Scheme of Studies of BE Civil (Specialization in Urban) for the Batch 2018 Only

FIRST YEAR									
Fall Semester					**Spring Semester**				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-118	Engineering Surveying-I	3	1	4	UE-117	Engineering Drawing & Drafting-I	1	2	3
EE-123	Basic Electrical Engineering	2	0	2	UE-102	Statics and Dynamics	3	1	4
ME-110	Basic Mechanical Engineering	2	0	2	UE-104	Engineering Materials	3	1	4
MT-114	Calculus	3	0	3	HS-205/ HS-209	Islamic Studies OR Ethical Behaviour (for Non-Muslims)	2	0	2
CY-110	Applied Chemistry for Engineers	2	1	3	HS-111	Functional English	2	0	2
HS-106 / HS-127	Pakistan Studies/ Pakistan Studies (for Foreigners)	1	0	1	MT-221	Linear Algebra & Ordinary Diff. Equation	3	0	3
	Total Credits	13	2	15		Total Credits	14	4	18
SECOND YEAR									
Fall Semester					**Spring Semester**				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-205	Engineering Drawing & Drafting-II	2	2	4	UE-361	Planning and Design of Transportation Systems	3	1	4
UE-212	Mechanics of Solids -I	3	1	4	UE-214	Fluid Mechanics	3	1	4
UE-215	Engineering Surveying - II	2	1	3	MT-229	Probability and Statistics	2	0	2
HS-304	Business Communication & Ethics	3	0	3	UE-218	Law and Regulatory Control Studies	2	0	2
AR-204	Urban Sociology	2	0	2	UE-209	Analysis of Structures	3	0	3
UE-114	Computing Tools and Applications	3	1	4	UE-216	Geology for Engineers	2	1	3
	Total Credits	15	5	20		Total Credits	15	3	18

THIRD YEAR									
Fall Semester					**Spring Semester**				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-351/CE-320	Reinforced Concrete Design-I	3	0	3	*UE-323*	*Urban Hydrology and Municipal Engineering*	*2*	*1*	*3*
UE-352/CE-321	Construction Engineering	3	0	3	UE-305/CE-305	Soil Mechanics-I	3	1	4
UE-353/CE-323	Quantity & Cost Estimations	3	0	3	CF-303	Applied Economics for Engineers	3	0	3
UE-316	*Traffic Engineering and Management*	*3*	*1*	*4*	UE-355/CE-424	Essential in Construction Project Management	3	0	3
MT-443	Numerical Analysis	*3*	*0*	*3*	UE-453/CE-420	Reinforced Concrete Design- II	3	0	3
AR-308	Urban Infrastructure Planning and Management	2	0	2					
	Total Credits	17	1	18		Total Credits	14	2	16
FINAL YEAR									
Fall Semester					**Spring Semester**				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-403/CE-403	Soil Mechanics-II	3	1	4	***UE-360***	***Mechanics of Solid-II***	***2***	***0***	***2***
UE-452	*Urban Mass Transportation*	*2*	*0*	*2*	*UE-435*	*Financial Resource Management*	*2*	*0*	*2*
UE-451/CE-418	Hydraulic Engineering and Water Resources Engineering-I	3	1	4	UE-454/CE-421	Design of Steel Structures	3	0	3
UE-359	***Structural Analysis-II***	***2***	***0***	***2***	EN-401	Environmental Engineering-II	2	1	3
EN-301	Environmental Engineering-I	2	1	3	***UE-460***	***Geoinformatics***	***1***	***1***	***2***
UE-415	Urban Engineering Project	0	3	3	UE-415	Urban Engineering Project	0	3	3
	Total Credits	12	6	18		Total Credits	10	5	15
	Total Fall semesters			71		Total Spring semesters			67
Grand Total- 138									

Bold fonts, Italics and thick border are courses, that have been introduced in the scheme as per desire of PEC (EAB-100)

Syllabus (Batch 2018)

Contents of Courses

FIRST YEAR (Fall Semester)

UE-118: ENGINEERING SURVEYING – I

UE-118	ENGINEERING SURVEYING – I
Basics of Surveying	Evolution of Surveying and geomatics, Types, Surveying Instrumentation, Survey References, 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, 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	Theory of Differential Levelling, Effects of Curvature and Refraction, Types of Levels, 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.
Surveying Instruments	Theodolites: Introduction, Types of Theodolites, Temporary adjustments, Measurement of Horizontal and Vertical Angles, Prolonging a Straight Line, Permanent Adjustments. Electronic Distance measurement: General, Principles of EDMI Operation, EDM Characteristics, EDM Accuracies, Geometry of EDM, Electro-Optical and Microwave Instruments, Total Stations.
Traverse Surveys	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 by co-ordinate methods, Use of computer programs.

