Types of Structure Deformation, Surveying Techniques for Detecting Vertical Movements, Surveying Techniques for Detecting Horizontal Movement, Techniques for Detecting 3D Movements, Analysis of Collected Data, Presentation of Results.

CEP 610 Adjustment and Analysis of Surveying Measurements

Univariate and Multivariate Statistics and Error Propagation, General Model for Combined Least Squares Adjustment, Parametric and Conditional Adjustment as Special Techniques, Combination of Different Adjustment Models, Step By Step Adjustment Techniques, Probability Distribution Functions, Interval Estimation and Hypothesis Testing, Measures of Quality of Surveying Networks, Optimization Method Techniques of Pre-Analysis and Design of Surveying Measurements, Techniques of Post-Statistical Analysis of Adjustment Results.

CEP 611 Cartography and Map Production

Types of Maps, Conventional Maps, Digital Maps, Layout of The Map Sheet, Symbolization, Map Compilation from Different Sources, Maps as Legal Documents, Coloring of Maps, Masking, Scribing, Printing, Archiving, Reduction of Maps, Map Projection Systems and Transformation.

CEP 612 Land Information Systems and Digital Terrain Models

Information Systems, Geographic Information System (GIS, LIS) Processing, Transformation, Classification, Programming, Data Input and Output Formats and Alternatives, Database Management, Database Systems Standards, Non-Standard Approach, Distribution System, Project Selection, Design, and

Implementation. Mathematical Methods for The Digital Terrain Models, Digital Terrain Models Derived from Tops Maps, Integration of DTM with Surveying Data, Applications.

CEP 613 Remote Sensing

Fundamentals, Electromagnetic Energy and Spectrum, Image Characteristics, Vision, Source of Remote Sensing Information, Interaction Between Energy and Matter, Characteristics of Aerial Films, Spectral Reflectance, Multi-Spectral Photography and Imagery, Remote Sensing Systems, (Multi-Spectral Scanners, Thermal Infrared Scanners, Microwave Imaging Systems, Solid Array Systems, Operational R. S. Systems, Application.

CEP 614 Management and Reporting of Surveying Projects

Main Elements of Surveying Projects, Estimation of Surveying Project Requirements Surveying Reference Data (Man, Power, Equipment), Planning and Design of Surveying Control Network, Planning and Construction for Surveying Moments, Time Schedule for The Elements of Surveying Projects (Planning, Field Works, Office Works), Field Check, Revision and Quality Control, Concept of Report Writing, Report Format, Basic Writing Principals, Contents of Formal Reports, Graphic and Tabular Presentation of Results, Filing and Security Procedure for Report.

CEP 615 Infra Structure Utilities and Surveying

Design of Control Networks, Highway Surveying, Surveying for Sanitary Engineering Projects, Setting Out of Infrastructure Projects, Role of Global Positioning System (GPS) in The Execution of The Infrastructure Projects, Coordination of Public Works Engineers for Performing Surveying Works Before, During and After The Execution of The Infrastructure Projects.

CEP 616 Application of GIS in Utilities Projects

Advanced Survey By GPS, Field Observations, Static and Kinematics Relative Positioning, Real Time Kinematics Positioning for Wide Areas, Application of GPS in Highway, Railway and Traffic Works, Integration of Total Station and GPS, Execution of Extended (Longitudinal) Projects.

CEP 617 Legal Registration and Cadastral Surveying

Types of Cadastral Maps (Hard Copy and Digital), Map Elements, Design of Library for Abbreviations and Symbols, Map Production of Different Scales From Cadastral Maps, Relationship Between Cadastral Maps, Legal Registration and Land Division Inside Towns and Agricultural Lands with The Relationship Between Water Recourses and Highways Legal and Cadastral Registration and Cadastral Taxes, Database for Cadastral Surveying.

CEP 618 Digital Maps From Mobile Sensors

Introduction to Digital Maps-Types of Sensors-Inertial Navigation Sensors- Types of Inertial Navigation Sensors, Point Positioning By Inertial Navigation Sensors, Errors in Inertial Navigator Sensors, Applications of Point Positioning By Kinematics GPS, Simultaneous Equations for Different Coordinate Systems for Sensors.

CEP 619 Quantity Survey and Its Applicants in Civil Engineering

Introduction to The Different Methods of Areas Computation and Volume Computation for Earth Works, Equations for Area and Volume Computations –Applications of Volume Computation in Highways, Volume Computation By Accumulative Method, Swell and Shrinkage Coefficients.

CEP 630 Advanced Highway Planning and Feasibility Studies

Advanced Studies on The Following Topics: Reconnaissance Studies, Route Selection, Economic Analysis and Feasibility Studies, Preliminary Engineering Studies, Principles of Planning.

CEP 631 Advanced Highway Geometric Design

Advanced Studies on The Following Topics: Highway Classification, Traffic Characteristics, Geometric Design Controls and Criteria Horizontal and Vertical Alignment, Planning and Design of Highway Intersections and Interchanges.

CEP 632 Advanced Soil and Materials Studies for Road Construction

Advanced Studies on The Following Topics: Soil Characteristics for Highway Construction, Base and Sub-Base Materials, Asphalt and Concrete Materials, Asphalt and Cement Concrete Mixtures.

CEP 633 Advanced Hydrological Studies of Highways

Advanced Studies on The Following Topics: Meteorological Information, Morphological Computations of Wadies and Basins, Determination of Water Discharge Flow, Hydraulic Design of Storm Water Drainage Structures, Highway Protection Techniques Against Storm Water.

CEP 634 Advanced Structural Design of Highway Pavements

Advanced Studies on The Following Topics: Vehicles Characteristics and Traffic Loading, Stress Analysis in Flexible and Rigid Pavements, Structural Design of Pavements.

CEP 635 Highway Management Systems

Pavement Management Processes, Pavement Evaluation and Performance, Design Alternatives Analysis, Implementation of Pavement Management Systems, Examples and Applications.

CEP 636 Advanced Airport Planning and Design

Advanced Studies on The Following Topics: Airport Components, Aircraft Types and Characteristics, Airport Planning, Geometric and Structural Design of Airfield Strip and Aprons, Marling Signs Navigation Aids and Lighting

CEP 637 Advanced Highway Construction Technology

Advanced Studies on The Following Topics: Highway Embankment Construction Technology, Pavement Construction Technology, Management of Production of Asphalt Mixture, Quality Control and Quality Assurance.

CEP 638 Advanced Highway Maintenance

Advanced Studies on The Following Topics: Pavement Distresses and Condition Evaluation, Maintenance Operations for Pavements, Drainage Structures and Highway Furniture Elements, Pavement Recycling, Maintenance Management Systems.

CEP 639 Advanced Highway Construction Management

Advanced Studies on The Following Topics: Highway Project Management Procedures and Methodology, Application of Highway Project Management, Application of Value Engineering in Highway Projects.

CEP 640 Rapid Speed Train Technology

Rapid Speed Train Characteristics, Technical Demandes and Requirements for Geometric Alignment and Structural Design of Lines, Turnouts, Station, Signals and Traffic Control System for Rapid Speed Trains Lines, Maintenance and Renewal of Rapid Train Lines. Economical & Feasibility Study for Rapid Speed Trains Lines Operations.

CEP 641 Advanced Railway Alignment

Digital Contour Maps Preparation By The Use of The Modern Surveying Apparatus and Photogrametry Technology, Technical Demands for Alignment, Alignment By The Use of Computer, Cut / Fill Volumes Calculations, Schedule Execution Table Design, Set Up Vertical and Horizontal Curves, Railway Project Cost Analysis.

CEP 642 Railway Track Design and Analysis

Strain-Stress Analysis in The Parts of Railway Tack (Rails-Sleepers, Ballast, Subgrade) By The Use of Structural Analysis Theories, Dynamic Effect of Train Movement on Track Elements- Railway Defects and Their Effects on The Track Safety, How to Inspect and Repair Track Defects, Track Vibrations and Their Effects on Passenger Comfort and Freight Safety.

CEP 643 Modern Turnouts Technology

Turnouts Development, Methods and Modern Apparatus to Ensure Safety Operating of Both Switches and Trunouts, Level Corssing of Railway Track and Roads Specifications and Design, Movable Railway Bridge: Operating and Maintemonce.

CEP 644 Advanced Technology of Railway Signals

Automatic and Light Signals Development Study for Both Urban (Underground Metro) Or Rural Trains, Train Driver Cabin Signals, Centralized Traffic Control (C.T.C) and Automatic Train Control (A.T.C) Study, Remote Sensing System for Train Operating, Line, Car, Station Capacity Improvements By Using Developed Signal System.

CEP 645 Modern Methods of Railway Station Planning

Architectural, Aesthetic, Operational Requirements for Station Design, Railway Station Layout and Elements, Freight Station and Cranes Types, Locomotive, Stabling and Marshalling Yards Atomization, How to Improve Urban (Underground Metro) and Rural Station Capacity.

CEP 646 Modern Methods of Construction, Maintenance and Renewal of Railway Lines

Modern Machines and Apparatus for Inspection and Measurements Track Defects, Study of Methods and Machines to Construct and Renew Railway Lines, Modern Methods for Maintenance of Both Running Stock and Track, Modern Technology of Lines Operating Under Maintenance Or Renewal Without Delay, Economical Effect of Maintenance and Renewal on The Track Safety and Its Life Time Improvements.

CEP 647 Railway Environmental Effects

Energy Consumption in The Railway, Air Pollution, Forecasting Models for Air Pollution, Methods to Decrease and Limit Air Pollution, Noise Sources in Railway, Factors Affecting Railway Noise, Forecasting Models for Railway Noise Level, American and Germany Methods for Study Noise, How to Limit Railway Noise, Noise Prevention Barriers.

CEP 648 Railway Simulation and Modeling

Purpose, Simulation Systems and Models for Technical and Economical Considerations, Statistical Evaluation, Simulation Applications on Railway Lines & Train Movements, Railway Dynamics Models, Rail, Sleeper and Ballast Stress Distribution Models Programs, Curves Alignment Program.

