

UNDERGRADUATE PROGRAMME

SYLLABUSES

CIVIL ENGINEERING

TERM SYSTEM

BATCH : 2008-2009

1st Year

2nd Year

3rd Year

4th Year

COURSES OF STUDY AND MARKS DISTRIBUTION

First Year (F.E.) Civil Engineering

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical / Design Class
1	CE-101	Engineering Drawing-I	100	50
2	CE-102	Engineering Mechanics	100	50
3	CE-103	Engineering Surveying-I	100	50
4	CE-104	Engineering Materials	100	50
5	EE-102	Electrical Engineering	100	50
6	ME-105	Applied Thermodynamics	100	50
7	MS-121	Applied Physics	100	50
8	MS-105	Applied Chemistry	100	50
9	MS-111	Calculus	100	--
10	HS-101	English	100	--
11	HS-105	Pakistan Studies (or)	100	--
	HS-127	Pakistan Studies (For Foreigners)		
		Total Marks = 1500	1100	400

SYLLABUS – FIRST YEAR ENGINEERING

CE-101

ENGINEERING DRAWING-1

Introduction:	Use and care of Drawing Instruments, Standard Drawing Office Practice, Principles of Orthographic Projection related to Simple Solids.
Descriptive Geometry:	Lines in Space and in Planes showing their traces and true inclination to planes of projection, Plane curves, Cycloid, Hypocycloid, In-volute, Curves of Interpenetration of Solids, Development of Surfaces, Isometric Views, Shadows.
Machine Drawing:	Representation of Riveted Joints, Screwed Fastenings, Keys and Cotters, Preparation of fully Dimensioned Working Drawing of component parts of machines, Practice in reading of drawing and deduction of new views from those given.
Symbols and Abbreviations:	Building materials, Electric and Plumbing symbols and Abbreviations.

CE-102

ENGINEERING MECHANICS

Static of Particles:	Forces in a Plane, Newton's First Law, Free Body Diagram, Forces in Space (Rectangular components), Equilibrium of a Particle in Space.
Kinematics of Particles:	Rectilinear and Curvilinear motion of particles, Components of Velocity and Acceleration, Motion relative to a frame in translation.
Kinetics of Particles:	Newton's Second Law, Dynamic Equilibrium, Rectilinear and Curvilinear motion, Work and Energy, Kinetic energy of a particle, Principle of Work and Energy, Conservation of Energy, Impulse and Momentum, Impulsive Forces and Conservation of Momentum, Impact; Direct and Oblique, Conservation of Angular Momentum.
Rigid Bodies:	Equivalent Systems of Forces, Principle of Transmissibility, Moment of a Force, Couple, Varignon's Theorem, Centre of Gravity of a three dimensional body and Centroid of a Volume, Moments of Inertia, Radius of Gyration, Parallel Axis Theorem.
Equilibrium of Rigid Bodies:	Free-Body Diagram, Equilibrium in two and three Dimensions, Reaction at Supports and Connections, Equilibrium of 2-Force and 3-Force Bodies.
Kinematics of Rigid Bodies:	General Plane Motion, Absolute and Relative Velocity and Acceleration.
Plane Motion of Rigid Bodies:	Forces and Acceleration, Energy and Momentum, Conservation of Linear and Angular Momentum.
Friction:	Basic Principles relating to Friction between Solid bodies, Friction angle and Wedges.
Analysis of Structures:	Internal Forces and Newton's Third Law, Planar and Space Trusses, Methods of Joints and Sections, Forces in Cables, Introduction of Shear force and Bending moment in Simply Supported beams and Cantilever beams.

CE-103

ENGINEERING SURVEYING – I

Basics of Surveying:	Definition, Evolution of Surveying, Types and Classes of Surveys, Plane Table Survey, Surveying Instrumentation, Survey References, Units of Measurement, Location Methods, Accuracy and Precision, Errors and Mistakes, Accuracy Ratio, Stationing, Field notes, Field management.
Measurement of Horizontal Distances:	Methods of Linear measurement, Types of Measurement, Chains, Tapes, Standard conditions for use of Steel tapes, Taping Accessories and their use, Systematic Taping Errors and Corrections, Random Taping Errors and Mistakes in Taping, Field notes for Taping, Conventional and Electronic Field books.
Levelling:	Definitions, Theory of Differential Levelling, Effects of Curvature and Refraction, Types of Levels, Automatic Level, Digital Level, Adjustment of Levels, Types of Levelling Staff, Levelling Operations, Techniques of Levelling, Benchmark Levelling (Vertical Control Survey), Profile and Cross-section Levelling, Reciprocal Levelling, Peg test, Errors in Levelling, Contours and their characteristics, Various methods of Contouring.
Angles and Directions:	Horizontal and Vertical Angles, Meridians, Types of Horizontal angles, Azimuths, Bearing, Relationship between Bearings and Azimuths, Reverse Directions, Azimuth and Bearings computations, Magnetic Declination, Types of Compasses.
Theodolites / Tacheometers:	Introduction, Types of Theodolites, Repeating, Directional and Electronic Theodolites, Temporary adjustments, Measurement of Horizontal and Vertical Angles, Prolonging a Straight Line, Permanent Adjustments, Use of Tachometers in computation of Horizontal and Vertical Distances.
Electronic Distance Measurement:	General, Principles of EDM Operation, EDM Characteristics, EDM Accuracies, Geometry of EDM, Electro-Optical and Microwave Instruments, Total Stations, Field procedures for Total Stations in Topographic Surveys, Construction layout using Total Stations.
Traverse Surveys:	Open and Closed Traverses, Latitude and Departures, Computation of Error of Closure, and the accuracy of a Traverse, Traversing with Total Station Instruments, Rules of Adjustment, Effects of Traverse Adjustments on the original data, Computation of Omitted Measurements, Area of Closed Traverse Methods, Use of computer programs.

CE-104

ENGINEERING MATERIALS

Classification and General Aspects of Construction Materials:	Overview of Materials used in construction, General aspects related to weight, Density, Specific gravity, Strength, Hardness, Durability, Workability and Cost of Materials, Classification of Materials, Ceramics, Metals and Organics.
Concrete Materials:	Introduction to Concrete, Manufacturing, Types and Properties of Cement, Types and Properties of Fine and Coarse Aggregates, Quality of Water, Mixing, Transportation & Placing of Concrete, Mix Design, Quality Control, Additives and Admixtures, Air Entrainment, Lightweight Concrete, Hot and Cold Weather Concrete, Precast Concrete with special reference to Cement Concrete Blocks.

Metals and Alloys:	Composition, Manufacturing, Properties and Uses of Ferrous Metals and their Alloys, Pig Iron, Cast iron, Wrought Iron and Steel, Types of Steel, Effects of Heat Treatment of Steel, Steel sections and bars, Corrosion and Method of its prevention.
Natural Stones, Bricks and Tiles:	General Characteristics, Varieties and Uses of Building Stones, Manufacture, Varieties, Properties and Uses of Bricks and Tiles
Timber:	Varieties, Properties and Uses of Timber, Grain and Moisture in Wood, Methods of Sawing, Defects, Decay and Insect Attack, Seasoning and its Methods, Preservation and its Methods, Glued Laminated Timber, Plywood, Hardboard, Chipboard, Particle board, Fibre board.
Rubber, Plastics and Bituminous Materials:	Composition, Varieties, Properties and Uses of Bitumen, Asphalt Glass, Rubber Laminates, Adhesives, Asbestos, Fibre Glass, Paints and Varnishes.
Insulating Materials:	Waterproofing and Heat Insulating Materials, Acoustical Materials.