EE-123: BASIC ELECTRICAL ENGINEERING

EE-123	BASIC ELECTRICAL ENGINEERING
Fundamentals of Electric Circuits	Charge, Current of voltage and power, Voltage and current sources, Ohm's Law.
Voltage and Current Laws	Nodes, Paths, Loops and branches, Kirchoff's Current law, Kirchoff's Voltage Law, The single loop circuits, The single node Pair Circuits,

	Series and Parallel Connected Independent Sources, Resistors in series and parallel, Voltage and Current Division.
Critical Analysis Techniques	Multi Nodal, Analysis, The super Nodal, mech Analysis, The super Mesh, Linearity and Superposition, Source Transformations, Thevinin and Norton Equivalent Circuit, Maximum Power Transfer Delta Wye Conversion. Capacitor, inductor, inductance and capacitance combination, The Source Free RL Circuit, Properties of Exponential Response, The Source Free RC Circuit.
On Line Diagram	Symbols of different components, understanding of one line diagram from generation to the distribution end.
Basic Electronics	Operation Application of diode/transistor circuits and systems, fundamental concepts of amplifier and oscillators, Concepts of digital Electronics.

ME-110: BASIC MECHANICAL ENGINEERING

ME-110	BASIC MECHANICAL ENGINEERING
Thermodynamics	Work, heat, open, closed and steady flow systems, thermodynamics properties and processes, absolute and gauge pressure, pressure temperature and flow measurement Laws of thermodynamics, equation of continuity, two phase systems, ideal gas, conservation of mass and energy, basic heat engine and refrigeration cycles.
Heat transfer	Fundamentals of heat transfer, conduction, convection, radiation, thermal, conductivity, overall heat transfer coefficient.
Heating Ventilation and Air Conditioning (HVAC)	Introduction to HVAC components, heating and cooling load, comfort charts, outline of A/C, systems consideration for air-conditioning in building, natural ventilation, insulating materials.

MT-114: CALCULUS

MT-114	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 some well-known functions. Limit of functions and continuous and discontinuous functions with graphical representation.
Complex Number:	Argand diagram, De Moivre formula, roots 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' Hospitals' 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 nonlinear 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.
Sequence & Series	Sequence, Infinite Series, Application of convergence tests such as comparison, Root, Ratio, Raabe's and Gauss tests on the behavior of series.

CY-110: APPLIED CHEMISTRY FOR ENGINEERS

CY-110	APPLIED CHEMISTRY FOR ENGINEERS
Electrochemistry	Law of Electrolysis, E.M.F. series, Corrosion, Types and theories of corrosion, Factors affecting rate of corrosion, Inhibition and protection, Corrosion of ceramics.
Water and Sewerage	Sources of water, Impurities, Hardness, Water softening, Purification of water for portable and industrial purposes, Electro dialysis, Introduction to environmental pollution, Main sources and effects, Sewerage treatment.
Fuels	Types of fuels, Classification of fossil fuels.
Metals and 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, Glass Organic Engineering Materials: Polymers, Rubbers, Plastics and Paints. Semiconductors and Dielectric materials.

HS-106/HS-127: PAKISTAN STUDIES/ PAKISTAN STUDIES FOR FOREIGNERS

HS-106	PAKISTAN STUDIES
Historical and ideological perspective of Pakistan Movement	Two Nation Theory: Claim of Muslims of being a separate nation from Hindus, based upon cultural diversity. Cultural diversity and interests as bases for the demand of Pakistan – Lahore resolution. Creation of Pakistan: Factors leading to the creation of Pakistan. Quaid-e-Azam and the demand of Pakistan.
Constitutional Process	Constitutional and Political developments in Pakistan 1947-1973. Salient features of the Constitutions 1956, 1962 and 1973 and amendments.
Land of Pakistan	Geo-physical conditions. Geo-political and strategic importance of Pakistan. Natural resource, viz: mineral, water and power.
Contemporary issues in Pakistan	A brief survey of Pakistan Economy: problems, issues and future prospects. Pakistani Society and Culture-Broad features with emphasis on youth role in the development of Pakistan. Literacy and education in Pakistan: problems and issues. State of Science and Technology in Pakistan: A comparison with other countries with special reference to the Muslim world. Environmental issues in

	Pakistan: government policies and measures and suggestions for improvement. Urbanization in Pakistan - problems and issues Pakistan's role in the preservation of nature through international conventions / treaties. Human Rights in Pakistan: Pakistan's response to human rights issues at national & international levels. Pakistan' s Foreign Policy:
HS-127	**PAKISTAN STUDIES FOR FOREIGNERS**
Land of Pakistan	Geo Political & Strategic importance of Pakistan Natural Resources of Pakistan Urban & Environmental issues in Pakistan.
Creation of Pakistan	Factors leading to the Creation of Pakistan.
Constitution and the Government	The constitution of 1973 – Salient Features.
Pakistan and the Contemporary World	Foreign Policy of Pakistan Pakistan's stand point on Human Rights Global economic issues.

FIRST YEAR (Spring Semester)

UE-117: ENGINEERING DRAWING & DRAFTING-I

UE-117	ENGINEERING DRAWING & DRAFTING-I
Introduction	Importance, Significance and Scope of Engineering Drawing, Introduction to Drawing Instruments and their Use. Principle of Dimensioning and Scaling, Lettering and Geometry of various shapes. Brief review of machine drawings.
Projections	Development of surfaces. Orthographic projection, Isometric and pictorial projections of solid figures, making of free hand sketches from solid objects and from orthographic projections.
Symbols and Abbreviation	Building materials; Electric and plumbing symbols and Abbreviations.
Software	Introduction to Engineering Drawing Software (AUTOCAD) and basic its basic tools.