CEP 649 Railway Freight Transport Systems

Freight Transport Systems Role Transport Chain, Freight Trains Types, Freight Transports Planning Problems, Marshalling Yards Container Transports, Station and Handle Systems. Handle Types and Tools, Store Methods, Freight Transport Methods.

CEP 651 Urban Transportation Planning

Fundamentals of transportation systems planning and analysis, data needs, surveys and analysis, sampling techniques, travel demand modelling, calibration of trip generation models, calibration of gravity models, direct demand models, discrete choice models, intercity transportation demand.

CEP 652 Advanced Transportation Systems

Transport System Components, Forecasting Transport Demand, Interaction of Transport Systems and Land Use, Formation of Transport Networks, Direct Transportation from Origin to Destination, Mediators, Optimization of Urban and Regional Transportation Networks.

CEP 653 Transportation Networks Equilibrium

Network Simulation, Network User Equilibrium, Basic Concepts in Minimization Problems, Formulating The Assignment Problem as a Mathematical Problem, Review of Optimization Algorithms, User Equilibrium with Variable Demand, Aggregate Transportation Planning Process.

CEP 654 Transportation Economics

Annual Cost Equations, Motor Vehicle Operating Cost and Economic Analysis, Economic Theory and Behavior of Large Transportation Systems, Estimation and Application Costs for Urban and Inter-City Passenger and Freight Travel, Demand Functions, Evaluation of Governmental Policies, Economic Regulations, Infrastructure Investments, Pricing and Financing, Benefit-Cost Analysis, Impact on Economic Efficiency.

CEP 660 Hydraulics of Networks & Plants

Hydraulics Laws for pipes Design, Pressure Losses & Its Reasons, Effect of Pipe Material, Hydraulic Losses in Plants, Orifices & Weirs Effects, Flow Measurements in Plants, Pump Stations in Networks & Plants.

CEP 661 Chemistry of Water

Water Quality and Methods of Measurements, Ph, Alkalinity, Hardness, Nitrogen, Phosphates Sulfates, DO, Chlorine, Chlorides, Iron and Manganese, Heavy Metal, Insecticides, BOD, COD, TOC.

CEP 662 Microbiology of Water

The Major Groups of Microorganisms, Value and Significance of Micro-Biological Examinations, Pollution of Water By Different Microorganisms, Microbial Indicators of Water Pollution and Its Detection.

CEP 663 Advanced Water Treatment

Theory of Coagulation and Flocculation, Theory of Filtration, Types of Filters, Iron and Manganese Removal, Adsorption, Water Softening, Removal of Traces, Organic Matters and Heavy Metals.

CEP 664 Advanced Domestic Wastewater Treatment

Methods of Ammonia Removal, Nitrate Removal, Phosphorus Removal, Chemical Treatment, Filtration Treatment By Using Activated Carbon, Anaerobic Treatment.

CEP 665 Industrial Wastewater Treatment

Effect of Industrial Wastes on Sewerage System and Wastewater Treatment Plant, Treatment of Industrial Wastes Produced from Paper Industry, Textile, Food Industry, Pharmaceutical Industry, and Steel Industry. Reuse of Treated Industrial Wastes.

CEP 666 Advanced Studies for Solid Wastes

Advanced Studies on The Following Topics: Source, Composition, Properties and Quantities of Solid Wastes, Handling and Storage at The Source, Methods of Solid Wastes Collection, Methods of Solid Wastes Collection and Methods of Disposal, Separation and Processing Technologies, Recycling of Solid Wastes Planning and Operation of Solid Wastes Management Systems.

CEP 667 Impact of Pollution on Environment

Advanced Studies on The Following Topics: Water Quality and The Environment Impact for Its Pollution, Environment Impact of Wastewater and Industrial Wastewater, Pollution of Ground Environment Impact of Wastewater and Industrial Wastewater, Pollution Water Against Water, Pollution of Surface Water, Engineering Works to Protect Natural Water Against Pollution.

CEP 668 Advanced Sludge Treatment

Advanced Studies on The Following Topics: Characteristics and Volume of Sludge, Sludge Handling, Sludge Stabilization, Thermal Processing of Sludge, Ultimate Disposal and Utilization of Sludge, Sludge Denaturing.

CEP 669 Water Treatment Modeling

Water Modeling for Physical Properties & Chemical Actions with Hydraulic Equations, Applied Models for Coagulation and Flocculation, Filtration, Iron and Manganese Removal Methods, Adsorption, Disinfection, Water Softening, Removal of Traces, Organic Matters and Heavy Metals.

CEP 670 Wastewater Treatment Modeling

Water Modeling for Physical Properties, Chemical & Biological Actions with Hydraulic Equations, Applied Models for Primary Treatment Methods, Attached Growth Biological Treatment, Suspended Growth Biological Treatment, Stabilization Ponds, Aerated Lagoons, Anaerobic Treatment, Chemical Treatment, Treatment with Activated Carbon.

CEP 671 Water Supply Systems Modeling

Water Modeling for Physical Properties with Hydraulic Equations, Applied Models for Water Supply Networks Planning, Water Piping Systems Hydraulic Design, Water Supply Pipes Materials, Appurtenance of Water Supply Pipes, Pumping Stations, Design of Carrier Lines, Water Hammer, Test of Water Lines, Valves & Control of Water Supply Networks.

CEP 672 Sewerage Systems Modeling

Water Modeling for Physical Properties with Hydraulic Equations, Applied Models for Planning of Collection System, Hydraulic Design of Gravity Sewers, Sewers Materials, Appurtenance of Sewers, Biological Decomposition in Sewers, Pumping Stations, Design of Force Mains, Water Hammer in Force Mains, Test of Sewers.

CEP 673 Special Topics in Environmental Engineering

Environmental Laws, Water Quality and its Pollution Environmental Impact, Wastewater & Its Reuse & its Environmental impact, Reuse of Industrial Wastewater & Its Environmental Impact, Ground Water Contamination, Surface Water Pollution, Water Pollution Control Engineering, Air Quality & Its Pollution Environmental Impact, Air Pollution Control Engineering.

CEP 674 Networks Operation & Maintenance Programs

Main Requirements for Operation of Water Supply & Sanitation Networks, Performance Evaluation for Networks, Evaluation & Follow up of networks operation, Periodical Operation Programs, Periodical Maintenance Programs, Environmental Impacts.

CEP 675 Sea Water Desalination

Need to Desalination, Properties of Fresh & Saline Water, Engineering and Economic Considerations, Methods of Desalination, Problems Common to Distillation, Multiple Effect Distillation, Multiple Stage Slash Distillation, Vapor Compression Distillation, Combined Distillation Plants, Distillation with Non-Fuel Energy Sources, Ion Exchange, Electro-Dialysis, Reverse Osmosis, Design of Desalination Plants.

CEP 676 Reuse of Treated Wastewater

Methods of Domestic Wastewater Ruse, Environmental Impact for Domestic Wastewater Reuse, Methods of Industrial Wastewater Ruse, Recycling of Industrial Wastewater, Environmental Impact for Industrial Wastewater Reuse.

CEP 677 Reuse of Solid Wastes

Methods of Domestic Solid Wastes Ruse, Environmental Impact for Domestic Solid Wastes Reuse, Methods of Industrial Solid Wastes Ruse, Recycling of Industrial Solid Wastes, Environmental Impact for Industrial Solid Wastes Reuse, Methods of Agricultural Solid Wastes Ruse, Environmental Impact for Agricultural Solid Wastes Reuse.

CEP 678 Sludge Disposal & Reuse

Sludge Disposal in Water Treatment Plants, Sludge Disposal in Wastewater Treatment Plants, Sludge Disposal in Industrial Wastewater Treatment Plants, Methods of Sludge Reuse, Environmental Impact for Sludge Reuse.

CEP 679 Industrial Water Supply

Water Different Uses in Industry, Problems Associated with Industrial Water Supply, Treatment of Boiler Water, Cooling Water Circuits, Industrial Water Supply for Metallurgical Industry, Paper Industry, Food Industry, Agricultural Industry, Textile Industry, Chemical and Pharmaceutical Industry and Other Industries, Reuse and Recycling of Industrial Water.

CEP 681 Traffic Flow Theory and Engineering Applications

Elements of a transportation system, static and dynamic characteristics of vehicles, forces acting on vehicles, vehicle trajectories, macroscopic flow characteristics, spatial and temporal variations of the

traffic flow, microscopic flow characteristics, traffic stream models, car following models, hypothesis and statistical testing, shockwaves, traffic micro-simulation models.

CEP 682 Traffic Operations and Control

Urban congestion and causes, traffic control measures, freeway surveillance and incident detection, high occupancy vehicle systems, integrated traffic management systems, strategies for urban mobility, analysis of signalized and un-signalized intersections, arterial performance, roundabouts, traffic signal coordination

CEP 683 Statistical Applications to Traffic Operations

Data description categories - Data Acquisition, Classification and Summarization – Basic Probability Concepts and Distributions - Statistical Sampling and Tests - Simple Linear Regression. Multiple Regression - Introduction to Optimization; Neural Network, Fuzzy Logic - Genetic Algorithms - Linear Programming (LP) - Inferences, ANOVA, Categorical Data, Traffic Data Survey and Sampling - Project Application.

CEP 684 Traffic Studies and Analysis

Introduction to traffic studies, traffic volume studies, spot speed studies, travel time and delay studies, parking studies, safety studies and data collection, data analysis, measures of effectiveness.

CEP 685 Transport Logistics

Supply chain fundamentals, Demand forecasting, Managing, Operations & People, Warehouse Operations, Order-Picking and Despatching Goods, Route Planning & Scheduling, Collection, Storage & Distribution Centres, Inventory Management, Transport Role, Structure & Environment, Transport Control & Regulation, Transport Planning & Operations, Operational Costs & Funding, Maritime management and logistics, Case studies.