EE-102

ELECTRICAL ENGINEERING

Electric and Magnetic Circuits:	Electric Circuits, Kirchoff's Laws, Superposition Theorem, Substitution Theorem Thevenin's Theorem Norton's Theorem, Rosen's Theorem of Star/mesh Transformation, Proof for DC circuits and their application to Circuit Analysis, Magnetic Circuits, Series and Parallel circuits, Principles of calculation of Ampere-turns for Magnetic Circuits of Electromagnets, Transformers, Bipolar and Multi-polar DC machines, Inductances in Series and Parallel, Hysteresis Loss, Eddy Current Loss, Lifting Power of a Magnet.
AC Single Phase and Poly phase Systems:	Single Phase systems, Series, Parallel and Series Parallel Circuits, J Operator Method and Polar Method, Resonance and Measurement of Power and Power Factor, Poly-phase Systems, Poly-phase Generation, Star and Delta Connections, Voltage and Current relations, Measurement of Power and Power Factor, Balanced and Unbalanced Load Analysis.
DC Machines:	Construction, Simple Lap and Wave Windings, Equalising Connections and Dummy Coils, Elementary concept of Armature Reaction and Commutation, Cross and Demagnetising Ampere-turns. DC Generators, Types, EMF Equation, Losses, Efficiency Performance Curves, Characteristics, Critical Resistance, Speed and Effect of Armature Reaction of OCC, Internal and External Characteristics from OCC neglecting and accounting Armature Reaction, Calculation of Series Ampere-turns for Level and Over, Compounding, Motors, Principle, Back EMF, Torque, Speed and Speed Regulation, Types, Characteristics, Performance Curves. Losses and Efficiency, Speed and Torque problems involving Magnetization Curve, Charging and Ignition Circuits of Automobiles
AC Synchronous:	Construction, Stator Single Layer, Double Layer and Concentric Windings, Damping Windings, Coil Span Factor, Distribution Factor, Leakage and Armature Reaction, Synchronous Impedance, Alternation, Types, EMF Equation, Speed and Frequency, Losses and Efficiency, Alternator on Load, Voltage Regulation by Synchronous Impedance Method, Synchronous Motors, Types, Principle of Working, Vector Diagram on Load and its analysis for Stator Current, Power Factor, Torque and Mechanical Output, Effect of Variation of Excitation, Losses and Efficiency.

Machine AC Induction	Induction Motors, Construction, Types, Rotating Field Theory, Principle of Working.
Machines:	Slip and its effect on Motor Current Quantities, Losses, Efficiency and Performance Curves, Starting, Full Load and Maximum Torque relations, Torque Slip Characteristics.
Transformers:	Construction, Principle of Working, EMF Equation, Transformation Ratings, No Load Working and Vector Diagram, Magnetizing Current, Vector Diagram on Load, Equivalent Circuit, Open Circuit and Short Circuit Test, Losses, Efficiency and Performance Curves, All-day-efficiency, Percentage and Per Unit R, X and Z, Voltage Regulation and Kapp's Regulation Diagram, Transformer as a Mutually Inductive Circuit.
Converting Machines:	Rotary Converters, Construction, Principle of Working, Transformer Connections, Voltage and Current Ratings of Single and 3 Phase Converters, Mercury Arc Rectifiers, Construction, Operation, Transformer Connections, Voltage and Current Ratios of Single Phase and 3 Phase Rectifiers

ME-105

APPLIED THERMODYNAMICS

Thermodynamic Properties:	Working Substance, System, Pure Substance, PVT Surface, Phases, Properties And State, Units, Zeroth Law, Processed and Cycles, Conservation of Mass.
Energy and its Conservation:	Relation of Mass and Energy, Different Forms of Energy, Internal Energy and Enthalpy Work, Generalized Work Equation Flow and Non-Flow Processes, Closed Systems, First Law of Thermodynamics, Open Systems and Steady Flow, Energy Equation for Steady Flow, System Boundaries, Perpetual Motion of the First Kind.
Energy and Property Relations:	Thermodynamic Equilibrium, Reversibility, Specific Heats and their Relationship, Entropy, Second Law of Thermodynamics, Property relations from Energy Equation, Frictional Energy.
Ideal Gas:	Gas Laws, Specific Heats of an Ideal Gas, Dalton's Law of Partial Pressure, Thermodynamic Processes.
Fundamentals of Heat Transfer:	Conduction and Convection, Radiation, Thermal Conductivity, Overall Heat Transfer Coefficients, Practical Equations.
Thermodynamic Cycles:	Cycle Work, Thermal Efficiency Carnot Cycle, Reversed and Reversible Cycles, Most Efficient Engine.
Two-Phase Systems:	Two-Phase System of a Pure Substance, Changes of Phase at Constant Pressure, Steam Tables, Superheated Steam, Liquid and Vapour Curves, Phase Diagrams, Rankine Cycle, Components of Steam Power Plant.
Internal Combustion Engines:	Otto Cycle, Diesel Cycle, Dual Combustion Cycle, Four-stroke and Two-stroke Engines, and Types of Fuel.
Reciprocating Compressors:	Condition for Minimum Work, Isothermal Efficiency, Volumetric Efficiency, Multi-Stage Compression, Energy Balance for a Two-Stage Machine with Intercooler.
Introduction To	Heating and Cooling Load and its calculations, Comfort Charts, Outline of A.C.

Air-Conditioning and Refrigeration: Systems, Consideration for Air – Conditioning in Buildings, Natural Ventilation, Insulating Materials.

MS-121

APPLIED PHYSICS

Introduction: Scientific notation and significant figures, Types of errors in experimental measurements, Units in different systems, Graphical Techniques (Log, semi-log and other non-linear graphs)

Vectors: Review of vectors, Vector derivatives, Line and surface integrals, Gradient of a scalar.

Mechanics: The limits of Mechanics, Coordinate systems, Motion under constant acceleration, Newton laws and their application, Galilean invariance, Uniform circular motion, Frictional forces, Work and Energy, Potential Energy, Energy conservation, Energy and our environment, Angular momentum

Electrostatics and Magnetism: Coulombs Law, Electrostatic potential energy of discrete charges, Continuous charge distribution, Magnetic fields, Magnetic force on current, Hall effect, Biot-Savart Law, Ampere's Law, Fields of rings and coils, Magnetic dipole, Diamagnetism, Paramagnetism and Ferromagnetism

Semiconductor Physics: Energy levels in a semiconductor, Hole concept, Intrinsic and Extrinsic regions, Law of Mass Action, P-N junction, Transistor, Simple circuits

Waves and Oscillations: Free oscillation of systems with one and more degrees of freedom, Solution for Modes, Classical wave equation, Transverse modes for continuous string, Standing waves, Dispersion relation for waves, LC network and coupled pendulums, Plasma Oscillations

Optics and Lasers: Harmonic travelling waves in one dimension, Near and far fields, Two-slit interference, Huygens Principle, Single-slit diffraction, Resolving power of optical instruments, Diffraction Grating Lasers, Population inversion, Resonant cavities, Quantum efficiency, He-Ne, Ruby and CO₂ lasers, Doppler effect and sonic boom

Modern Physics: Inadequacy of classical physics, Plank's explanation of black body radiation, Photoelectric effect, Compton effect, Bohr theory of Hydrogen atom, Atomic spectra, Reduce mass, De-Broglie hypothesis, Braggs Law, Electron microscope, Uncertainty relations, Modern atomic model, Zeeman effect, Atomic nucleus, Mass-energy relation, Binding energy, Nuclear forces and fundamental forces, Exponential decay and half-life, Radioactive equilibrium in a chain, Secular equilibrium, Nuclear stability, Radiation detection instruments, Alpha decay, Beta decay, Gamma decay attenuation, Nuclear radiation hazards and safety, Medical uses of Nuclear Radiation, Fission, Energy release, Nuclear Reactors, Breeder Reactor, Nuclear Fusion.