UE-104: ENGINEERING MATERIALS

UE-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;; Additives and admixtures; Air entrainment; Light weight concrete;

	Hot and cold weather concrete; Pre-cast 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, fiber board.
Rubber, Plastics and Bituminous Materials	Composition, varieties, properties and uses of bitumen, asphalt glass, rubber Laminates Adhesives, Asbestos, Fiber Glass, Paints and varnishes. Geo textile and geo-membranes. Plastics and composites.
Insulating Materials	Water proofing and heat insulating materials; Acoustical materials.

UE-102: STATIC & DYNAMICS

UE-102	STATICS AND DYNAMICS
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; 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.

HS-205: ISLAMIC STUDIES

HS-205	ISLAMIC STUDIES
Tauheed: Prophet Hood: Here-After:	Al-Ambiya-22, Al-Baqarah - 163&164, Al-Imran-79, Al –Huda7, Al-Maida0h-3, Al –Baqarah-48, and one Hadith.
Basic Islamic Practices:	Al-Mu' minun-1-11, and two Ahadith.
Amer-Bil-Ma'Roof WaNahi Anil Munkar	the concept of Good & Evil,Importance and necessity of Da'wat-eDeen Al- Imran – 110,Method of Da'wat-e-Deen An-Nehl-125, AlImran-104, and two Ahadith.
Unity of the Ummah	Al-Imran-103, Al-Hujurat-10, Al-Imran-64, Al-An' am –108, and two Ahadith.
Kasb-e-Halal	Ta ha-81, Al- A'raf-32-33, Al-Baqarah-188, and two Ahadith.
Haquq-ul-Ibad	Protection of life Al-Maidah-32, Right to Property Al-Nisa-29, Right to Respect & Dignity Al-Hujurat -11-12, Freedom of Expression: Al-Baqarah-256, Equality: Al-Hujurat-13,Economic Security: Al-Ma'arij-24-25, Employment Opportunity on Merit: AnNisa-58, Access to Justice: An- Nisa-135.
Women's Rights	An-Nehl-97, Al-Ahzab-35, An-Nisa -07.
Relations with Non-Muslims	Al-Mumtahanah-8-9, Al-Anfa'al-61 and The last Sermon of Hajj of Holy Prophet (PBUH): Relevant extracts.
Seerat (life) of the Holy Prophet (PBUH)	Birth,life at Makkah,declaration of prophet hood, preaching & its difficulties, migration to Madina, brotherhood (Mawakhat) & Madina Charter, The Holy Wars of the Prophet (Ghazwat-eNabawi), Hujjat-ul-Wida, The last sermon of Khutbatulwida: Translation and important points.
Islamic Civilization	In the sub-continent: pre- Islamic civilizations. The political, social & moral impacts of Islamic civilization. In the world: academic, intellectual, social & cultural impact of Islam on the world.

HS-209: ETHICAL BEHAVIOR

HS-209	ETHICAL BEHAVIOR
Introduction to Ethics	Definition of Ethics, Definition between normative and positive science, Problem of freewill, Method of Ethics, Uses of Ethics.
Ethical Theories	History of Ethics: Greek Ethics, Medieval, Modern Ethics, Basic concept of right and wrong: good and evil, Utilitarianism, hedonism, self-realization: egoism, intuitionism, rationalism, Kant's moral philosophy.
Ethics & Religion	The relation of Ethics to religion, Basic ethical principles of major religions: Hinduism, Judaism, Buddhism, Zoroastrianism, Christianity, Islam.
Ethics, Society and moral theory	Society as the background of moral life, Ethical foundation of Rights and Duties, Universalism and Altruism, Applied Ethics, Theories of punishment.

HS-111: FUNCTIONAL ENGLISH

HS-111	FUNCTIONAL ENGLISH
Speaking and Listening	Listening actively through the use of skills and sub skills, and in a variety of situations. Speaking: Fluency and confidence building through group discussions, role plays and public speaking.
Vocabulary development	Tips / strategies in vocabulary enhancement Practice in vocabulary development.
Reading	Reading skills, Sub skills Reading strategies Reading practice through variety of reading texts and comprehension exercises Précis writing.
Writing	Note taking: Techniques for taking notes from lectures, from books (integrated with listening & reading) Process of Writing with practice in pre writing strategies, in revising, and in, editing for grammar. Writing well- structured and effective paragraphs, essays and letters (routine communication) using proper writing mechanics. Writing descriptions, narrations, cause and effect, compare and contrast etc.

MT-221: LINEAR ALGEBRA & ORDINARY DIFFENTIAL EQUATIONS

MT-221	LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS
Linear Algebra	Linearity and linear dependence of vectors, basis, dimension of a vector space field, Matrix and type of matrices (singular, nonsingular, 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, Diagonolization, 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.