CEP 686 Public Transport Systems

Introduction to public transport systems, Strategic planning. Network design, Public transport sector organization, Service quality assessment, Public transport performance, analysis and modeling, Operations planning, Service reliability and control, Data collection methods and advanced public transport systems, Case studies.

CEP 687 Fundamentals of ITS

Introduction: what is ITS, Why ITS-Requirements and needs of ITS Services - ITS Technologies- ITS User Services and Taxonomy - ITS Enabling Technologies – ITS Deployments and Benefits - Introduction to ITS Architecture - Transportation Planning and ITS - ITS Evaluation -Types of Risks and Mitigation Strategies - ITS Challenges and Opportunities in Developing Countries - Applicability to local and regional context - Case Studies.

CEP 688 Traffic Modelling and Simulation

Introduction - Simulation model strengths - Steps in developing a simulation model – Functions of traffic simulation models for ITS - Limitations of traffic simulation models for ITS - Classification of Simulation models an example problem. Estimation Methods of Origin -Destination Flows from Traffic Count: Traffic modelling based approaches - Statistical Inference approaches - Gradient based solution techniques. Microscopic simulation models: Model selection procedure - Implementation of the procedure - General process for conducting & implementing of a microscopic simulation- on line simulation – Cell transmission models (CTM): The concepts CTM and the generalized form of CTM. - Discussion of instability phenomenon - Model discussion in terms of a linear program formulation for merging and

diverging - Establishment of the network representation and topologies - calibration, Validation & application of Traffic Simulation Models

CEP 689 GIS Applications in Transportation

Concept of GIS, RS and GPS - Land use and Transportation Data - Map Generation and Analysis - Transportation Network Development and Algorithms - Transportation Models and their Applications in GIS.

CEP 690 Utilities Networks Planning & Its Economy

Types of Utilities Networks, Water Supply Distribution Networks Types, Sewerage Systems Types, Basics of Urban Planning, Planning of Water Supply Networks for different purposes, Planning of sewerage systems, Intersections with gas, Electricity & Communication networks, Public Utilities Economy.

CEP 691 Engineering Economics

Equivalence, Interest Factors and Problems, Annual Cost Method, Present Worth Method, Rate of Return Method, Benefit to Cost Ratio Method, Income Tax, Depreciation, Choice of Growth Factors, Multiple Alternatives, Sensitivity Tests, Expected Cost, Increment Cost, Sunk Cost, Source of Funds, Cost Effectiveness Method.

CEP 692 Advanced Environmental and Social Studies

Advanced Studies on The Following Topics: Studying of Main Factors Officiating The Environment, Environment Problems, Studying The Socio-Economic and Physical Characteristics for Study Area That Affects The Future Plan of Infra-Structure Projects. Methods for Population Prediction in The Future, Environment Impacts of Infrastructure Projects, Environmental Law and Their Suitability for The Protection of The Environment.

CEP 693 Railway Economic and Management

Public transport system by Railway, Urban and rural Railway systems components, Infrastructure of Railway, Advanced studies concurring management of Railway projects executing, Applied studies on Railway projects managements, Risk analysis and its applications on the Railway field.

CEP P99 Project

قسم

هندسة القوى والألات الكهربائية

Electrical Power & Machines Engineering Department



List of postgraduate courses

(No prerequisites for the following courses)

Postgraduate Diploma

1- Switchgear and Protection Diploma

a- Introductory courses ((mandatory))

No.	Code	Course title	Credit hours	Marks
1	EPM 521	Electrical Power Systems Analysis	3	100
2	EPM 526	Protection of power systems	3	100
3	EPM 532	High voltage engineering	3	100
4	EPM 542	Power Electronics Systems	3	100
Total credit hours			12	

b- Selective courses

(select only four courses)

No.	Code	Course title	Credit hours	Marks
1	EPM 511	Theories of Electrical Machines	3	100
2	EPM 527	Digital protection in power systems	3	100
3	EPM 531	Switchgear in power systems	3	100
4	EPM 533	transmission High voltage direct current	3	100
5	EPM 534	Electric equipments in power plants	3	100
6	EPM 553	Micro-controller applications in electric Power and machines	3	100
7	EPM 571	Electrical testing	3	100

c- Free elective course

d- Project (EPM P99)

2- Electrical power plants and networks diploma

a- Introductory courses (mandatory)

No.	Code	Course title	Credit hours	Marks
1	EPM 521	Electrical Power Systems Analysis	3	100
2	EPM 526	Protection of power systems	3	100
3	EPM 532	High voltage engineering	3	100
4	EPM 542	Power Electronics Systems	3	100
Total credit hours			12	

b- Selective courses

(select only four courses)

No.	Code	Course title	Credit hours	Marks
1	EPM 511	Theories of Electrical Machines	3	100
2	EPM 522	Electric power system planning	3	100
3	EPM 523	Electric power systems control and dynamics	3	100
4	EPM 533	transmission High voltage direct current	3	100
5	EPM 534	Electric equipments in power plants	3	100
6	EPM 563	Operation of Power Systems with Large Amounts of Renewable Power	3	100
7	EPM 571	Electrical testing	3	100

c- Free elective course

d- Project (EPM P99)

(No prerequisites for the following courses)

3- Control of Electrical Machines Diploma**a- Introductory courses (mandatory)**

No.	Code	Course title	Credit hours	Marks
1	EPM 511	Theories of Electrical Machines	3	100
2	EPM 521	Electrical Power Systems Analysis	3	100
3	EPM 542	Power Electronics Systems	3	100
4	EPM 555	Renewable Energy Technology	3	100
Total credit hours			12	

b- Selective courses

(select only four courses)

No.	Code	Course title	Credit hours	Marks
1	EPM 514	Control of electric machines	3	100
2	EPM 535	Numerical methods in power systems	3	100
3	EPM 544	Electric traction technology	3	100
4	EPM 548	Control techniques of Synchronous machines	3	100
5	EPM 549	Dynamics of Electric drives	3	100
6	EPM 553	Micro-controller applications in electric Power and machines	3	100
7	EPM 571	Electrical testing	3	100

c- Free elective course**d- Project (EPM P99)****4- Renewable Energy Systems Diploma****a- Introductory courses (mandatory)**

No.	Code	Course title	Credit hours	Marks
1	EPM 511	Theories of Electrical Machines	3	100
2	EPM 521	Electrical Power Systems Analysis	3	100
3	EPM 542	Power Electronics Systems	3	100
4	EPM 555	Renewable Energy Technology	3	100
Total credit hours			12	

b- Selective courses

(select only four courses)

No.	Code	Course title	Credit hours	Marks
1	EPM 526	Protection of power systems	3	100
2	EPM 523	Electric power systems control and dynamics	3	100
3	EPM 533	transmission High voltage direct current	3	100
4	EPM 561	PV Energy Systems	3	100
5	EPM 562	Wind Energy Conversion Systems	3	100
6	EPM 563	Operation of Power Systems with Large Amounts of Renewable Power	3	100
7	EPM 565	Energy Storage Systems	3	100
8	EPM 571	Electrical testing	3	100

c- Free elective course**d- Project (EPM P99)**

(No prerequisites for the following courses)

Master of Engineering – Master of Science – Ph.D**Basic courses**

No.	Code	Course title	Credit hours	Marks
1	EPM 611	Theories of Electrical Machines	3	100
2	EPM 621	Electrical Power Systems Analysis	3	100
3	EPM 631	High and Extra-High Voltage Engineering	3	100
4	EPM 641	Power Electronics Systems	3	100
Total credit hours			12	

Optional courses

(Select 6 courses for M.Sc. and 10 courses for M.E.)

No.	Code	Course title	Credit hours	Marks
1	EPM 601	Electromagnetics	3	100
2	EPM 612	Transients in Linear Systems	3	100
3	EPM 613	Design of Electrical Machines	3	100
4	EPM 614	Control Systems of Electrical Machines	3	100
5	EPM 622	Control of Power Systems	3	100
6	EPM 623	Operation of Electric Power System and Renewable Energy	3	100
7	EPM 624	Electric power system planning	3	100
8	EPM 625	Digital Protection	3	100
9	EPM 626	Advanced Power System Protection	3	100
10	EPM 627	Applications of optimization techniques to electric power systems	3	100
11	EPM 628	Applications of Artificial Intelligence to electric power systems	3	100
12	EPM 632	Electric Materials	3	100
13	EPM 636	Reliability Evaluation of Power Systems	3	100
14	EPM 637	Power Quality	3	100
15	EPM 638	High Voltage DC Transmission	3	100
16	EPM 643	Advanced Power Electronics Systems	3	100
17	EPM 651	Power Generation from Renewable Sources	3	100
18	EPM 653	Wind Energy Systems	3	100
19	EPM 654	Distributed Generation (DG)	3	100
20	EPM 673	Electrical testing	3	100
21	EPM 681	Selected Topics in Electrical Power Systems and Machines	3	100

COURSE SYLLABUSES

EPM 511 Theories of Electrical Machines

The Basis Generalized Theory of Electrical Machines, The Basic Model of Electrical Machines, Linear Transformation, Kron's Primitive Machines, Writing Machine Models in Different Reference Frames.

EPM 514 Control of Electrical Machines

Types of Electric Drives, Transfer Functions of Separately-Excited DC Motors, Closed Loop Control Of DC Motors Applying Controlled Rectifiers and Choppers, Equivalent Circuits of Three- Phase Induction Motor, Speed Control of Three Phase Induction Motors, Voltage Control, Slip Energy Recovery, Inverter Methods, Direct Torque Control, Vector Control Methods, Synchronous Motors Equivalent Circuits, Vector Control Methods, Inverter Applications.