MS-105

APPLIED CHEMISTRY

Gases: Gas Laws, Kinetic gas equation, Vandar Waal's Equation, Critical phenomenon, liquidification of gases, specified heat (molar heat capacity).

Properties of Solution Surface Tension, Viscosity, Osmosis, Osmotic Pressure, pH - Buffer solution,

& Liquids:	Spectrophotometer, Basic concepts of Colloidal Chemistry, Classification purification (dialysis).
Thermochemistry:	Chemical thermodynamics, Hess's Law, Heat of reaction, Relation between H and U measurement of heat reaction, Bomb Calorimeter
Electrochemistry:	Laws of Electrolysis, E.M.F. series, corrosion (Theories, inhibition & protection)
Water & Sewage:	Sources of water, impurities, hardness, water softening, purification of water for potable and industrial purposes, electro dialysis, introduction to environmental pollution, main sources and effects, Sewage treatment
Fuels:	Types of fuels, classification of fossil fuels.
Metals & Alloys:	Properties and general composition of metals and alloys such as Iron, Copper, Aluminum, Chromium, Zinc used in engineering field
Engineering Materials:	Inorganic engineering materials: Cement, Class Organic engineering materials: Polymers, Rubbers, Plastics and Paints, Semiconductors and Dielectric materials.

MS-111

CALCULUS

Set and Functions:	Define rational, irrational and real numbers; rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic and rational inequalities in involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, DeMorgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well known functions. Limit of functions and continuous and discontinuous functions with graphical representation.
Propositional Logic:	Definition of Proposition, Statement and Argument, Logical Operators, Simple and Compound proposition, various types of connectives, Truth table, tautology, Contradiction, Contingency & Logical equivalence.
Boolean Algebra:	Definition, Boolean function, duality, some basic theorems & their proofs, two valued Boolean algebra, Truth functions, Canonical sum of product form, Digital logic Gates & Switching circuit designs
Complex Number:	Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions)
Differential Calculus:	Differentiation and Successive differentiation and its application, Leibnitz theorem, Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series, Taylor and Maclaurin series, L' Hopitals rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors, extreme values of a function of two variables with and without constraints, Solution of non linear equation using Newton Raphson method
Integral Calculus:	Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence, Beta and Gamma functions and their

identities, applications of integration, Centre of pressure and depth of centre of pressure

Solid Geometry: Coordinate Systems in three dimensions, Direction cosines and ratios, vector equation of a straight line, plane and sphere, Curve tracing of a function of two and three variables, Surfaces of revolutions, transformations (Cartesian to polar & cylindrical)

HS-101

ENGLISH

Study Skills: Reading, dictionary, library skills, speed reading, writing outlines, note taking

Advanced reading Comprehension: Using texts dealing with science, literature and human rights

Oral Communication: Confidence building, class discussion, speeches, verbal interaction

Précis Writing: Rules of précis writing, practice précis

Controlled and guided writing: Pre writing (planning, information gathering, preparing to write), writing, search for topic sentences, developing a theme, following up ideas and arguments, outline plans etc.

Essay Writing:
a) Types of writing – narrative, descriptive, expository, argumentative etc.
b) Using guided writing to organize essays.
c) Include human rights as essay topics

Writing short reports: a) Short background of report and its importance, b) memo report, c) brief reports on events seen / experienced like visit to an exhibition etc.

Letter writing: a) format and layout, b) formal letters, c) types of letters – invitations (acceptance and refusals), condolence, thanks, congratulations, to the editor, chairman, class advisor, Dean, Vice Chancellor etc.

Applied Grammar: Morphology, Types of sentences, Sentence analysis, Tenses, Jumbled sentences, Question tags, Homonyms and Homophones, and their use in sentences, Punctuation – sentences and paragraphs, Use of idioms

HS-105

PAKISTAN STUDIES

Historical and Ideological Prospective of Pakistan Movement: Two-Nation Theory: Definition and Significance, Factors Leading towards the Creation of Pakistan, Quaid-e-Azam and the Demand of Pakistan.

Land of Pakistan: Geo-Physical Conditions, Geo-Political and Strategic Importance of Pakistan, Natural Resources, Minerals, Water and Power.

Constitutional Process: Early efforts to make a Constitution: Problems and Issues, Constitution of 1956 and 1962 and their Abrogation, Constitutional and Political Crisis of 1971, Constitution of 1973, Recent Constitutional Developments.

Contemporary Issues in Pakistan: A brief survey of Pakistan's Economy, Discussion on Social and Environmental Issues.

Foreign Policy:	Relations of Pakistan with Neighbours, the Muslim World and Super Powers.
Human Rights:	Conceptual Foundations of Human Rights, Definition, Significance and Importance, Comparison of Islamic and Western Perspectives of Human Rights, An overview of UN Systems for Protection of Human Rights, Review of Important International Treaties and Conventions, Pakistan's Response to Human Rights Issue at National and International Levels.

HS-127

PAKISTAN STUDIES (FOR FOREIGNERS)

Land of Pakistan:	Land and People, Strategic Importance, Important and Beautiful Sights: Natural Resources (some portion of Economics of Pakistan)
A Brief Historical Background:	A brief historical survey of Muslim Community in the Sub-Continent, British rule and its Impacts, Indian Reaction, Two-Nation Theory, its Origin and Development, Factors leading towards the Demand of a separate Muslim State, Creation of Pakistan.
Government & Political Development in Pakistan:	Constitution of Pakistan, A brief outline, Governmental Structure, Federal and Provincial, Local Government Institutions, Political History and its brief account.
Pakistan & the Muslim World:	Relations with Muslim Countries
Language and Culture:	Origin of Urdu Language, Influence of Arabic and Persian on Urdu Language and Literature, A short history of Urdu Literature, Dominant Cultural Features.

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COURSES OF STUDY AND MARKS DISTRIBUTION

Second Year (S.E.) Civil Engineering

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical / Design Class
1.	CE-201	Engineering Surveying-II	100	50
2.	CE-202	Introduction to Computing	100	50
3.	CE-203	Engineering Drawing-II	100	50
4.	CE-204	Fluid Mechanics-I	100	50
5.	CE-205	Mechanics of Solids-I	100	50
6.	CE-206	Engineering Geology	100	50
7.	CE-209	Structural Analysis-I	100	50
8.	MS-331	Probability & Statistics	100	50
9.	MS-221	Linear Algebra & Ordinary Differential Equations	100	--
10.	HS-205	Islamic Studies (or)	100	--
	HS-206	Ethical Behavior		
11.	HS-303	Engineering Economics	100	--
		Total Marks = 1500	1100	400

SYLLABUS – SECOND YEAR ENGINEERING

CE- 201

ENGINEERING SURVEYING – II

Surveying Drafting and Computations:

General, Maps and Plans, Plotting, Contour Maps, Profiles, Cross- sections, End areas and Volumes, Prismoidal formula, Calculation of volumes, Area computations, Area by graphical analysis, Use of surveying software.

Highway and Railway Curves:

Route surveys, Circular curves, Deflections and Chord calculations, Setting out circular curve by various methods, Compound curves, Reverse, Vertical, Parabolic curves, Computation of the high or low point on a vertical curve, Design considerations, Spiral curves, Spiral curve computations, Approximate solution for spiral problems, Superelevation.

Construction Surveys:

Introduction, Horizontal and Vertical control, Buildings, Rail Road, Pipelines and other construction surveys.

Hydrographic Surveys:

General, Objectives of hydrographic survey and electronic charting, Planning, Survey vessels, Vertical control, Depth and Tidal measurements, Position-fixing techniques, Sounding plan, Horizontal control, Processing and Presentation of data.