Contents of Courses

SECOND YEAR (Fall Semester)

UE-205: ENGINEERING DRAWING & DRAFTING-II

UE-205	ENGINEERING DRAWING & DRAFTING II
Introduction	Need and requirement of drawings for civil and urban 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. Perspective Drawing and its components.
Building Drawing and its components	Elements of architectural planning and design, various building elements, details of doors, windows, staircases etc. Plumbing and electrical detailing pertaining to small residential units.
Structural Drawing and its detailing	Preparation of reinforcement plans and details for reinforced concrete structure (elevation and section) i.e. slabs, beams, columns, footings, staircase, water tanks. Details of steel roof truss, connection details and fabrication drawings.
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. Preparation of submission Drawing on AutoCAD.

UE-215: ENGINEERING SURVEYING-II

UE-215	ENGINEERING SURVEYING-II
Earthwork volume Computations	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, Super elevation.
Construction Surveys	Introduction, Horizontal and Vertical control, Layout techniques with special reference to Buildings, Rail Road, Pipelines and Tunnels.
Hydrographic Surveys	General, Objectives of hydro graphic 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, linkage to conventional surveying, aircraft and Satellite Remote Sensing.

Control Surveys	General, Datums and Map Projections, Coordinate System, Horizontal and Vertical Control Techniques.

HS-304: BUSSINESS COMMUNICATION & ETHICS

HS-304	BUSSINESS COMMUNICATION & 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, Nonverbal, 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.

UE-212: MECHANICS OF SOLID-I

UE-212	MECHANICS OF SOLID-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 no 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 Curvature, slope and deflection of beams using integration methods.
Biaxial state of stress	Biaxial state of stresses, stress transformation; Principal plane, principal stresses and strains; Graphical representation of stress and strains, Mohr's circle of stresses and strains.
Theory of Torsion	Theory of torsion of solids and hollow circular shafts, shearing stress distribution, angle of twist, strength and stiffness of shaft.
Cylinders	Analysis of thin and thick walled cylinder.

AR-204: URBAN SOCIOLOGY

AR-204	URBAN SOCIOLOGY
Concepts and Terminology	Introduction types and formats of social relationship: Urban communities; space and its types (physical, social and economic); social infrastructure; sociology and development; social and psychological characteristics.
Urban Communities	Types and characteristics; communities in relation to build environment; issues related to urban communities; case studies
Issues in Urban sociology	Population; urbanization; human values; culture, traditions and norms; distribution and utilization pattern of resources gender and space; social justice.

UE-114: COMPUTING TOOLS AND APPLICATIONS

UE-114	COMPUTING TOOLS AND APPLICATIONS
Elementary Programming	Programming Basics Concepts; flow charts, algorithm, variables declarations, Logical expressions, Input and Output Statements, IF Statement, Loops in Programming, Matrix manipulation.
General Computing Applications	Spreadsheets, Databases, Generating Queries.
Computer Algebra Systems (CAS)	Computer solution of engineering problems involving roots of equations, simultaneous equations, curve fitting, integration, differentiation, and differential equations.

SECOND YEAR (Spring Semester)

UE-361: PLANNING AND DESIGN OF TRANSPORTATION SYSTEM

UE-361	PLANNING AND DESIGN OF TRANSPORTATION SYSTEM
Transportation Systems and Planning	Role of Transportation: Classification of Transportation Systems development of various modes in Pakistan; Role of highways within a transport system; Highway classification. Planning needs Goals and Objectives, Types of Plan.
Geometric and Pavement design of Highway	Geometric design including cross section element Horizontal alignment Curves; Super elevation and gradient Flexible and rigid pavement design; Highway drainage.
Air Transportation:	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.
Waterway	Role of water transportation as a supplementary transportation

Transportation	system. Classification of harbours; Ports and harbours of Pakistan; Design principles and requirement of harbours; Effect of wind, waves and tides on design; wharves and jetties; Breakwater and groins Channel regulation and demarcations; Classification of docks and their construction; Transit sheds and warehouses. Emerging trends in Ports/ container terminal.

UE-214: FLUID MECHANICS

UE-214	FLUID MECHANICS
Basic Concepts and Definitions	Units, density, specific weight, mass, viscosities, compressibility, surface tension, vapor pressure; Continuum, Lagrange and Eulerian description.
Fluid Statics	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 and Steady Flow	Types of flow; Streamline and streak lines; Velocity and acceleration in steady & unsteady flow; Equation of continuity, Energy Equations; Hydraulic grade line and energy line; Flow in a curved path;
Impulse momentum	Basic principle; Force on pressure conduits, stationary and moving blades, reducers and bends; Torques in rotating machines; Applications.
Fluid Properties Measurements	Static, velocity and acceleration measurements; Orifices meter, notches & weirs, venturimeter.
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, Nukuradse'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.

MT-229: PROBABILLITY & STATISTICS

MT-229	PROBABILLITY & STATISTICS
Presentation of Data	Classification, tabulation, classes, graphical representation, histograms, frequency polygons, frequency curves and their types.
Measures of Central Tendency	Means: Arithmetic Mean (A.M), Geometric Mean (GM), Harmonic Mean (HM), and their properties, Weighted mean, median, quartiles, mode and their relations, Merits and demerits of Averages.
Measures of Dispersion	Range, moments, skewness, quartile deviation, mean deviation, standard deviation, variance and its coefficients, kurtosis.
Curve Fitting	Goodness of fit, Fitting a straight line, parabola, and circle.
Simple Regression	Scatter diagram, linear regression and correlation.
Probability	Definitions, sample space, events. Laws of probability, conditional probability, Dependent and independent events.