EPM 521 Electrical Power System Analysis -

Modeling of electric power system components in steady state ; - Power flow computations; - Unsymmetrical fault analysis; - Reactive power compensation and equalization; - Sizing and siting for optimal reactive power compensation

EPM 522 Electrical Power Systems Planning-

Load and energy forecast; - Electric networks planning in distribution networks; Distributed generation planning in distribution networks - Distribution network reliability; -Probabilistic and historic reliability indices; - Electric networks planning in transmission networks; Renewable energy integration planning - Automated transmission network planning; -Generation availability assessment

EPM 523 Electrical Power Systems Control and Dynamics -

Introduction and Review on Synchronous Generators. Automatic Voltage Regulators (AVR's). Automatic Generation Control (AGC's). Automatic load-frequency control systems. V/Q control and impact of renewable resources and distributed generation. Acceptable voltage limits considering load requirements and voltage stability. Load modeling and impact on V/Q control actions. FACTS devices.

EPM 526 Power System Protection

Introductory background on short circuit currents, features of protection systems, protection zones, Primary and back up protection; - Basic elements of trip circuit, classification of relays, time characteristics of relays, IED; - Over-current protection (setting of over-current relays); - Distance protection (impedance, Mho and quadrilateral relays, relay settings); - Differential protection (setting of differential relays); - Protection of generators, transformers, TLs, distributors & motors

EPM 527 Digital Protection

Technologies of protective relays; Construction of a microprocessor-based protective relay; Mathematical basis for digital relaying; Aliasing and sampling theorem; -Digital filters; -Signal identification algorithms; Overcurrent protection algorithms; -Distance relaying Algorithms; Differential relaying algorithms; -Relay testing

EPM 531-Switchgear Engineering in Electrical Power Systems

AC and DC Arcs, Interruption and Some Applications; Indoor and outdoor switchgear; -Circuit Breakers: Types and Use; Protective Relays and Protection Systems; Current and Voltage Transformers, Performance Under Transient Conditions; Over-Voltage Protection; -Insulation coordination

EPM 532 High Voltage Engineering -

Advanced techniques of high voltage generation, measurements and testing; Generating circuits of high voltage impulse and switching surges; Breakdown theories in gaseous insulating material; Breakdown theories in solid insulating materials; Testing specimens and testing methods for measurements of breakdown voltages; Relations between The Macroscopic and Microscopic Properties of Insulating Materials.; The Basic Insulation Levels (BIL); Technical specifications of high voltage cables and cable ampacities.; Advanced computational methods for calculating electric and magnetic;

EPM 533 HVDC Transmission of Electrical Energy -

Basics of HVDC transmission: types, advantages and disadvantages, applications, terminal apparatus, converter circuits; Analysis of HVDC systems: converter circuit analysis, rectifier and inverter stations, voltage, current, active and reactive powers, power factor, commutation reactance, steady-state characteristics; Control of HVDC transmission; -Harmonic analysis of HVDC systems; Protection of HVDC systems; -Economic calculations of HVAC and HVDC transmission

EPM 534 Electrical Equipment in Power Plants -

Generators, Transformers, switchgear, other plant equipments; Bus-bar systems, bus-tie, sectionalizer, ..etc; Measuring, Monitoring and Communication systems; - DC system; Protection systems, fire alarming and fighting system; Earthing of Electric Power Equipment; Starting and Testing Systems

EPM 535 Computational Methods in Power System Analysis -

Data structures for system analysis; - Linear and non linear sparse systems; Numerical analysis and numerical integration methods; Frequency and Time series signal analysis; Optimization methods; - Decomposition analysis; Case studies and applications: OPF, Optimal economic dispatch, ..etc

EPM 542 Power Electronics converters

Revision of Thyristors, GTO, and Power transistors characteristics, protection and rating calculations, DC choppers for static and dynamic loads, AC choppers for phase control and period control in single-phase and three-phase systems, different types of single-phase and three-phase inverters for static loads, frequency converters and their applications.

EPM 544 Electric traction technologies

Electric traction systems, Electric trains, Motion Dynamics, Driving Devices. Speed-time curves, Dc traction motors, starting and braking, applications of dc and ac traction motors, feeders. Electric trains on town and suburban lines, Electric vehicles, batteries and recharging equipment, stations electric escalators and elevators.

EPM 548 Control techniques of AC Machines

Dynamic model of the Induction and Synchronous machines, scalar control methods, vector or field oriented control, direct torque/power and flux control, field weakening operation, sensorless control, and adaptive control for cylindrical, reluctance and permanent magnet Synchronous motors and generators; and adaptive control for cage and wound Induction motors and generators.

EPM 549 Dynamics of Electric drives

Rating and Heating of motors, Motor/Drive selection, Operation characteristics of electric drives, Acceleration time curves for electric drive systems, Braking systems, Harmoics generations from electric drives, Harmonic suppression, Effect of grid voltage sag on the operation of the electric drives, Fault ride through operation.

EPM 553 Applications of Microcontroller in Electric Power and Machines

The basic structure of a microcontroller; Types and Features; Designing processes; Programming environments & languages; Higher integration; Interfacing and interfacing examples; Applications in electric power and machines systems.

EPM 555 - Renewable Energy Technologies

Renewable Sources of Energy, Solar Energy, the photovoltaic cells, sizing a stand-alone photovoltaic system, storage batteries and inverters for photovoltaic systems, Wind Energy, aerodynamic characteristics of wind turbines, wind turbine parameters, basics of control, wind data and energy estimation, Wave Energy Conversion Systems, power take off (PTO) devices, direct drives and linear generators, Biogas and Biomass Renewable Energies, Fuel cells systems: theory of operations, types, characteristics, and hydrogen reformers.

EPM 561 PV Energy Systems

Principles of solar cell operation, structure, electrical and optical characteristics, equivalent circuit, Crystalline silicon solar cells, Thin film technologies for PV, Energy production by a PV array, Maximum power points tracking techniques, grid connection and stand alone operation of PV systems, Different control techniques for PV systems, low voltage ride through capability and grid code.

EPM 562 Wind Energy Conversion Systems

Wind turbines: Construction and design. Generating systems of wind plants. Wind speed and power duration curves, Power curve of the wind turbine generator and calculation of energy produced at different sites. Wind energy conversion generators: Fixed speed wind turbines, Partially variable speed wind turbines, Variable speed wind turbines; Gearless wind energy conversion systems, Different control systems for Wind energy conversion; On-Shore and Off-shore Wind units; Self excited induction generator.

EPM 563 Operation of Power Systems with Large Amounts of Renewable Power

Energy and challenges - Introductions Conventional energy resources and technologies Renewable energy resources and technologies; Sustainability; Characterization of renewable resources from planning and operation points of view; Energy mix and load curves; Energy security and renewable energy; Utility system planning and grid reliability; Power system operational requirements and constraints; Technical challenges of variable generation and R&D requirements; Transmission technologies and their future; Hydrogen as an energy resource Renewable energy integration and grid codes; Environmental impacts.

EPM 565 Energy Storage Systems

Ultrasonic Capacitor (Super-capacitor), Superconducting Magnetic Energy Storage (SMES), Types of Batteries, Methods of Charging and Discharging of the Batteries, Fuel cells, Flywheels Energy storage systems, Storage System Interfacing.

EPM 571 Electrical Testing

Running a Group of Advanced Electrical Tests and Experiments in The Laboratories of The Electrical Power and Machines Department, These Are: Electrical Machines Lab, Power Systems Lab, High Voltage Lab, Computer Lab, Power Electronics Lab.

EPM 601 Electromagnetics

Electromagnetics and Electrical Engineering, Revision of Principles, Electric Fields, Polarization Work and Energy in Electric Fields, Lines of Force, Energy and Force, Static Magnetism Sources, Magnetic Circuits,

Laplace Equation Magnetic Images, Energy and Force in Magnetic Fields, Time Varying Magnetic Fields, Maxwell's Equations, Electromagnetic Radiation, Electro-Magnetic Energy Conversion, Experimental and Numerical Methods, Digital Methods for Solution.

EPM 611 Theories of Electrical Machines

Basics of The General Theory of Electrical Machines, The Elementary Two Pole Machine, Kron's Primitive Machine, Linear Transformations, Power Invariance, Rotating Axes Frame of Reference, 3-Phase Reference Frame, Inter Frame Transformations, Torque Equations, Application and Limitations of The General Theory, Applications: DC Machines, Transient and Steady State Operation, Synchronous Machines, Transient and Steady State Operation, Induction Machines, Transient and Steady State Operation, Commutator Machines.

EPM 612 Transients in Linear Systems

Transient Performance in Linear Electric Circuits, Magnetically Coupled Circuits, Inertia Effects in Power Systems, Transients in Complex Systems, Magnetic Saturation Vector Control In AC Motors, Abnormal Modes of Operation in Synchronous Machines.

EPM 613 Design of Electrical Machines

Windings of Single Phase and Three Phase Machines, Design, Computation of Magnetomotive Force and Winding Coefficients, Eddy Currents and Energy Losses in Machines and Transformers Winding, Design of High Starting Torque, Design of High Starting Torque in 3-Phase Induction Motors, Design of Single-Phase Induction Motors, Computation of Magnetizing and Leakage Inductances, Cooling and Ventilation of Electric Machines.

EPM 614 Control Systems of Electrical Machines

Control Of DC Motors By Single Phase and Three Phase Controlled Rectifiers, DC Choppers, Analysis Of AC Motors Controlled By AC Choppers, Inverters, Harmonic Analysis.

EPM 621- Power System Analysis

Introduction to power system analysis and power system modeling in the transient state; The equal area criterion and its application on SMIB; - Improving the transient stability; - Transient stability of a 2 machine & multi-machine systems; - Voltage stability (VS) analysis: definitions, causes; - VS assessments, VS indices, SVD, nodal analysis; - Load c/cs and VS; - VS corrective measures and FACTS

EPM 622- Control of Power Systems

Introduction and Review on Synchronous Generators. Automatic Voltage Regulators (AVR's): Theory, Static operation, Dynamic operation and compensation. Automatic Generation Control (AGC's): Construction, Theory, Steady state analysis and Dynamics. Automatic load-frequency control systems. V/Q control: theory, control parameters, control methods, impact of renewable resources and distributed generation. Acceptable voltage limits considering load requirements and voltage stability. Load modeling and impact on V/Q control actions. FACTS: Basic theory and Applications in power system control. Advanced applications of FACTS devices in power system control.