Photogrammetry:

Introduction, Aerial photogrammetry and its Applications, Flying heights, Flight planning, Relief displacement, Photograph overlap, Ground control for mapping, Mosaics, Stereoscopic viewing and Parallax, Stereo plotting instruments, Analytical plotters, Orthophotos, Photogrammetric mapping.

Control Surveys:

General, Geodesy Universal Transverse Mercator grid system, Modified Transverse Mercator grid system, State plane coordinate grid system, Lambert projection, Computations for the Lambert projection, Computations for the Transverse Mercator Secant Projection, Use of grid coordinates, Horizontal control techniques, Triangulation, Control survey markers, Direction of a line by observations on Polaris, Time and procedure for Observing Polaris, Computation technique for azimuth determination, Gyro theodolite.

Global Positioning System (GPS):

Background information, Global positioning, Receivers, Satellites, Errors, GPS surveying techniques and applications, Survey planning, Initial ambiguity resolution, Vertical positioning.

CE-202

INTRODUCTION TO COMPUTING

Computer and System Fundamentals:

Computer hardware fundamentals, Operating Systems: DOS, WINDOWS. Word Processing, Spreadsheets, Databases and drawing tools, Flowcharting techniques.

Introduction to programming

FORTRAN and BASIC, Selected topics in programming, with emphasis on numerical techniques as applied to civil engineering problems, Packages in Civil Engineering

CE-203

ENGINEERING DRAWING – II

General:	Need and requirement of drawings for civil Engineering projects. General nature of drawings, components, symbols and nomenclature needed for specific drawings such as architectural, structural, plumbing, electrical, air-conditioning, roads and earth work etc. Drawings at different stages of projects, Elements of perspective drawing
Civil Engineering Drawing:	General description of drawings related to civil Engineering projects.
Building Drawing:	Elements of architectural planning and design, conceptual, schematic and working drawings and details of residential, commercial, religious, recreational, industrial, clinical, hospital, and educational buildings, Details of doors, windows, staircases etc. Elements of structural drawing and detailing, preparation of foundation plan, structural framing, slab details, staircase details, water tanks, beam and column elevations and sections mostly pertaining to reinforced concrete structures. Details of steel roof truss, connection details and fabrication drawings Plumbing and electrical detailing pertaining to small residential units
Computer Aided Drafting:	General and basic know how related to computer aided drafting, e.g. co-ordinate system, drawings setup procedure, basic draw commands, basic edit commands, Layers, creating text and defining styles options, block and drawing import/export options, Cross hatching, save and plot (2D) and isometric drawings.

CE- 204

FLUID MECHANICS – I

Basic Concepts and Definitions:	Units, density, specific weight, mass, viscosity, compressibility, surface tension, vapor pressure, Continuum, Lagrange and Eulerian description
Fluid static's:	Pascal's Law, Measurement of pressure, Pressure head, Hydrostatics forces on submerged areas (plane and curved), Manometers, Buoyancy of fluids, Simple lift and drag equations and their applications
Fluid Kinematics:	Types of flow, Streamline and streak lines, Velocity and acceleration in steady & unsteady flow, Equation of continuity, Flow net
Steady Flow:	Energy, Energy Equations, Hydraulic grade line and energy line, Flow in a curved path, Vortex and cavitation
Impulse-Momentum:	Basic principle, Force on pressure conduits, stationary and moving blades, reducers and bends, Torques in rotating machines, Applications
Dimensional Analysis & Similitude:	Definitions, Geometric and other similarities, dimensionless numbers, Models.
Forces on Immersed bodies:	Introduction to boundary layers, approximate solutions, Lift and drag over a flat plate, Application to simple problems
Fluid Properties Measurements:	Static, velocity and acceleration measurements, Orifices meter, notches & weirs, venturimeter

CE-205

MECHANICS OF SOLIDS – I

Different Stress States:	Uniaxial state of stresses and strains, Relationships between elastic Constants, Response of materials under different sets of monotonic loading, Normal and shearing stress and strains, Gradually and suddenly applied loads, Distribution of direct stresses on uniform and non-uniform members, Thermal stresses and strains
Bending Theory:	Theory of simple bending, position of neutral axis, moment of resistance and section modulus, Bending and shearing stress distribution in beams, Relationship between load, shear force and bending moment, Stresses in composite sections.
Slope and Deflection:	Curvature, slope and deflection of beams using integration methods
Theory of Torsion:	Theory of torsion of solids and hollow circular shafts, shearing stress distribution, angle of twist, strength and stiffness of shaft.
Biaxial state of stress:	Biaxial state of stresses, resolution of stresses, Principal plane, principal stresses and strains, Graphical representation of stress and strains, Mohr's circle of stresses and strains.

CE-206

ENGINEERING GEOLOGY

General Geology Definition and Scope:	The earth as planet, Process of external origin, weathering, erosion, transportation and deposition, of rock material by geological agents, Processes of internal origin volcanism, earthquakes, intrusion, metamorphism and the rock cycle, diastrophism and isostasy.
Elements of Structural Geology:	Folds and faults, joints, fractures and cleavages, unconformities, primary and secondary structural features of rock, Expression of these features on geological field maps and construction of cross sections and geological mapping.
Elements of Crystallography:	Crystallographic system, Important rock and soil forming minerals, and their identification Igneous Sedimentary and metamorphic rocks, fossils, Basic principles of stratigraphy, Geologic time scale, Brief introduction of local geology from bore logs.
Applied Geology:	Application of geology to planning and design of dams, reservoirs, bridges and tunnels, Application of geology to building materials and soils.
Rock Classification:	Litho logical classification, Classification by field measurements and strength tests by rock testing, Physical and mechanical property of rocks.
Earthquakes:	Theory of plate- tectonics, seismic waves, seismology, prediction of earthquakes and preventive measures against earthquakes, Ground subsidence and land slides.

CE - 209

STRUCTURAL ANALYSIS - I

Introduction:	Introduction of Structural forms, two dimensional pin connected and flexural forms, three dimensional pin connected and flexural forms: Surface structures, Simplification for analysis and design.
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External Loads:	Techniques of evaluation of estimated external loads, Dead, Live, Wind and Earthquake loads, Use of codes in estimating different types of external, Static, Dynamic and Moving loads, Load combinations.
Determinacy of Structure:	Determinate and indeterminate structures, Static and kinematics determinacy, Compatibility and boundary conditions: Structural safety, Stress and deformation characteristics, Small deflection theory.
Evaluation of Deformation Using Geometric Methods:	Principal of superposition, Moment area method, Conjugate beams method and Newmark's method
Evaluation of Deformation Using Energy Principles:	Unit load method, Principal of real work, Principal of virtual work: Castigliano's theorems
Arches and Suspension Structures:	Analysis of arches, Introduction to suspension type structures: Importance of stiffened girders.