Random Variable	Introduction, distribution function, discrete random variable and its probability distribution, Continuous random variable and its probability density function, Mathematical expectation of a random variable, Moment generating functions.
Probability Distribution	Binomial, Poisson, uniform, exponential and normal distribution functions and its approximation to Poisson distribution.

UE-218: LAW & REGULATORY CONTROL STUDIES

UE-218	LAW & REGULATORY CONTROL STUDIES
Law	Definitions of government and law; legal relations; subjects and objects of legal relations; physical and jurisdictional individuals; Local Government Legislation / Act and Licenses requirement and regulation professional ethics. Importance of regulating built environment in urban areas.
Property rights	Forms and types, Possession use and disposal. Transaction; ownership; tenancy and traditional forms of property accesses.
Building plans	Submission of Building applications and drawings: Procedural checks: ownership verification; planning application forms; Drawing fees, No objection certificates, Advertisement; etc. Site visits, serving of notices; Fines and compounding of violation. Analysis of building proposals: conformity with the development plans, land use zoning planning criteria building bylaws, design guidelines, building line / parking requirements, chamfer requirements, construction over cultivators etc.
Coordination and Action between Civic Agencies:	Consultation with the neighbors, roads authorities line departments and allied agencies; Decision about approval of planning proposal; completion certificate. Demarcation and removal of encroachments; Declaration and demolition of dangerous buildings; Litigation involved in building; control.

UE-216: GEOLOGY FOR ENGINEERS

UE-216	GEOLOGY FOR ENGINEERS
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 landslides.

UE-209: ANALYSIS OF STRUCTURES

UE-209	ANALYSIS OF STRUCTURES
Introduction	Introduction of structural forms, two dimensional pin connected & flexural form, three dimensional pin connected and flexural form; Surface structure; Simplification for analysis and design.
External Loads	Estimation of external loads external loads, including Dead, Live, Wind and Earthquake loads, Use of codes in estimating different types of external, Static, Dynamic and Moving loads, Load combinations.
Statically determinate Structures	Determinate structures; Static & kinematics determinacy; Compatibility and boundary conditions; Structural safety-stress and deformation characteristics; Small deflection theory. Fundamentals of energy methods; Deformations in pin connected and frame structures by virtual work, moment area, conjugate beam method.
Statically Indeterminate Structures	Analysis of indeterminate pin connected and framed structures using consistent deformation method, slope deflection method, moment distribution method.
Matrix Methods	Matrix method of analysis: Stiffness method.

Contents of Courses

THIRD YEAR (Fall Semester)

UE-351/CE-320: REINFORCED CONCRETE DESIGN-I

UE-351/CE-320	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.

UE-352/CE-321: CONSTRUCTION ENGINEERING

UE-352/CE-321	CONSTRUCTION ENGINEERING
Introduction	Construction Projects, Project Life Cycle Phases, Key Players, Project Success Parameters, Normal Tracking and Fast Tracking, Project Categories, Building Permits; Codes and Regulations, Construction Standards, Sustainability.
Construction Equipment	Types of Equipment used specifically in Building Construction, Analysis of Capital; Operating; Investment; Maintenance; Repair Costs, Equipment Productivity and Cost Effectiveness.
Over-view of Constructional Aspects	An over view 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	Site Selection and Orientation of Buildings, Grading Considerations,

Techniques	Layout techniques with special reference to buildings.
Excavation	Excavation in deferent types of soils, stability of excavation 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.
Construction Methodologies	In-Situ and Pre-Cast Concrete Construction of Buildings, Slab on Grade, Plain Cement Concrete Floors, Planar and Non-Planar Roofing Systems. Doors, Windows, Masonry, Brickwork, Glazing, Cladding, Façade, Curtain Wall, Floor Finishing, Interior and Exterior Building Finishes, and Water Proofing. Protection of adjacent Structures. Mechanized construction. Design and use of formwork for various building units/members. Methods of Concreting Vertical and Horizontal Members, including Mechanized Placement, Ready Mix Concrete etc. Construction Joints, Mass concreting, Plinth Beams and Plinth Protection. Planar and Non-Planar Construction Aspects related to Services.

UE-353/CE-323: QUANTITY & COST ESTIMATIONS

UE-353/CE-323	QUANTITY & COST ESTIMATIONS
General	Scope of civil engineering works, General practice in industry or schedule of rates and specifications, Rates analysis, Procedure and Application to Concrete, Description of Schedule of Values, Specifications for various items in construction.
Estimating Basics	Concept, Need and Significance, Estimate Categories and Project Life Cycle (PLC), Role of Estimates in PLC, Estimate Types, Estimate Accuracy vs. Time, Scheduling the Estimating Process, Estimating Data Needs; Sources; and Data Collection Approaches, Estimating Considerations, Estimating Procedure, Computerized Estimating Overview.
Developing Preliminary Estimates	Development Process and Illustrative Examples of Conceptual and Assemblies Estimates.
Quantity Takeoff Basics	Process, Measurement Units, Takeoff Rules, Measurement Accuracy, Organization of Takeoff, Overview of Takeoff by Computer, Review of Estimate Math.
Pricing Basics	Pricing Parameters, Pricing Sources, Contractor's Risk of Pricing Low or High, Direct and Indirect Cost, Labor Productivity, Overview of the Process and Considerations of Pricing; Labor; Equipment; Materials; Subcontracted Work; and General Conditions.
Definitive Estimates	Working out quantities, rates and costing analysis of construction works.
Bill Processing	General principle, Contents and preparation of bills of quantities for a project and maintaining of Measurement Books.
Estimating	Quantity Takeoff and Pricing of Labor, Material and Equipment for;