EPM 623-Operation of Electric Power System and Renewable Energy

Power system operation: states and objectives. Standard operational requirements of power systems. Operational characteristics of conventional and renewable energy sources: dispatchability, variability, intermittency... etc. improvement of the operational characteristics of renewable resources. Hydrogen as an energy storage and energy carrier. Grid code requirements: connection codes, and operation codes. Power system operation in the presence of renewable energy resources. Optimal power flow OPF. Optimal economic dispatch. Interconnected operation of power system. Undervoltage and underfrequency Load shedding. Unit commitment constraints and solution methods. Power system security. Power system state

estimation. Control centers and energy management systems.

EPM 624-Electric power system planning

Load and energy forecast; - Electric networks planning in distribution and distributed generation ; - Distribution network reliability; - Probabilistic and historic reliability indices; - Electric networks planning in transmission; - Automated transmission network planning and renewable resources; - Generation availability assessment; - Optimization techniques for power systems; - Load managements and energy conservation

EPM 625 Digital Protection

Different technologies of protective relays; - Construction of a microprocessor-based protective relays; - Mathematical basis for digital relaying.; - Aliasing and sampling theorem; - Digital filters; - signal identification algorithms; - overcurrent protection algorithms; - Artificial Neural Networks applications in Protective relaying; - Wavelets applications in protective relaying

EPM 626 Advanced Power System Protection

Distance protection (impedance, Mho and quadrilateral relays, relay settings); - Differential protection (setting of differential relays); - Protection of generators, transformers, TLs, distributors & motors; - Integration of protection, monitoring and control functions in substations.

Phasor Measurements Unit and its applications; - Wide-area measurements and protection; - Adaptive protection.

EPM 627 Application of optimization techniques to electric power systems

Classification of optimization techniques; - Linear and Nonlinear programming; - Interior Point (IP) approach; - Meta-heuristic techniques: Genetic Algorithms; - Particle Swarm Optimization; - Applications to power systems

EPM 628 Applications of Artificial Intelligence to power systems

Classification of AI techniques; - Artificial Neural Networks; - Fuzzy Logic; - MATLAB; Toolboxes; - Applications to power systems

EPM 631 High and Extra-High Voltage Engineering

Electrical breakdown in gases, ionization, healing of ions; Electrical discharge supporting its continuation; the mechanisms of Electrical breakdown; corona; Electrical breakdown under the influence of alternating fields; Gases viable to absorb electrons; Electrical breakdown in insulating fluids; Electrical breakdown in solid insulating material; Calculation of electric fields and methods of stress control; Overvoltage and its protection; Traveling waves and their applications; Coordination of electrical insulators.

EPM 632 Electric Materials

Insulating Materials in DC and AC Conditions, Semi-Conductors, Conductors, Insulators Characteristics in Switchgear, Insulators Characteristics in Transformer and Switchgear Substations, Insulators in Other Pieces of Equipment

EPM 636 - Reliability Evaluation of Power Systems

Introduction, Generating capacity: basic probability methods; Interconnected systems; Distribution systems: basic techniques and radial networks; Distribution systems: parallel and meshed networks; Substations and switching stations; Applications of Monte Carlo simulation; Evaluation of reliability worth.

EPM 637 - Power Quality

Power Quality Definitions; Power-Quality Standards: IEEE Standards, ANSI Standards, CBEMA and ITIC Curves; Voltage Sag: Classification, Causes, Area of vulnerability, Analysis and Mitigation; Long Duration Voltage Variations : Voltage regulation, Voltage decline, Reactive compensation, Transmission voltage control, Distribution voltage control; Transient Overvoltages: Sources, Lightning surges and switching transients, Ferroresonance Surge Arresters; Power System Harmonics: Power and harmonics, Total harmonic distortion Total demand distortion, True power factor, IEEE 519 Standard, Means to mitigate harmonics; Power Harmonic Filters: Shunt passive, Multi-section, Active and Hybrid harmonic filters; Power Quality Measurements: Multi-meters, Oscilloscopes, Power-Quality meters and analyzers

EPM 638: High Voltage DC Transmission

Evolution of classic and light HVDC systems, comparison of HVAC and HVDC transmission systems, components of HVDC transmission system, analysis of HVDC converters, HVDC control, mal-operation and protection of converters, filter design, AC/DC load flow, transient and dynamic stability analysis, multi-terminal HVDC, different application of HVDC system, advances in HVDC systems, and HVDC system application in wind power generation.

EPM 641 - Power Electronics Systems

Methods of improvement of power factor of Rectifier circuits: Phase angle control, Semiconverter operation of full converter, Extinction angle control, Symmetrical angle control, Pulse Width Modulation. Closed form solution of DC Drives: Continuous Armature current, Discontinuous armature current. Power Electronics in HVDC technology, HVDC 12 pulse system and Converters Background, HVDC transmission and Converter Control. Switched mode power supplies: Specifications of SMPS, Isolated SMPS, Fly back converters, Forward converters, Half bridge converters, Full bridge converters. Push-Pull converters, SMPS with multiple outputs. Neutral point clamped inverter. Multi level inverters (MLI); Types and operations: Diode clamped MLI, Flying Capacitor MLI, and Cascaded MLI. Selective harmonics elimination (SHE) for MLI.

EPM 643 - Advanced Power Electronics Systems

Space Vector Modulation (SVM): switching states, space vectors, dwell time calculation, modulation index, switching sequence, spectrum analysis, even-order harmonic elimination, discontinuous space vector modulation; Resonance Pulse Inverter: series resonant inverters, frequency response of series resonant inverters, parallel resonant inverters, voltage control of parallel resonant inverters, class e resonant inverter and rectifier, zero current switching resonant converters, zero voltage switching resonant converters, resonant dc link inverters; Z Source Converters: principle of operation of Z-network, Z source inverter (ZSI), PWM methods of ZSI: simple boost control, maximum boost control, and constant maximum boost control. Hysteresis current control of ZSI.

EPM 651 - Power Generation from Renewable Sources

Conventional and non-conventional energy resources: a comparative study. Modern wind turbines: Construction and design. Generating systems of wind plants. Lanchester-Betz limit for wind plants power. Statistical study of wind data; Wind speed and power duration curves, Mean value and standard deviation, Power curve of the wind turbine generator and calculation of energy produced at different sites. Self excited induction generator. Distributed generation technologies. The concept of Static Synchronous Generator (SSG) and its application to interface renewable energy resources with the grid, Different control systems of the SSG to interface distributed generators. Doubly Fed Induction Generator. Unreliability of Solar Energy, Solar energy storage and storage methods, Utility power-leveling, Battery energy storing system and logic of operation, Generation characteristic of the PV Power, Voltage and current modes of control for dc/dc converters to interface PV.

EPM 653 – Wind Energy Systems

Wind energy conversion systems; Wind energy conversion generators: Fixed speed wind turbines, Partially variable speed wind turbines, Variable speed wind turbines; Different Control system for Wind energy conversion; On-Shore and Off-shore Wind units; Wind power transmission; Wind system protection

EPM 654 - Distributed Generation (DG)

DG Definitions, Standards, and Benefits: Definitions, standards, current status, available/future technologies, and technical-economical-environmental impacts, Impact of electricity market (deregulation) on the spread of DG; DG Types (Technologies): Conventional and renewable energy sources applications; DG applications, Operating Modes: Base load, peak load shaving/ shifting, remote/isolated, and stand alone/grid connection; DG interconnection and its requirements: DG interface of rotating machines/ power electronic based, DG interface's protection requirement; Power Quality/Reliability: Voltage regulation, harmonics from power electronic based DG, Improving reliability on customers and utility applications; Protection Aspects: Protective relays coordination, Anti-islanding detection/ Islanding prevention techniques, Safety of personnel; DG impact on distribution planning: Distribution system (radial/loop) expansion planning using DG; DG Cost/Pricing: Energy (kWh), demand (kW), pf costs and penalties Connection and operating costs and charges Cost and rate of return analysis; DG Regulatory Issues: Required contracts for DG connection to the grid/operation.

EPM 673 Electric Testing

A Group of Advanced Experiments in Electrical Machines Lab, Power Systems Lab, High Voltage Lab, Computer Lab, Power Electronics Lab

EPM 681 Selected Topics in Electrical Power Systems and Machines -

Different advanced topics may be suggested at different semesters and taught by professors and experts. Topics belong to the field of specialization in the department of Electrical Power and Machines.