MS-331

PROBABILITY & STATISTICS

Statistics:	Introduction, types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types
Measures of Central Tendency and Dispersion:	Statistics Averages, Median, Mode, Quartiles, Range, Moments, Skewness & Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems
Curve Fitting:	Introduction, fitting of a first and second degree curve, fitting of exponential and logarithmic curves, related problems, Principle of least squares, Second order Statistics & Time series not in bit detail.
Simple Regression & Correlation:	Introduction, Scatter diagrams, Correlation & its Coefficient, Regression Lines Rank Correlation & its Coefficient, Probable Error (P.E), Related problems
Sampling and Sampling Distributions:	Introduction, Population, Parameter & Statistic, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non-Sampling Errors, Random Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems
Statistical Inference and Testing of Hypothesis:	Introduction, Estimation, Types of estimates, Confidence interval, Tests of Hypothesis, Chi-Square distribution/test, one tails & two tails tests, Application in related problems
Probability:	Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability, Conditional probability, Baye's rule, Related problems in practical significance
Random Variables:	Introduction, Discrete & Continuous random variables, Random Sequences and transformations, Probability distribution, Probability density function, Distribution

function, Mathematical expectations, Moment Generating Function (M.G.F)
Markove_random walks chain/Related problems

Probability Distributions: Introduction, Discrete probability distributions, Binomial, Poisson Hyper geometric & Negative binomial distributions, Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

MS-221

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

Linear Algebra:

Linearity and linear dependence of vectors, basis, dimension of a vector space field, Matrix and type of matrices (singular, non-singular, symmetric, non-symmetric, upper, lower, diagonal), Rank of a matrix using row operations and special method, Echelon and reduced echelon forms of a matrix, determination of consistency of a system of linear equation using rank, matrix of linear transformations, eigen value and eigen vectors of a matrix, Diagonalization, Applications of linear algebra in relevant engineering problem

1st Order Differential Equations:

Basic concept, Formation of differential equations and solution of differential equations by direct integration and by separating the variables, Homogeneous equations and equations reducible to homogeneous form, Linear differential equations of the order and equations reducible to the linear form. Bernoulli's equations and orthogonal trajectories, Application in relevant Engineering

2nd and Higher Orders Equations:

Special types of 2nd order differential equations with constant coefficients and their solutions, The operator D, Inverse operator 1/D, Solution of differential by operator D methods; Special cases, Cauchy's differential equations, Simultaneous differential equations, simple application of differential equations in relevant Engineering

Partial Differential Equation:

Basic concepts and formation of partial differential equations, Linear homogeneous partial differential equations and relations to ordinary differential equations, Solution of first order linear and special types of second and higher order differential equations, D' Alembert's solution of the wave equation and two dimensional wave equations, Lagrange's solution, Various standard forms.

Fourier Series:

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients; Expansion of function with arbitrary periods, Odd and even functions and their Fourier series; Half range expansions of Fourier series.

HS-205

ISLAMIC STUDIES

Fundamentals of Islam:

Tauheed, Arguments for the Oneness of God, Impact of Tauheed on human life, Place of Man in the Universe, Purpose of creation, Textual study of Surah Al-Rehman and Sura Al-Furqan, Prophet hood, Need for prophet, Characteristics of prophet, Finality of Prophet hood, Seerat life of the Prophet as embodiment of Islamic-Ideology, Faith in Here-after (AKHRAT), Effects of the beliefs on worldly life

Ibadah:

Concept of Ibadah, Major Ibadah, Salat, Zakat, Hajj and Jihad

Basic Source of Shariah:

The Holy Quran, Its Revelation and Compilation, The Authenticity of the Text, Hadith, Its Need, Authenticity and Importance, Consensus (Ijmaa), Analogy (Qiyas)

Sources of Knowledge: Islamic Approach to Intuition, Reason and Experience, Revelation (Wahi) as a Source of Knowledge

Moral and Social Philosophy of Islam: The concept of Good and Evil, Akhlaq-e-Hasna with special reference to Surah Al-Hujrat, Professional Ethics (Kasb-e-Halal)

HS-206

ETHICAL BEHAVIOUR

Nature, Scope and Methods of Ethics: Ethics and Religion, Ethical teachings of World Religions

Basic Moral Concepts: Right and Wrong, Good and Evil Hedonism, Utilitarianism, Rationalism & Kant
Ethical Systems in Philosophy: Self Realization Theories, Intuitionism

Islamic Moral Theory: Ethics of Quran and its Philosophical basis, Ethical precepts from Quran and Hadith and Promotion of Moral Values in Society

HS-303

ENGINEERING ECONOMICS

Introduction: Basic Concepts and principles of Economics, Micro-economics theory, the problems of scarcity, Basic concept of Engineering Economy

Economic Environment: Consumer and Producer goods, Goods and services, Demand and supply concept, Equilibrium, Elasticity of demand, Elasticity of supply, Measures of Economic worth, Price-supply-demand-relationship

Elementary Financial Analysis: Basic accounting equation, Development and interpretation of financial statements- Income Statement Balance Sheet and Cash flow, Working capital management

Break Even Analysis: Revenue/cost terminologies, Behaviour of Costs, Determination of Costs/Revenues, Numerical and graphical presentations, Practical applications, BEA as a management tool for achieving financial/operational efficiency

Selections Between Alternatives: Time value of money and financial rate of return, Present value, Future value and Annuities, Cost-benefit analysis, Selection amongst materials, techniques, designs etc. investment philosophy, Investment alternatives having identical lives, Alternatives having different lives, Make or buy decisions and replacement decisions

Value Analysis/ Value Engineering: Value analysis procedures, Value engineering procedures, Value analysis versus value engineering, Advantages and application in different areas, Value analysis in designing and purchasing

Linear Programming: Mathematical statement of linear programming problems, Graphic solution Simplex procedure, Duality problem

Depreciation and Taxes: Depreciation concept. Economic life, Methods of depreciation, Profit and returns on capital, productivity of capital, Gain (loss) on the disposal of an asset, depreciation as a tax shield

Business Organization & Industrial Relationship

- a) Type of ownership, single ownership, partnerships, corporation, type of stocks and joint stock companies, Banking and specialized credit institutions
- b) Labour problems, Labour organizations, Prevention and settlement of disputes

Capital Financing and

Capital Budgeting, Allocation of capital among independent projects, financing **Allocation:** with debt capital, Financing with equity capital, Trading on equity, Financial leveraging

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COURSES OF STUDY AND MARKS DISTRIBUTION

Third Year (T.E.) Civil Engineering

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical / Design Class
1.	CE-301	Mechanics of Solids-II	100	50
2.	CE-302	Transportation Engineering-I	100	50
3.	CE-303	Engineering Construction	100	50
4.	CE-304	Reinforced Concrete Design-I	100	50
5.	CE-305	Soil Mechanics-I	100	50
6.	CE-306	Environmental Engineering-I	100	50
7.	CE-307	Civil Works Quantity and Cost Estimations	100	50
8.	AR-309	Architecture and Town Planning	100	--
9.	CE-310	Fluid Mechanics-II	100	50
10.	CE-314	Structural Analysis-II	100	--
11.	HS-304	Business Communication & Ethics	100	--
		Total Marks = 1500	1100	400

SYLLABUS – THIRD YEAR ENGINEERING

CE-301

MECHANICS OF SOLIDS-II

Enhanced Topics Related to Beam Bending and Shear:	Unsymmetrical bending, shear flow, shear center, Analysis of curved beams and beams on elastic foundations.
Theory of Elasticity:	Analysis of stresses and strains due to combined effect of axial, bending and twisting forces/moments, Elementary theory of elasticity, equilibrium and compatibility equations, stress and deformation relationships, Stress transformation, polar co-ordinates, Theories of failure.
Torsion of Thin Tubes and Open Sections:	Torsion of non-circular shafts, membrane analogy, Torsion in thin tubes and open sections.
Cylinders:	Analysis of thin and thick cylinders.
Theory of Plasticity:	Elementary theory of plasticity, plastic hinges, shape factor and failure mechanism.
Energy Methods:	Energy methods-General area of application and its usefulness.
Stability:	Struts and columns, Euler, Rankine and other formulas for buckling load of columns, Stability analysis of columns under eccentric loading.

CE-302

TRANSPORTATION ENGINEERING-I

Transportation Planning:	Modes of transport, Development of various modes in Pakistan, Role of highways within a Transport System, Highway classification, Highway planning and economic appraisal, Network planning, origin and destination studies
Highway Engineering:	Geometric design including cross section elements, Highway materials. tests and construction practices, Flexible and rigid pavement design, Highway drainage, Highway maintenance.
Traffic Engineering:	Traffic flow characteristics, Traffic studies, Capacity analysis, Traffic control devices.