Worked Examples	Site work, Concrete, Masonry, Carpentry, and Finishes Works; Overview and Discussion of Estimating Procedures and Considerations for Concrete Retaining Wall, Piles, Steel Truss, Road, Sewer and Water Mains Pipe Works.
Further Estimating Concerns	Estimate Setup, Overhead, Profit, Sources of Estimating Errors, Escalation, Contingency, Life-Cycle Costing.
Contract & Tender	Preparation of civil engineering contracts and tender documents; Evaluation of proposals and contracts.
Use of Estimating Software / Spreadsheets	

UE-316: TRAFFIC ENGINEERING AND MANAGEMENT

UE-316	TRAFFIC ENGINEERING AND MANAGEMENT
Traffic flow characteristics:	Flow characteristics, Interrupted and uninterrupted flows, Traffic bottlenecks Traffic studies; Macroscopic and Microscopic studies, Methods of measuring speed and volume, Relation between speed volume and density. Saturation flow, Traffic delay.
Traffic safety and control	Traffic Lighting; Traffic signals, Signs and markings, Safety and Accident studies, One way and tidal flow systems. Traffic calming, bus priorities, pedestrian facilities and Travel demand management, Road safety audit.
Capacity analysis	Analysis of various highway and traffic facilities including multi-lane highways and signalized intersection.
Intelligent transport systems	Introduction to various components of ITS system needs and application. Discussing and debating solution to urban congestions.
Parking design and control	On street and Off Street Parking, Parking demand and Turnover, Parking Control.

MT-443: NUMERICAL ANALYSIS

MT-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, Nonlinear 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, 1/3th Simpson's rule, 3/8th Simpson'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).

AR-308: URBAN INFRASTRUCTURE PLANNING AND MANAGEMENT

AR-308	URBAN INFRASTRUCTURE PLANNING AND MANAGEMENT
Introduction	Definition; cities and infrastructure development; types of infrastructure; interface of urban planning and infrastructure examples.
Basic Studies of Urban Planning:	Population/demographic study; Land use study; Study of transport system; Study of Urban landscape and conservation Role of government in provision of community facilities/utilities.
Special Approach to Planning Process	Urban Design concepts; Theory of good city form; Quantitative methods of urban planning Social welfare planning.
Implementation, Policies, Plans, Programs, Regulation and Renewal	Definitions of development objectives, policy and planning program; Comprehensive plan and its related documentation process; Programming of community development and capital intensive projects of government; Urban zoning issues; Land subdivisions (both at formal and informal level).
Urban Planning, Management and Maintenance Institutions in Local context	Organization and structure of Institutions; Internal administration of institutions; People's initiatives and institutions.

THIRD YEAR (Spring Semester)

UE-323: URBAN HYDROLOGY AND MUNICIPAL ENGINEERING

UE-323	URBAN HYDROLOGY & MUNICIPAL ENGINEERING
Urban Hydrology	Hydrological cycle; hydrologic unit, Surface water and groundwater hydrology. Precipitation, infiltration, Evaporation, transpiration, outflows. Storage, Rainfall-runoff data analysis.

Urban Drainage Works	Stream flow. Run-off-hydrograph, Unit hydrograph, Peak runoff, Rational method, NRCS-TR-55 method. Open channel /Drainage design and disposal.
Municipal Engineering	Legal framework (acts/ordinance). Organization of local government; Role of planners; Municipal Engineer co-ordination with different civic agencies.
Land development Process	Regional context; Preparation and contents of neighborhood plan; Subdivision of land i.e. principles, street and block patterns; Development of maps and plans; Zoning restrictions; Local approval process; Financial feasibility.
Provision of Government Services	Street Layout - Global street design (NACTO). Services to support modern transportation and transit systems; Parking facilities, Street lighting.
Katchi Abad	Katchi Abadi development; Squatters settlement; Improvement land use control and provision of infra structure utilities (water supply, septic tank, etc.).

CF-303: APPLIED ECONOLICS FOR ENGINEERS

CF-303	APPLIED ECONOMICS FOR ENGINEERS
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 of 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 Allocation	Capital Budgeting, Allocation of capital among independent projects, financing with debt capital, Financing with equity capital, Trading on equity, Financial leveraging.

UE-305/CE-305: SOIL MECHANICS-I

UE-305/CE-305	SOIL MECHANICS-I
Nature of Soils	Origin, Formation, Soil minerals, Clay mineralogy, Soil structures, Particle shapes and sizes.
Composition and Physical Properties	Phase diagram, water content, void ratio, porosity, and degree of saturation, specific gravity, and 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 reconsolidation pressure, swelling clays and clay-shale.
Soil Compaction	Requirements, principle and methods including standard and modified AASHTO tests.