قسم

هندسة القوى الميكانيكية

**Department of Michatronics
Engineering**



List of postgraduate courses

Department of Mechanical Power Engineering

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	MEP	500	Transient Combustion	70	30	0	100	3	3
02	MEP	502	Combustion Equipment for Boilers	70	30	0	100	3	3
03	MEP	503	Measuring Instruments in Furnaces and Boilers	70	30	0	100	3	3
04	MEP	510	Pump Design (1)	70	30	0	100	3	3
05	MEP	511	Pipe Networks and Reservoirs	70	30	0	100	3	3
06	MEP	512	Operation, Maintenance and Testing of Pumps	70	30	0	100	3	3
07	MEP	513	Pump Selection	70	30	0	100	3	3
08	MEP	516	Pump Design (2)	70	30	0	100	3	3
09	MEP	517	Corrosion Engineering	70	30	0	100	3	3
10	MEP	522	Gas Dynamics (1)	70	30	0	100	3	3
11	MEP	529	Fluid Mechanics (1)	70	30	0	100	3	3
12	MEP	530	Heat Transfer (1)	70	30	0	100	3	3
13	MEP	531	Hot and Cold Water Piping Systems	70	30	0	100	3	3
14	MEP	537	Water Treatment for Boiler and Industrial Processes	70	30	0	100	3	3
15	MEP	541	Testing, Adjusting and Balancing of HVAC Systems	70	30	0	100	3	3
16	MEP	544	Control and Safety Equipment in Refrigeration and Air Conditioning	70	30	0	100	3	3
17	MEP	549	Airconditioning Thermal Load (1)	70	30	0	100	3	3
18	MEP	550	Airconditioning Thermal Load (2)	70	30	0	100	3	3
19	MEP	551	Natural and Mechanical Ventilation Systems	70	30	0	100	3	3
20	MEP	552	Air Distribution Systems in Air Conditioning	70	30	0	100	3	3
21	MEP	553	Airconditioning and Ventilation Systems	70	30	0	100	3	3
22	MEP	556	Airconditioning and Ventilation Applications	70	30	0	100	3	3
23	MEP	559	Energy and Environment	70	30	0	100	3	3
24	MEP	560	Solar Energy	70	30	0	100	3	3
25	MEP	561	Wind Energy	70	30	0	100	3	3
26	MEP	564	Energy Storage	70	30	0	100	3	3
27	MEP	565	Sea Wave Energy	70	30	0	100	3	3
28	MEP	566	Bio-Energy	70	30	0	100	3	3
29	MEP	567	Thermodynamics (2)	70	30	0	100	3	3
30	MEP	568	Control of Industrial Furnaces, Boilers and Thermal Processes	70	30	0	100	3	3
31	MEP	572	Automatic Control in Internal Combustion Engines	70	30	0	100	3	3
32	MEP	573	Performance of Internal Combustion Engines	70	30	0	100	3	3
33	MEP	574	Testing and Calibration of Internal Combustion Engines	70	30	0	100	3	3
34	MEP	575	Foundations and Vibrations of Internal Combustion Engines	70	30	0	100	3	3
35	MEP	581	Project Management	70	30	0	100	3	3
36	MEP	600	Combustion Engineering	70	30	0	100	3	3
37	MEP	601	Advanced Thermodynamics	70	30	0	100	3	3
38	MEP	611	Advanced Fluid Dynamics	70	30	0	100	3	3

Department of Mechanical Power Engineering

(No prerequisites for the following courses)

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
39	MEP	612	Multi-Phase Flow	70	30	0	100	3	3
40	MEP	613	Water Power Engineering	70	30	0	100	3	3
41	MEP	614	Unsteady Flow of Fluids	70	30	0	100	3	3
42	MEP	616	Jet Propulsion	70	30	0	100	3	3
43	MEP	617	Turbulent Flow	70	30	0	100	3	3
44	MEP	620	Fluid Mechanics (2)	70	30	0	100	3	3
45	MEP	621	Aerodynamics	70	30	0	100	3	3
46	MEP	622	Advanced Turbo-Machines	70	30	0	100	3	3
47	MEP	624	Gas Dynamics (2)	70	30	0	100	3	3
48	MEP	630	Heat Transfer By Conduction	70	30	0	100	3	3
49	MEP	631	Convective Heat and Momentum Transfer	70	30	0	100	3	3
50	MEP	632	Water Desalination	70	30	0	100	3	3
51	MEP	633	Boundary Layer Theory	70	30	0	100	3	3
52	MEP	634	Heat Transfer By Radiation	70	30	0	100	3	3
53	MEP	672	Advanced Measurements	70	30	0	100	3	3
54	MEP	690	Economics of Power Generation	70	30	0	100	3	3
55	MEP	691	Turbulent Jets and Wakes Flows	70	30	0	100	3	3
56	MEP	692	Renewable energy and its impact on environment	70	30	0	100	3	3
57	MEP	693	Introduction to computational fluid dynamics	70	30	0	100	3	3
58	MEP	P99	Project	70	30	0	100	3	3

COURSE SYLLABUSES

MEP 500 Transient Combustion

Basics of combustion – fuel properties (solid – liquid – gaseous) – Mathematical model for evaporation of liquid droplet – model of chemical reactions – burning of liquid droplet – introduction of chemical kinetics – properties of premixed flames – mechanisms of combustion pollutants – laminar flame propagation.

MEP 502 Combustion Equipment for Boilers

Combustion Requirements, Methods of Flame Stabilization, Gaseous Fuel Burners, Liquid Fuel Burners, Components of Solid Fuel Burners, Air Supply Systems for Burners, Components of Fuel Supply Lines for Gaseous, Liquid and Solid Fuel Burners, Starting Up Requirements for Burners, Load Control in Burners, Safety Systems for Operation of Burners, Burner Specifications, Selection of Burners for The Operation of Boilers and Industrial Furnaces.

MEP 503 Measuring Instruments in Furnaces and Boilers

Temperature measuring sensors and instruments, pressure measuring sensors and instruments, flow measuring sensors and instruments, analysis of combustion products sensors and instruments, level measuring sensors and instruments.

MEP 510 Pump Design (1)

Revision of Classification and Performance of Different Pump Types, Design of Centrifugal Pumps: Design of Pump Shaft and Impeller Dimensions, Design of Impeller Vanes, Diffuser Design, Design of Pump Casing.

MEP 511 Pipe Networks and Reservoirs

Symbols for Pipelines and Fittings, Incompressible Flow in Pressure Conduits, Pipeline System Analysis and Design, Pipe Fittings, Pipe Industry and Technology, an Introduction to Transfer of Solids in Piping, Pipeline Insulation. Laying and Protection, Economics of Pipelines and Costing, Water Hammer in Pipelines, Methods of Water Hammer Protection, Computer Programming Aids. Measurements and Telemetry, Standard Specifications.

MEP 512 Operation, Maintenance and Testing of Pumps

Pumps Classification and Range of Application. Pumps Sealing and The Mechanical Seals with The Theory of its Operation, Types of Impeller Rotors, Pump Materials Used for The Construction of Different Pump Components with The Standard Specifications, Starting and Stopping Procedures for Pumps with Low Specific Speeds, Daily, Semi Annual, and Annual Inspection and Maintenance of Different Types of Pumps, Pump Troubles and Ways of Maintenance and Repair. Pump Testing, Tabling of Results and Improving The Performance.

MEP 513 Pump Selection

Rotodynamic Pump Types, Displacement Pump Types. System Requirements, Manufacture's Requirements, Consulting Engineer Requirements, Number of Pumping Units, Suction Conditions, Discharge Conditions, Specifications, Prime Movers, Accessories, Maintenance and Operating Economics, Pump Data Sheets, Pump Drawings, Evaluation of Bids.

MEP 516 Pump Design (2)

Airfoil Theory for Propeller Pump Design, Design of Axial Flow Pumps, Design of Different Types of Positive Displacement Pumps.

MEP 517 Corrosion Engineering

Theory of Corrosion: Nature of Metals, Electrolytes, Corrosion Mechanism, Polarization, Passivity. Forms of Corrosion: Bi-Metallic Corrosion, Differential Concentration Corrosion. Erosion Corrosion, Stray Current Corrosion. Theory of Corrosion Prevention: Coating Inhibitors, Cathodic Protection, Anodic Protection. Corrosion Survey and Monitoring, Design of Protection Systems.

MEP 522 Gas Dynamics (1)

Steady Flow Energy Equation, Euler's Equation, Speed of Sound and Mach Number. Flow with Friction, Equation of Flow with Friction, Sonic Flow, The Area-Velocity Relationship, Flow in a Constant-Area Duct. The Shock Wave, The Normal Shock Relation for The Perfect Gas, Equation for Flow with Combined Area Change, Friction and Heat Transfer, The General Heat Transfer Case, with Area Change Without Friction, Heat Transfer in a Constant Area Duct Without Friction, The Rayleigh Curve.

MEP 529 Fluid Mechanics (1)

Kinematics of Fluid Motion, Flow of Incompressible Ideal Fluids, Flow of Compressible Ideal Fluids, Impulse Momentum Principle, Similitude and Dimensional Analysis, Fluid Flow in Pipes, Fluid Flow Around Immersed Bodies, Troubles of Unsteady Flows, Fluid Measurements.

MEP 530 Heat Transfer (1)

The Differential Equation of Heat Conduction, The Steady State Heat Conduction in Two and Three Dimensions: Analytical and Numerical Methods. Fins with Variable Cross Section. The Transient Heat Conduction in One and Multi Dimensions for Sudden Change of The Surface or The Surrounding Fluid Temperatures By Analytical, Heisler Charts and Graphical Methods, Lumped System Analysis.

MEP 531 Hot and Cold Water Piping Systems

Pressure Drop Equations and Pressure Drop Evaluation, Flow Rate Limitations, Sizing of Hot and Cold Water Piping, Gas, Steam and Fuel Piping, District Heating and Cooling: Design Guide Lines for The Water Distribution Systems, Hydraulic Considerations: Water Hammer, Pressure Losses and Pipe Sizing, Thermal Considerations: Methods of Heat Transfer Analysis and Thermal Insulation, Pipe Supporting and Guides, Anchorage, Distribution System Construction.

MEP 537 Water Treatment for Boiler and Industrial Processes

Chemical and Physical Composition of Water, Methods to Remove Solid Water Suspensions: Methods of Water Purification By Settlement, Construction and Performance of Water Filters, Water Storage, Requirements of Boiler and Industrial Water, Methods to Reduce Dissolved Salts in Water, Control Equipment for Operation of Water Treatment Plants. Internal Water Treatment for Boiler and Industrial Processes, Dearators and Gas Extraction Towers, Selection of Water Treatment Plants to Suit Type of Boilers and Industrial Processes.

MEP 541 Testing, Adjusting and Balancing of HVAC Systems

Terminology, General Criteria, Air Flow Measurement Methods- Balancing Procedure for Air Distribution, Variable Air Volume (VAV) Systems, Balancing Hydronic Systems: Principles and Procedures- Methods of Water-Side Balancing, Fluid Flow Measurements, Steam Distribution, Cooling Towers, Temperature Control Verification, Field Survey for Energy Audit, Testing for Sound and Vibration.

MEP 544 Control and Safety Equipment in Refrigeration and Air Conditioning

Control Theory and Terminology, Types of Control Systems : Pneumatic, Electric, Electronic and Fluidic Hydraulic, Flow Control Devices, Elementary Control Systems, Complete Control Systems. Electric

Control Systems- Supervisory Control Systems, Special Applications in Control Systems.