CE-303

ENGINEERING CONSTRUCTION

Over-view of Constructional Aspects:	An Overview of constructional aspects for different types of engineering projects, e.g. building retaining structures, bridges, pavements and special structures, General consideration common to all projects with special reference to building structures.
Layout Techniques:	Layout techniques with special reference to buildings.
Excavation:	Excavation in deferent types of soils, and solution of particular problems arising out of condition of sub-soil at site e.g. de-watering, shoring and bracing, sheet piling etc.

Placement of Concrete:	Methods of preparation pouring, placement and curing of concrete in foundations. Construction joints in raft foundations, mass concreting, Plinth joints in raft foundations, mass concreting, Plinth beams and plinth protection, damp proof course.
Substructure Constructional Aspects:	Sub structure construction methodologies pertaining to insitu and precast construction for moderate to high rise buildings, Mechanized construction techniques e.g. lift slabs etc, Form work for general insitu construction and a comparison with precast construction, General Principles of designing props, bracing and horizontal shuttering platforms, Alignments, plumbs, leveling and cambering, Methods of concreting vertical and horizontal members, including mechanized placement, ready mix concrete etc.
Flooring Systems:	Constructional methodologies, slab on grade, plain cement concrete floors, floor finishing, Roofing systems planar and non-planar, its construction methodologies, finishes and water proofing.
Non Structural Elements:	Non structural elements, specially masonry and brickwork with sufficient details related to constructional aspects, Doors, windows alignment, plumb and fixation, Construction aspects related to services.

CE-304

REINFORCED CONCRETE DESIGN – I

Constituent Materials & Properties:	Concrete constituent material and its mechanical properties, Properties of hardened cement concrete. Durability aspects and factors contributing towards durability
Basic Principles of Reinforced Concrete:	Basic principles of reinforced concrete design and associated assumptions, Behavior of reinforced concrete members in flexure, Design philosophy, design codes, factor of safety and load factors, Prevailing methods of design of reinforced concrete members.
Working Stress Method of Analysis:	Working stress method, serviceability criteria and checks for deflection, crack width and crack spacing, Importance of working stress method related to pre stress.
Ultimate Strength Method:	Ultimate strength method, analysis of prismatic and non-prismatic sections in flexure, Compatibility based analysis of sections and code requirements for flexure, Analysis of one-way solid and ribbed slabs, two way solid slabs with general discussion on other slab systems, Design for flexure
Shear in Beams: Bond, Anchorage & Development Length:	Shear stress in reinforced concrete sections, models and analogies towards solution of diagonal tension problem, Design for diagonal tension Design and detailing for bond, anchorage, development length, laps and splices.
Columns & Footings:	Analysis of sections in pure compression, Design of short columns under pure compression and with eccentric loading, Isolated footings, structural design of simple rectangular footing and combined footing.

CE-305

SOIL MECHANICS-I

Nature of Soils:	Origin, Formation, Soil minerals, Clay mineralogy, Soil structures, Particle shapes and sizes.
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Composition and Physical Properties:	Phase diagram, water content, void ratio, porosity, degree of saturation, specific gravity, unit weights, mass-volume relationships, Formation, structural & physical properties of clay minerals.
Index Properties and Classification Tests:	Particle size distribution by sieving and sedimentation, In-Place density test, relative density, Atterberg's limits and their determination, plasticity and liquidity index: Sensitivity and Activity of fine soils
Soil Classification Systems:	Unified soil classification system, M.I.T. system and AASHTO classification systems
Water in Soils:	Free energy (pressure and heads), Capillarity and its effect on soil behavior, Electro-Osmosis, Darcy's law, Seepage forces and their effect on soil stability, Design of filters, Factors effecting permeability, Permeability tests, Laplace's Equation and its solution (Flow Nets), Methods of drainage and dewatering of soils.
Stress Acting in Soils:	Soil mass stresses, effective stress and neutral stress, stress at a point and Mohr's circle, Westergard's and Boussinesq's solutions, Pressure distribution in the soil mass resulting from different vertical surface loadings, Newmark's influence charts.
Shearing Strength of Soils:	Basic principle relating to friction between solid bodies, Coulomb's law, Shear strength parameters, Shearing strength of granular and cohesive soils, Shearing strength tests and their results, effect of strain, rate and drainage conditions on shearing strength.
Compressibility and Consolidation:	Mechanics of consolidation, One - dimensional consolidation equation, coefficient of consolidation, compression index, Consolidation tests and graphical representation of data, Degree of consolidation. Determination of preconsolidation pressure, swelling clays and clay-shale
Soil Compaction:	Requirements, principle and methods including standard and modified AASHTO tests.

CE-306

ENVIRONMENTAL ENGINEERING-I

Communicable Disease Control:	Water borne, foodborne, milkborne and vectorborne diseases, Water supply and sanitation.
Environmental Pollution:	Sources, Pollutants, Effects and remedation of air, water, land, noise and radiation pollution, Toxic/hazardous wastes
Water Demand & Supply:	Population forecast, Water uses & consumption, Types and variations in demand, Maximum demand & fire demand, Urban & rural water supply, Appropriate technology.
Water Quality:	Water impurities & their health significance, Water quality standards, (U.S. & WHO, etc.), Water quality monitoring, Sanitary survey.
Water Treatment:	Treatment of surface & ground waters, screening, sedimentation, coagulation. coagulants & dosages, Filtration, design aspects of slow sand and rapid sand filters, Filtration rates, operation head loss, backwash and filter efficiency,

Pressure filters, Fluoridation, hardness removal, Iron & Manganese removal, Water softening methods, Water disinfection and chemicals, Use of chlorine, quantity, dosage & efficiency, Emergency treatment methods.

Building Water Supply: Layout of water supply arrangement, Fixtures and their installation, Tapping of water mains.

Laboratory Works: Related to the above, sampling techniques and examination of water (physical, chemical and microbiological parameters).

CE-307

CIVIL WORKS QUANTITY AND COST ESTIMATIONS

General: Scope of civil engineering works, General practice in government department for schedule of rates and specifications, Rates analysis, Specifications for various items in construction.

Estimate & Cost: Working out quantities, rates and costing analysis of construction materials, Valuation, Depreciation and sinking fund.

Bill Processing: General principle, Contents and preparation of bills of quantities for a project and maintaining of Measurement Books.

Worked Examples: Measurement, specification and costing of: excavation and back filling, mass concrete retaining wall, beams, concrete piles, steel or wood truss or steel framed gantry, estate road, sewer and water main pipe works.

Contract & Tender: Preparation of civil engineering contracts and tender documents

Civil Work Account: General principles of account of work, Responsibilities of engineer, contractor & owner.

AR-309

ARCHITECTURE & TOWN PLANNING

Architecture

Historical Development: Egyptian, Asiatic, Greek, Roman Byzantine and Gothic Architectures, Modern trends with emphasis on Muslim architecture.

Influences: Geographical, climatic, religious, social, historical.

Principles: Truth or purpose & beauty.

Qualities: Strength, vitality, grace, breadth and scale.

Factors: Proportion, colour and balance.

Use of Materials: Stone, wood metals, concrete, Composite, ceramics.

General Treatment to Walls and their construction, Openings and their position, character and

Plan of Buildings: shape, Roofs and their development and employment, Columns and their position, form and decoration, Molding and their form and decoration, Ornament as applied to any buildings.

Town Planning

Purpose and Scope: Definitions of town planning, Trends in Urban growth, Objectives of sound planning, Modern planning in Pakistan and abroad.