UE-355/CE-424: ESSENTIAL IN CONSTRUCTION PROJECT MANAGEMENT

UE-355/CE-424	ESSENTIAL IN CONSTRUCTION PROJECT MANAGEMENT
Introduction	The Construction Industry, Nature and Challenges, Key Industry Support Organizations, Public and Private Works, Past; Present; Opportunities; and Threats with Specific Reference to Pakistani Construction Industry.
Project Management in the Engineering & Construction Industry	PM knowledge areas; PM Life Cycle processes; Organizational structure of a construction project; Responsibilities of client, Key PM Skills; Key Roles and Responsibilities of Client, Consultants - including architects, engineers and allied professionals, constructors, PM and CM; Professional construction management; Project Management issues and need for improved organization and management structures and processes with particular reference to local construction industry.
Project Scoping, Bidding and Preconstruction Planning	Determining Relative Priorities of Key Project Objectives; Defining Project Scope, Types of tenders / contracts; Pre-Qualification process, Bidding process, Bid Package, Overview of Preconstruction Planning Aspects Including Area and Site Investigation; Preliminary schedules; Value Engineering; Constructability Analysis; Work packages; Drawings and Specifications review.
Project Planning, and Scheduling by Deterministic Methods	Planning and Scheduling Overview; Planning and Scheduling Process; Work Breakdown Structure; Planning and Scheduling Activities; Bar/ Gant Charts; ADM & PDM Networks; CPM project scheduling using PDM; Time Constrained Scheduling.
Project Planning, by Probabilistic Methods	Uncertainty Sources; Limitations of Deterministic CPM; PERT scheduling; PERT advantages and limitations; PERT today in construction industry.
Resource and Cost Considerations in Project Planning & Scheduling	Resource planning and scheduling; Resource Productivity; Resource levelling; Resource curves and profiles; Direct cost versus indirect cost; ; Contingency and profit; Cost Accrual Patterns; Time cost trade off; Least cost expediting; Project cost accounting; Cash flow and S-Curve;
Project Monitoring and Control	Project Monitoring System, Project Control Process, Time; Cost; and Work performance Measurement and Evaluation, Percent Complete, Look Ahead Schedules; Earned Value Cost and Schedule Control System.
Site Organization	Site Layout Planning, Contractor's Site (Team) Organization Chart, Mobilization Plan, Overview of Site Management issues. Project Management Career Paths. Use of Computer Software in Planning and Management for Construction Projects.

UE-453/CE-420: REINFORCED CONCRETE DESIGN- II

UE-453/CE-420	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.

Contents of Courses

FINAL YEAR (Fall Semester)

UE-452: URBAN MASS TRANSPORTATION

UE-452	URBAN MASS TRANSPORTATION
Urban Mass Transit	Need, Types of Mass transit, Mass Transit Planning, Mass Transit Design and operation, Mass Transit Issues, Transportation Demand Forecast, System Evaluation.
Rail transit	Rail systems; Railway organization; Railway alignment and grades; Cross sectional elements of railway tracks; Pointers and crossings, stations and yards; Railway signal 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; Subways, LRT and MRT.
Design and Feasibility of Public Transport Projects	O-D surveys for public transport users, Analysis of trip patterns using desire lines; Service scheduling and design of new bus services.

UE-359: STRUCTURAL ANALYSIS-II

UE-359	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.

UE-403/CE-403: SOIL MECHANICS-II

UE-403/CE-403	SOIL MECHANICS-II
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, Terzahgi'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.
Soil Property Modification	Mechanical and chemical stabilizations of soil, principles & methods.

UE-451/CE-418: HYDRAULIC ENGINEERING AND WATER RESOURCES ENGINEERING-I

UE-451/CE-418	**HYDRAULIC ENGINEERING AND WATER RESOURCES ENGINEERING-I**
Introduction to Water Resources Engineering	Hydrogen cycle; Overview, Rain, Surface and sub-surface water hydrology, and water resource estimates.
Open Channels and Sediment Transport	Erosion and Sediment yield; Design of open channels - Kennedy's and Lacey's theories.
Surface Water Hydrology	Rainfall – Local Rainfall, Spatially – Averaged Rainfall, Design Rainfall Interception, Depression storage, Infiltration Rainfall – Runoff Analysis-Runoff Models; Time of Concentration, Peak- Runoff Models.
Irrigation	Irrigation, Indus Basin Irrigation System (Indus water treaty; water apportionment accord etc.), Soil –water-plant relationship, Irrigation methods (Pressurized and non-pressurized).
Subsurface hydrology/ Drainage	Unsaturated and saturated subsurface water and its movement-Darcy's Equation, Water wells and its construction. Waterlogging and Salinity, Surface &subsurface drainage and its methods.
Dams and Barrages	Types, components, and function of barrages and Dams; Reservoirs.
Introduction to Coastal Engineering	Basic terminologies within coastal engineering; Importance of coastal engineering to coastal zone management; Linear wave theory; Wave transformation and attenuation processes; Waves of unusual character.