MEP 549 Airconditioning Thermal Load (1)

Introduction, Thermal Storage, and Thermal Capacity of Structures and Enclosures. Sensible and Latent Loads, Weather Data, Outside and Inside Design Conditions, Heat Transmission Coefficients. The Cooling Load Temperature Differences, Methods of Calculation of The Conduction Cooling Load from Exterior Walls, Ceilings, Floors, Interior Partitions and Roofs Conduction and Solar Load from Fenestration, Effect of Shading on The External and Solar Loads. The Load from The Structure During The Noncontinuous Operation, The Effect of The Running Time and Timing on The External Loads in Noncontinuous Operation.

MEP 550 Airconditioning Thermal Load (2)

Internal Loads: Occupants, Machinery and Equipment, Electric Motors, Appliances, Lighting, Ventilation and Infiltration Air Cooling Load, Pressurization Air to Prevent Infiltration. Cooling Loads for Residential Buildings. Psychrometric Processes.

MEP 551 Natural and Mechanical Ventilation Systems

Hygienic Aspects of Ventilation, The Goal of Ventilation, Health Industrial Hazards, Dust, High Temperatures and Humidity, Harmful Liquids and Gases. Ventilation methods: The Natural Ventilation, The Role of Wind and The Structure Height. The Mechanical Ventilation: Design Principles, Local Ventilation and Isolation of Districts, Ventilation Air Quality, Temperature and Humidity, Fire Precautions in Ventilation Systems, Special Ventilation Application: Air Curtains and Ventilation Protections Against Fire, Ventilation of Hospitals and Clean Rooms, Industrial Ventilation, Control of Thermal Sources and Relaxation of Heat Loads, Concentration Dilution By Ventilation, Local Exhaust Systems, Exhaust Air Quantity, Ventilation Hoods Design and Selection, Air Flow and Distribution Methods, Air Flow in Ducts, Duct System Design and Construction Details, Dust Collection Ducts, Exhaust Fans, Noise Attenuation.

MEP 552 Air Distribution Systems in Air Conditioning

Air Flow and Ducts: Pressure Variation in Ducting Flow, The Friction Pressure Loss in Ducts, The Darcy Equation, The Friction Factor Chart, The Correction Factors, The Dynamic Pressure Loss, The Dynamic Pressure Loss Coefficient, The Additional Equivalent Length, Air Duct Designs: The Design Considerations, Methods of Designs: The Variable Velocity Method, The Equal Friction Method, The Static Pressure Regain Method The Heat Loss or Gain and Ducting Insulation Noise: Noise Sources, Noise Attenuation. Air Diffusion: Principles of Air Diffusion, Air Outlets, Its Locations and Types, Methods of Air Purification, Types of Air Filters, Its Selection and Applications, Air Fans: Fans Types, Fan Laws, Performance Charts, The Inter- Relationship of Fans and Ducts, Selection of Fans, Fan Installation.

MEP 553 Airconditioning and Ventilation Systems

Basics of Airconditioning System Design, All Air Systems, Air and Water Systems, Unitary Systems, Total Energy Systems, Forced Air Systems, Chilled and Dual Temperature Water Systems, Industrial Exhaust Systems.

MEP 556 Airconditioning and Ventilation Applications

Introduction, Residences, Retail Facilities, Commercial and Administrative Buildings, Places of public Assembly, All kinds of Hotels , Health Facilities, Surface Transportation, Aircraft, Ships, Industrial Air Conditioning, Enclosed Vehicular Tunnels Facilities, Laboratories, Engine Test Facilities, Printing Plants, Textile Processing, Photographic Materials, Drying and Storing Farm Crops, Airconditioning of Wood and Paper Products Facilities, Mine Airconditioning and Ventilation, Ventilation of The Industrial Environment.

MEP 559 Energy and Environment

Gaseous and Solid Pollutants, Formation Mechanism of Gaseous and Solid Pollutants During Combustion Processes Within Boilers, Industrial Furnaces and Gas Turbines, Formation Mechanism of Pollutants in Internal Combustion Engines, Control of Pollutants Formation in Boilers, Industrial Furnaces and Gas Turbines, Control of Pollutants in Internal Combustion Engines, Thermal Pollution from Cooling Processes of Power Producing Equipment.

MEP 560 Solar Energy

General Idea About The Solar Energy, Its Intensity in The Outer Space and The Motion of The Earth with Respect to The Sun, The Angles of Solar Rays on Earth. Different Models for Calculating Solar Energy Intensity and The Fraction Dispersed Through The Earth's Atmosphere. Theory of Solar Collectors and Equations Defining The Glass Cover Transmissivity, Thermal Losses and Thermal Efficiency, Solar Collector Performance and Its Effect on The Phase of The Fluid Flowing Through The Collector.

MEP 561 Wind Energy

An Introduction to Wind Energy, Survey of Wind Energy, Measuring Instrumentation for Wind Velocity and Direction, Theoretical Study of Wind Energy, Wind Turbine Blades, Horizontal and Vertical Axis Wind Turbines, Control System, Wind Energy for Pumping and Electricity Generation. Computer Programs for Calculating The Turbine Power, Wind Measurements. Design of Wind Turbines Through The Application of The Appropriate Aerodynamic Theories.

MEP 564 Energy Storage

Need to Storage, Types of Energy Storage: Biological, Chemical, Thermal, Electrical, Mechanical. Pumped Storage: Requirements, Working Principle, Economic Justification, Advantages of Pumped Storage, Site Selection, Classification, Machinery, Lakes, Power Houses, Typical Plants.

MEP 565 Sea Wave Energy

Introduction. Sea Wave Characteristics, Wave Energy Conversion to Mechanical Energy, Mechanical Energy Conversion Into Other Usable Forms, Tides, Tidal Energy, Construction of Moving Prevention Devices, Environmental, Social and Industrial Considerations, Typical Plants.

MEP 566 Bio-Energy

Energy Sources and Their Classifications, Conventional Energy Conversion, Power Plants and Vapor Cycles, Methods of Bio-Mass Conversion Into Energy, Biological Methods, Aerobic and Anaerobic Fermentation, Thermo-Chemical Methods Direct Combustion, Gasification (Partial Combustion) and Pyrolysis, Practical Applications of Bio-Mass Conversion Into Energy, The Use of Gaseous Fuel in Internal Combustion Engines.

MEP 567 Thermodynamics (2)

Applications on First and Second Law, Entropy, Properties of Compressible Fluids. Adiabatic Flow with Friction, Flow with Heat Transfer.

MEP 568 Control of Industrial Furnaces, Boilers and Thermal Processes

Introduction and Basic Definition, Advanced Process Dynamics, Industrial Controllers (Design, Tuning, Maintenance), Optimum Controllers and Tuning, Final Control Elements (Servo-Motors, Valves), Design, Choice and Maintenance), Identification of Control Systems and Processes in Open Loops and Closed Loops, Introduction to Nonlinear Control Systems (Relay Control Systems, Harmonic, Linear), Introduction to Stochastic Systems, Control Systems for Burners & Boiler Feed Water, Control of Total Dissolved Solids in Boiler Water, Safety Valves.

MEP 572 Automatic Control of Internal Combustion Engines

Automatic Control Systems. Classification of Control Systems, Block Diagram, Engine Steady State Conditions, Engine Unsteady State Conditions, Engine Differential Equations, Engine As a Plant Controlled By The Crankshaft Rotational Speed, Engine As a Plant Controlled By The Cooling Water (Air) Temperature, Selection of Control Method, Direct Acting Governors, Indirect Acting Governors, Electronic Governors, Dynamic Performance of Governors and Their Components, Stability of Automatic Control Systems.

MEP 573 Performance of Internal Combustion Engines

Introduction to Supercharging, Supercharger Types and Efficiency, Matching Superchargers (Mechanically Driven), Utilization of Exhaust Gas Energy, Matching Turbochargers, Pulse Converters, Two Stage Turbo-Charging Pressure Exchangers, Turbo-Charging of Petrol Engines, Analytical Matching and Performance Prediction Methods, Elementary Methods, Quasi Steady Methods, The Gas Exchange Process. Filling and Emptying Methods, Transient Response Models.

MEP 574 Testings and Calibration of Internal Combustion Engines

Test Cell As a Thermodynamic System, Study of Ventilation, Cooling Water, and Exhaust Gas Systems for the Control Room, Fuel and Oil Storage and Supply, Types of Engine Dynamometers, Measurement of Fuel and Air consumption, Measurement of Oil Consumption, Measurements of Heat and Mechanical Losses, Measurement of Exhaust Emissions, Engine Vibration and Noise Analysis, Cylinder Pressure Recording , Estimation of the Rate of Heat Release, Engine Performance Mapping, Statistical Analysis of Test Results, Correction of Results according to The Standard Conditions..

MEP 575 Foundations and Vibrations of Internal Combustion Engines

Calculation of The Pressure Variation During The Engine Cycle, Force Analysis for The Piston, Connecting Rod and Crank Shaft for a Single Cylinder, Force Analysis for Multi-Cylinder Engines, Torsional Vibrations, Engine Foundations, Dampers, Types, Design, Calculation of Deflection of Dampers. Frequency of Vibration of Dampers, Resonance.

MEP 581 Project Management

Principles of Management, Functions of Enterprises: Production, Personal, Accounting ,Marketing, Quality Engineering Control. Basic Problems Facing Project Management ,Demand Forecasting, Factors Affecting The Production of The Enterprise, Importance of Cost in Project Management, Methods and Techniques of Pricing, Project Follow Up and Final Report Writing, Total Quality Application in Efficient Project Management, Engineering Approach to Improve Project Performance, Case Studies.