Information Required: Maps, natural resources, economic resources, legal and administrative problems, civic survey.

Urban Ecology: Need and scope of comprehensive plan, Phases of planning, Principles of planning, Communication (rail road network & airport etc.), port and harbour facilities, street traffic and design.

Urban Zoning and Land Use Control: Parks and recreation facilities, location of public and semi-public buildings, civic centers, commercial centers, local shopping centers, public schools, Location of industry & residential areas, Lay out of street, road crossing & lighting, Community planning, Suburban development, Slum areas and their upgrading.

CE-310

FLUID MECHANICS – II

Elementary Hydrodynamics: Ideal and real fluid, Differential equation of continuity, Rotational and irrotational flow, Stream function and velocity potential function, Brief description of flow fields, Orthogonality of stream lines and equipotential lines, Flow net and its limitations, Different methods of drawing flow net.

Steady Flow through Pipes: General equation for friction, Laminar and turbulent flow in circular pipes, semi-empirical theories of turbulence, Velocity profile in circular pipes, pipe roughness, Nikuradse's experiments, Moody's diagrams, Minor losses, Pipe flow problems.

Pipe Networks: Pipes in parallel, branches, Hardy Cross Method, Water hammer, Water Loss, Head losses and material of pipes.

Steady Flow in Open: Uniform flow equations (Chezy and Manning), Specific energy and critical depth, Dynamic equation of gradually varied depth, surface profiles and back water curves, Hump and constrictions, Hydraulic jump, Broad crested weirs, venturi flume and critical depth flume.

Unsteady Flow: Flow through pipes, orifices and over weirs under varying heads, Surges in open channel.

Water Turbines: Types, reaction and impulse-turbines, Momentum equation applied to turbines, Specify speed, Turbine characteristic.

Centrifugal Pumps: Types, Stages, Works and efficiencies, Specify speed and characteristic curves.

Reciprocating Pumps: Types, Maximum suction lift, construction features, specific speed, cavitation and operation.

Hydraulic Scale Models: Concept of similitude and hydraulic modeling.

CE-314

STRUCTURAL ANALYSIS-II

Analysis of Indeterminate Structures Using Force Approach:

Compatibility methods for beams and frames with and without support settlement

Analysis of Indeterminate Structures Using Stiffness Approach:

Moment distribution for beams and frames for prismatic and non-prismatic members with and without side-sway and support settlement, Slope deflection method for beams and frames with and without support settlement.

Matrix Methods:

Introduction to flexibility method, Determination of flexibility matrix for beams, Introduction to stiffness method, development of member and structure stiffness matrices, Bending moment and shear force diagrams, Application of computer programs.

Finite Element Method:

Introduction to finite elements, Stiffness matrices for bar elements, Triangular elements and Rectangular elements, Shape functions and Displacement functions, Transformation matrices, Structure stiffness matrix.

HS-304

BUSINESS COMMUNICATION AND ETHICS

Communication Skills:

Definitions and Conditions, Modes: verbal, non-verbal, vocal, non-vocal, sender, Receiver, en-coding, decoding, noise, context, emotional maturity, relationships, etc, Language, perception, Non-verbal, body language, physical appearance, cultural differences etc, Personal and interpersonal skills/ perceptions, Communication dilemmas and problems, Public Speaking – speaking situation, persuasion, Making presentations, Interviews

Business Writing:

Formal / Business letters, e-mails: a) job applications and resumes / CV, b) enquiries, c) complaints / adjustments, d) orders, e) quotations, f) banking etc. Memos: layout, language, style. Meeting management: notice, agenda, conducting/ participating, writing minutes. Contracts and agreements (basic theoretical knowledge and comprehension), Research / scientific reports: types, structure, layout / presentation, writing process etc, Tenders (basic theoretical knowledge and comprehension)

Engineering / Business Ethics:

Need and objectives for code of ethics and its importance, Types of ethics, involvement and impact in daily life, Problems / conflicts / dilemmas in application (case studies), Sexual Harassment / discrimination in the workplace: a) why it occurs, b) myths regarding sexual harassment, c) how to deal with it, d) gender equality e) respect etc. Codes of conduct: Code of Pakistan Engineering Council, Code for Gender Justice, Brief study of other codes of conduct.

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COURSES OF STUDY AND MARKS DISTRIBUTION

Final Year (B.E.) Civil Engineering

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical / Design Class
1.	CE-401	Steel Structures	100	50
2.	CE-402	Structural Design & Drawing	100	50
3.	CE-403	Soil Mechanics-II	100	50
4.	CE-404	Environmental Engineering-II	100	50
5.	CE-405	Reinforced Concrete Design-II	100	50
6.	CE-406	Construction Planning and Management	100	50
7.	CE-407	Transportation Engineering-II	100	50
8.	CE-408	Irrigation and Water Resources Engineering	100	50
9.	CE-409	Civil Engineering Project	--	200
10.	MS-443	Numerical Analysis	100	
		Total Marks = 1500	900	600

SYLLABUS – FINAL YEAR ENGINEERING

CE-401

STEEL STRUCTURES

Introduction:	Steel properties, design load and load factors, Types and shapes of structural steel members, Specifications and design codes, Safety factors.
Tension Members:	Design of threaded, riveted and welded tension members.
Flexural Members:	Design of laterally supported and unsupported beams, Deflection, Design of beams for heavy concentrated loads, Bearing plates, Design of purlins, Design of beams with unsymmetrical cross-section and unsymmetrical bending, Design of builtup beams, gentry girder and plate girder.
Compression Members:	Design & analysis of axially loaded columns, Design of laced columns, Analysis and design of eccentrically loaded columns, Length effects and evaluation of effective length factor for columns in braced and unbraced frames.
Connections:	Types of high strength bolts and rivets, Friction & bearing type connections, Fasteners subjected to eccentric loads, Design of seated beam connection, Continuous beam-to-beam and beam to-column connection.
Framing System & Design:	Design of industrial frame works, crane and gantry girder-setting of geometry, different load conditions and lateral bracing, Design of frames using plastic analysis.
New Design Codes:	Introduction of LRFD.

CE-402

STRUCTURAL DESIGN & DRAWING

Design of Buildings for Wind & Earth Quake:	Analysis and design of reinforced concrete and steel, industrial and commercial type of buildings including affects of wind and earthquake.
Tanks & Reservoirs:	Analysis and design of underground, overhead tanks and reservoirs. Analysis and design of cantilever and counter fort retaining walls
Shell, Plates and Bridges:	Introduction to analysis and design of thin shell, and folded plate structures, steel and RCC bridges.

CE-403

SOIL MECHANICS-11

Sub Soil Investigation:	Purpose, Preliminary and detailed investigation, Boring methods, spacing and depth of borings, soil sampling, In situ testings, Standard penetration test, static cone penetration test, Presentation of boring information, Preparation of bore logs
Settlement Analysis:	Settlement by elastic theory, Settlement analysis of a thin stratum of clay from index properties, Thick clay stratum settlement, analysis by strain versus

	Logarithm of pressure test data, Construction period correction, Secondary consolidation.
Bearing Capacity:	Stability of soil masses, Rankine's, Terzaghi's and Meyerhof's analysis, Ultimate and safe bearing capacities for shallow foundations, Plate bearing test, Deep foundations bearing capacity, Static and dynamic load carrying capacity analysis of pile, Pile load test, Group action in piles, Raft foundation.
Lateral Earth Pressure:	Types of lateral soil pressure, Rankine's and Coulomb's theories of lateral earth pressures, Soil pressure analysis of earth retaining structures (including retaining wall, sheet piles and excavation supports).
Stability of Slopes:	Varieties of failure, Stability analysis of infinite and finite slopes, General method of slices (Swedish Methods), Bishop simplified methods of slices, Friction circle method. Taylor's stability number and stability curves, Effect of pore water and seepage forces on stability
Introduction to Soil Dynamics:	Dynamic loading conditions, Fundamental definitions, Vibration theories of single-Degree-of-Freedom System, Natural frequency of soil-foundation system, Evaluation of various parameters (damping, mass & spring constant) for dynamic analysis, Analysis of machine foundation (vertical mode of vibration only).
Soil Property Modification:	Mechanical and chemical stabilizations of soil, principles & methods.