EN-301: ENVIRONMENTAL ENGINEERING-I

EN-301	ENVIRONMENTAL ENGINEERING-I
Communicable Disease Control	Water borne, foodborne and vector borne diseases, Water supply and sanitation.
Environmental Pollution	Sources, Pollutants, Effects and remediation of air, water, land and noise pollution, Toxic/hazardous wastes.
Water Demand & Supply	Population forecast, Water uses & consumption, Types and variations In demand, Maximum & firefighting related demand, Urban & rural water supply, Appropriate technology.
Water Quality	Water impurities & their health significance, Water quality standards, (U.S. & WHO & Local etc.), Water quality monitoring, Sanitary survey.
Water Treatment	Treatment of surface & ground waters, screening, sedimentation, coagulation. Filtration, design aspects of slow and rapid sand filters, Filtration rates, operation head loss, backwash and filter efficiency, Pressure filters, hardness removal, Water softening methods, Water disinfection, Emergency treatment methods.
Building Water Supply	Layout of water supply arrangement, Fixtures and their installation, Tapping of water mains.
Energy Conservation	Introduction to concepts of energy conservation, energy management in industry and construction activities and green buildings.
Laboratory Works	Related to the above, sampling techniques and examination of water (physical, chemical and microbiological parameters).

FINAL YEAR (Spring Semester)

UE-360: MECHANICS OF SOLIDS-II

UE-360	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.
Theory of Plasticity	Elementary theory of plasticity, plastic hinges, shape factor and failure mechanism.

Stability	Struts and columns, Euler, Rankine and other formulas for buckling load of columns, Stability analysis of columns under eccentric loading.

UE-435: FINANCIAL RESOURCE MANAGEMENT

UE-435	FINANCIAL RESOURCE MANAGEMENT
Resource Management	Meaning; Nature; Aims; Characteristics; Elements; Functions and Objectives of management.
Capital financing and Allocation	Difference between sources of capital; Equity and borrowed capital; Financing with debt capital- cost of debt capital; Financing with bonds-cost of equity capital; Financing through retained profit; Leasing as a source of capital; Capital Allocation; An overview of a typical corporate capital budgeting Process.
Banking and specialized Credit Institution	Functions of Bank and Credit Institution; Documentation related to International and Domestic Banks, Financial and funding Institutions.
Business and Consumer Loans	Open-End Credit and charge cards; Installments loans; Early payoffs of loans; Personal property loans; Real estate loans.
Taxation	Basics of taxation; Tax formulas and computation; Tax laws for capital gains.
Price Changes and Exchange Rate	Terminology and basic concepts; Differential price inflation or deflation; Application strategy; Foreign Exchange rates and purchasing power.
Home ownership and Mortgage financing (Owning v/s Renting)	Mortgage financing for home ownership; Mortgage the investment market in the investment market; Comparing mortgages and different interest rates; Effects of different interest rates; Effects of different mortgages lives.
Investment Property	Land inventory; Features of investment real estate; Investment return; Determination of project feasibility.

UE-454/CE-421: DESIGN OF STEEL STRUCTURES

UE-454/CE-421	DESIGN OF 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 built-up 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.

UE-460: GEOINFORMATICS			
	Cr. Hrs.	Contact Hrs.	Exam Marks
Th.	1	1	100
Pr	1	3	50

Introduction to Geo informatics Resources of information: Photogrammetric surveying, Satellite System, Aerial and Satellite photogrammetry. **Geographic Information System (GIS):** Fundamentals of GIS, Spatial Data types and acquiring consideration. Data models and structures. Coordinate System, Datum and map projection and their transformation. Attribute-based operation, Introduction to Spatial Analysis. **Remote Sensing (RS):** Basic Concepts. Physicals basis of Remote Sensing, Earth Resources Satellites/ Platforms, Sensors, Types of Resolutions, Georeferencing, Image Processing Techniques. Classification. **Global Positioning System (GPS):** Navigational Satellites, Positioning Systems (GLONASS, GPS & Galileo), Fundamentals and Elements of GPS, System Operation & Characteristics, Errors and Atmospheric effects. Differential GPS (DGPS). **Field and Laboratory Work:** Training on GPS instruments-based surveys, Integration GPS data in GIS. Exercises on Image processing software and recent GIS software. Demonstration on RS/GIS applications in engineering disciplines

Recommended book(s) for the approved course
(Author's name, "*Title*", edition, publisher, publication year).

Text book:

1. Michael Kennedy, The Global Positioning System and Arc GIS System, 3rd Edition, Taylor & Frances, New York, , 2017
2. Thomas, M. Lillesand & Ralph W. Kiefer, Remote Sensing and Image Interpretation, 7th edition, John Wiley & Sons, Inc. 2015,
3. Clarke, K. Getting Started with Geographic Information System, Prentices Hall, New York 3rd Edition, 2010, ISBN-1879102897
4. Chang, K. T., Introduction to Geographic Information Systems, 9th Ed. McGraw-Hill Higher Education, 2019

EN-401: ENVIRONMENTAL ENGINEERING- II

EN-401	ENVIRONMENTAL ENGINEERING- II
Storm Flow & Sewage Flow Estimates	Rainfall intensity formulas, 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, antisyphon pipes and waste water pipes; Sanitary fixtures and

	traps; House connection and testing of house drainage; Cross connection and back syphonage 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).