MEP 600 Combustion Engineering

Introduction to Combustion, Mass and Heat Transfer, Vaporization of Liquid Fuel Droplets Introduction to Diffusion Combustion, Vaporization of Liquid Fuel Droplets, During Combustion Laminar Diffusion Flames. Turbulent Diffusion Flames, Kinetically Influenced Combustion Phenomena, Introduction to Chemical Kinetics, Spontaneous Combustion, Well Stirred Reactor, Flame Stabilization By Bluff Bodies, Laminar Flame Propagation, Spark Ignition.

MEP 601 Advanced Thermodynamics

Applications of The First and The Second Laws of Thermodynamics, The Entropy, Entropy Changes in Reversible and Irreversible Processes, The Principle of Increase of Entropy, Mixtures of Gases, Its Properties, Processes, Gas and Vapor Mixtures and Its Properties, The Reversible Work, Availability and Irreversibility, The Thermodynamic Relations, The Equations of State, The Fugacity, Properties of Compressible Fluids, Flow of Compressible Fluids in Nozzles and Blade Passages: The Reversible Adiabatic Flows, The Adiabatic Flow with Friction, Chemical Reactions and Combustion: Chemical

Analysis, Enthalpy of Formation, Internal Energy and Enthalpy of Combustion, First Law for Reacting Systems, Efficiency of Combustion, Adiabatic Flame Temperature, Phase Equilibrium.

MEP 611 Advanced Fluid Dynamics

Euler's Equation of Motion, Continuity Equation, Irrotational Flow, Velocity Potential, Laplace Equation, Stream Function in Two Dimensional Flow, Two Dimensional Sources and Sinks, Two Dimensional Doubles, Circulation, Combined Flows, Complex Variables, Conformal Mapping, Steady Flow Around Circular Cylinders and Circular Arcs, Joukowski Airfoil, Equations for Viscous Flow, Flow between Parallel Boundaries, Flow between Concentric Cylinders, Theory of Lubrication.

MEP 612 Multi-Phase Flow

Fundamentals for Phase Equilibrium of Single Materials and Mixtures. Basics of Dynamic Equilibrium and Equations for Bubble Growth Dynamics, Momentum and Viscosity Effects. Two Phase Flow Regimes (Gas-Liquid), Models for Void Fraction and Pressure Drop Calculations. Boiling Modes.

MEP 613 Water Power Engineering

Study of Flow Data and Water Power Estimates. Hydraulic Turbines. Power Plant Construction, Waterways and Penstocks, Power House Equipment, Plant Accessories, Speed and Pressure Regulation, Water Hammer, Causes, Effects and Protection. Cost and Value of Water Power, Pumping Storage Constructions.

MEP 614 Unsteady Flow of Fluids

Analysis of unsteady flow, water hammer description and analysis, unsteady flow in pipelines, unsteady flow partial differential equations in pipe networks, boundary conditions at inlet and outlet, pumps and valves in pipes.

MEP 616 Jet Propulsion

Introduction, Basic Gas Turbine Cycles, Actual Gas Turbine Cycles, Performance of Air Compressors, Performance of Turbines. Matching between The Compressor, The Turbine, and The Combustion Chamber, Combustion and Chemical Equilibrium, Flow in Nozzles and between Turbine Blades, Liquid and Solid Propellants, Jet Propulsion Units, Performance of Liquid and Solid Propellant Rockets.

MEP 617 Turbulent Flow

The Nature of Turbulence, Methods of Analysis, Diffusivity of Turbulence, Length Scales in Turbulence Flows, Measurement of Turbulence. The Hot Wire Anemometer, The Laser-Doppler Anemometer, The Equations of Motion. Time Averaging of The Conservation Equations, Turbulent Shear Stress, Models of Turbulence.

MEP 620 Fluid Mechanics (2)

Kinematics of Fluid Motion, Flow of Incompressible Ideal Fluids, Flow of Compressible Ideal Fluids, Impulse and Momentum Principle, Similitude and Dimensional Analysis, Fluid Flow in Pipes, Fluid Flow Around Immersed Bodies, Fluid Measurements. Basics of Thermodynamics, Isentropic Flow, Waves, Adiabatic Flow with Friction, Thermodynamics of Turbo-Machines.

MEP 621 Aerodynamics (2)

Airfoils and Wings, Other Different Airplane Components, Aerofoil Characteristics. Force Representation, Lift, Drag and Lift/Drag Ratio, Pitching Moment, Aerofoil Balance and Stability, The Aerofoil Dimensions, The Aspect Ratio and Plan Form Influences.

MEP 622 Advanced Turbo-Machines

Introduction, Two Dimensional Cascades, Axial Flow Turbines, Two Dimensional Theory, Axial Flow

Compressors, Pumps and Fans, Three Dimensional Flows in Axial Turbo- Machines, Fluid Dynamics Considerations, Detailed Discussion of Turbines, Detailed Discussion on Pumps, Compressors and Positive Displacement Machines.

MEP 624 Gas Dynamics (2)

Adiabatic Flow in Variable Cross- Section Channels with Friction, The Phone Line, The Relish Line, The Fanno Line and Normal Shock Waves, Isothermals in Flow with Friction in a Two Dimensional Constant Cross- Section Duct, One Dimensional Wave Motion, The Weak Shock, The Very Strong Shock, Two Dimensional Flow, The Steady Supersonic Flow, Oblique Shock Waves, The Supersonic Flow Over a Wedge, The Weak Oblique Shock Wave, Supersonic Compression, Supersonic Oppression By Turning, Mayor Function.

MEP 630 Heat Transfer By Conduction

General Heat Conduction Equation, Thermal Conductivity, Steady One-Dimensional Conduction, Resistance Concept, Extended Surfaces, Steady Two-And Three Dimensional Conduction, Unsteady Heat Conduction and Multidimensional Systems, Time Varying Boundary Conditions, Phase Change with Moving Boundaries, Solution Methods, Laplace Transform, Fourier Series, Bessel Functions, Legender Series and Numerical Methods.

MEP 631 Convective Heat and Momentum Transfer

Laminar Boundary Layer on a Flat Plate, Energy Equation of The Boundary Layer, The Thermal Boundary Layer, The Relation Between Friction and Heat Transfer in Tubes for Turbulent Flow of Fluids, Flow Across Cylinders and Spheres, Flow Across Tube Banks, Free Convection Heat Transfer on a Vertical Flat Plate, Free Convection from Vertical Planes and Cylinders, Free Convection from Horizontal Cylinders and shperes, Free Convection from Inclined Surfaces, Free Convection in an Enclosed Space, Combined Free and Forced Convection, Condensation Heat Transfer Phenomena, Boiling Heat Transfer.

MEP 632 Water Desalination

Need to Desalination, Properties of Water and Aqueous Solutions, Engineering and Economic Considerations, Methods of Desalination, Problems Common to Distillation. Multiple Effect Distillation, Multiple Stage Flash Distillation, Vapor Compression Distillation Desalination, Combined Distillation Plants, Distillation with Nonconventional Energy Sources, Separation By Freezing, Ion Exchange Electro- Dialysis, Reverse Osmosis, Design of Desalination Plants.

MEP 633 Boundary Layer Theory

Fundamental Laws of Motion for a Viscous Fluid, The Boundary Layer Concept, Derivation of Navier-Stokes Equations, Creeping Motion, Laminar Boundary Layers, Exact Solutions of The Steady State Boundary Layer Equations, Approximate Methods for The Solution, Thermal Boundary Layers in Laminar Flows, Laminar Boundary Layers in Compressible Flows, Turbulent Boundary Layers.

IVIEP 634 Heat Transfer By Radiation

Radiation from a Blackbody, Definitions and Estimation of Radiative Properties of Nonblack Surfaces, Properties of Real Materials, The Gray Body, Radiation Exchange between Black and Nonblack Surfaces. Thermal Radiation between Gases and Enclosures, Combined Convection and Radiation Heat Transfer, Applications and Numerical Solutions.

MEP 672 Advanced Measurements

Laser Applications for Measurements of Fluid Flow Velocity, Concentration of Combustion Products, Temperature and Soot Concentration, Chromatographic Chemical Analysis of Gaseous Mixtures, Measurements of Flow Velocity with Hot Wire Anemometer, Data Acquisition Systems, High Speed

Cameras. Renewable Energy Measurements.

MEP 690 Economics of Power Generation

First and Second Laws Analysis of Thermal Systems. Energy Analysis of Power Cycles, The Cost of Electrical Power Generation, Selection of Type of Generation, Performance and Operating Characteristics of Power Plants, Load Sharing Among Generators, Interest and Depreciation, Present Worth, Annual Fuel Cost, Levelizing Equations, Economic Evaluation Methods. Construction Cost, Operation and Maintenance Costs, Cogeneration, Economic Scheduling Principles, Load Distribution, Variation of Station Cost with Size of Unit.

MEP 691 Turbulent Jets and Wakes Flows

Definitions of Plane Jets and Plane Mixing Layers, Submerged Jet, Jet in a Stream, Two Dimensional Wakes Flow, The Governing Equations to Compressible Fluid Flow (N.S. Equations). Prandtl Simplifications for The Two Dimensional Compressible Boundary Layer Flow. Assumptions for The Mathematical Modeling for The Shear Stress in Turbulent Flow. Two Dimensional Free Turbulent Flow Modeling for Mixing between Streams, Jets and Wakes, Turbulent Mixing between Streams of Different Temperatures and Densities. Equation of Motion, Energy and Diffusion and Their Solution, Reynolds Analogy for The Velocities, Temperatures and Concentrations Profiles. Application for Flow Geometry and Configuration Inside Combustion Chamber of Gas Turbines (Cold Model) and for Film Cooling of Flat Plates.

MEP 692 Renewable Energy and its Impact of Environment

Solar energy fundamentals, wind energy, wave energy, biomass energy, tidal energy, solar ponds, geothermal energy, agricultural and organic waste energy.

MEP 693 Introduction to Computational Fluid Dynamics

Classification of PDEs , Boundary and initial conditions , Taylor series , Finite difference method , Discretization schemes , Computational error and solution accuracy , Convergence criterion , Stability conditions , Consistency , Solution examples of PDEs in fluid dynamics and heat transfer.

MEP P99 Project