CE-404

ENVIRONMENTAL ENGINEERING-II

Storm Flow & Sewage Flow Estimates:	Rainfall intensity formulae, hydrograph & dry weather flow, sewage quantities, Variations and rates of flows, Velocity gradient & limiting velocities.
Types of Sewerage Systems:	Separate & combined systems, Types shapes, sizes and materials of sewers, Sewer appurtenances, pipe strengths and tests.
Principles of Design:	Construction & maintenance of sewers, Sewer, system analyses, Diameter and gradient, sewer joints, grading, laying, jointing and testing of sewers.
Characteristics of Sewage:	Municipal and industrial wastes, Water pollution, causes and control parameters, Effluent disposal guideline and standards
Sewage Treatment:	Primary, secondary & tertiary treatment, Screening grit chamber, skimming tanks & sedimentation tanks, Activated sludge treatment, trickling filters, oxidation ponds, etc.
Sewage Disposal Method:	Receiving body, assimilation capacity, Stream pollution and self-recovery, sludge handling & disposal, Effluent Reuse. Control and management of industrial wastewaters
Building Drainage:	Requirements and arrangement of building drainage, Soil pipes. Anti-siphon pipes and waste water pipes, Sanitary fixtures and traps, House connection and testing of house drainage, Cross connection and back siphon age control.
Solid Waste Disposal:	Types, characteristics, sources and quantities of solid wastes, Collection disposal and recycling.

Laboratory Work: Related to the above, sampling techniques and examination of wastewater (physical, chemical and microbiological parameters).

CE-405

REINFORCED CONCRETE DESIGN-II

Design for Torsion: Torsion in reinforced concrete members. Analysis and design of reinforced concrete members under combined torsion and shear stress.

Flat Slab, Flat Plate & Waffle Slab: Analysis and design of flat plate, flat slabs and waffle slabs, for flexure and shear under gravity loading.

Slender Columns: Analysis and design of slender columns subjected to combined flexure and axial loading, Guidelines for design of shear walls-an over view.

Design of Different Types of Foundations: Analysis and design of eccentric, strap, strip footings and pile caps.

Prestressing Principles & Design Philosophy: Principles of prestressing, properties of high strength materials used in prestressing, Importance of high strength concrete and steel used in prestressing, Behavioral aspects of prestressed beams and comparison with reinforced concrete beams, comparison with reinforced concrete beams, post tensioning and pre-tensioning techniques, comparison and hard-ware requirements.

Prestress Losses: Prestress losses, immediate and time dependent losses, lump sum and detailed estimation of prestress loss.

Analysis and Design: Simply supported prestressed beams for flexure and shear.

CE-406

CONSTRUCTION PLANNING & MANAGEMENT

Project Management in the Engineering & Construction Industry: PM knowledge areas; PM processes; Construction PLC; Fast tracking; Organizational structure of a construction project; Responsibilities of client, consultants including architects, engineers and related professionals, constructors, PM and CM; Professional construction management; Management issues and need for improved organization and management structures with particular reference to local construction industry.

Pre-Construction Stages & the Role of Professional Construction Manager: Site Investigation; Preliminary estimates; Preliminary schedules; Work packages; Types of tenders / contracts; Pre - Qualification process; Bidding process; Specifications review.

Project Planning, Scheduling and Control by Deterministic Methods: ADM & PDM; CPM project scheduling using PDM; Time monitoring and control; Time Performance measurement; Time-Scaled Networks; Use of PM software for schedule development, tracking and updating.

Project Planning, Scheduling and Control by Probabilistic Methods: PERT; PERT scheduling; PERT Advantages and Limitations; PERT today in construction industry.

Cost Considerations in Project Planning & Scheduling:	Resource planning; Resource Productivity; Resource levelling; Resource curves & profiles; Direct cost versus indirect cost; Cost performance measurement; Time cost trade off; Least cost expediting; Project cost accounting; Cash flow and S-Curve; Use of PM software for resource / cost loading and cost accounting.
Site Organization:	Site organization chart; Site management issues.

CE-407

TRANSPORTATION ENGINEERING-II

Railway engineering:	Types of rail systems, Railway organization in Pakistan, Railway alignment and grades, Cross sectional elements of railway tracks, Pointers and crossings, stations and yards, Railway signalling systems, Laying of tracks and maintenance of railway right-of-way, Creep and anti-creep devices, Various types of railway locomotives, Methods of traction, Track resistances.
Coastal Engineering:	Classification of harbours, Ports and harbours of Pakistan, Design principles and requirements of harbours, Effect of wind, waves and tides on design, Wharves and jetties, Breakwaters and groynes, Channel regulation and demarkation, Classification of docks and their construction, Transit sheds and warehouses.
Airport Engineering:	Component of air transportation, Airport activity, Aircraft characteristics affecting airport airside, Airport site Selection, Airside configuration, Navigation aids, Airport lighting and marking, Distribution concepts of terminal buildings, Geometric design of airside, Structural design of airfield pavements.

CE-408

IRRIGATION AND WATER RESOURCES ENGINEERING

Water Cycle:	Rain, Surface and sub-surface water, Reservoirs, Dams, Lakes, Water conveyance by canals, Evaporation and transportation, Run-off.
Hydrograph:	Stream flow and run-off-hydrograph-unit, hydrograph IUH, synthetic hydrographs and matrix method of unit hydrographs.
Open Channels:	Design of open channels, Stability of sides and beds, flow in regime, accretion and sedimentation (Particles properties, fall velocity, movement of bed and surface bed load)
Irrigation:	Water requirement, Irrigation methods (including sprinkler, drip), Khoslar and Lacey's theories.
Dams & Barrages:	Types of storage dams and barrages, Principles of design.
Drainage:	Land drainage for reducing water levels, Types of land drainage.
Ground Water:	Occurrence, Ground water hydraulics, wells, yields, tube wells
Water Resources Management:	Sustainable tapping Resources, Principles of planning and development.

CE-409

CIVIL ENGINEERING PROJECT

MS-443

NUMERICAL ANALYSIS

Error Analysis:	Types of errors (relative, absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any computational tools to analysis the numerical solutions.
Finite Difference:	Functions of operators, difference operators and the derivative operators, identities, Linear homogeneous and non-homogeneous difference equations, Numerical Differentiation, Forward Difference Method, Backward Difference Method, Central Difference Method
Solution of Non-linear Equation:	Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton-Raphson, Chebyshev and Graeffe's root squaring methods), rate of convergence and stability of an iterative method, Fixed point iteration, Bisection Method, Non-linear systems of equations, application to consolidation settlement and seepage analysis.
Solution of Linear Equation:	Numerical methods for finding the solutions of system of linear equations (Gauss-Elimination, Gauss-Jordan Elimination, Triangularization, Cholesky, Jacobi and Gauss-Seidel), Applications to structural analysis and water distribution network problems.
Interpolation & Curve Fitting:	Lagrange's, Newton, Hermit, Spline, least squares approximation Linear and non-linear curves)
Numerical Integration & Differentiation:	Computation of integrals using simple Trapezoidal rule, Simpon's rule, Composite Simpson's and Trapezoidal rules, computation of solutions of differential equations using (Euler method, Euler modified method, Runge Kutta method of order 4)

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