



UNIVERSITY OF SARGODHA SARGODHA

Registrar's Office

Phone: 048-9230811-15 Ext: 517

No.UOS/Acad/1894

Dated: 19/11/2014

The Principal
University College of Engineering & Technology
University of Sargodha

Subject: **SCHEME OF STUDIES / COURSE OUTLINES FOR BS CIVIL,
ELECTRICAL & MECHANICAL TECHNOLOGIES PROGRAM**

Dear Sir,

I am directed to refer to the minutes of the meeting of Academic Council held on 10.07.2014 (Item No.38) and request you to kindly process the curriculum / curricula at the earliest.

2. The curriculum shall be notified after vetting of the committee constituted by the Academic Council to review the course code / basic template of schemes of studies.

3. Please refer to annexed notification of the committee for the said purpose.

Yours faithfully

(Ch. FAROOQ AHMAD)
Assistant Registrar (Acad)
for Registrar

Encl: As Above (Curricula in original)

C.C:

- Prof. Dr. Mian Ghulam Yasin
Dean, Faculty of Social & Behavioral Sciences
University of Sargodha
- Secretary to the Vice-Chancellor
- P.A to Registrar

Copy to Dr. Waheed Y/S 20/11

Scheme of Study for BS CIVIL TECHNOLOGY
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Semester-I

Code	Subject	Credit Hours		Contact Hours
		T	P	
HU-111	Applied Mathematics-I	3	0	3
CS-112	Computer Applications	1	1	4
HU-113	Communication Skills-I	3	0	3
CT-114	Civil Engineering Drawing	1	2	7
HU-115	Islamic Studies	2	0	2
CT-116	Materials and Methods of Construction	3	0	3
Total		13	3	22

Semester-II

Code	Subject	Credit Hours		Contact Hours
		T	P	
CT-121	Applied Mechanics	3	1	6
CT-122	Concrete Technology	3	1	6
CT-123	Surveying	2	2	8
HU-124	Communication Skills-II	2	0	2
Total		10	4	22

Semester-III

Code	Subject	Credit Hours		Contact Hours
		T	P	
HU-211	Applied Mathematics-II	3	0	3
CT-212	Theory of Structures	3	1	6
CT-213	Fluid Mechanics	3	1	6
CT-214	Mechanics of Materials	3	1	6
CT-215	Engineering Geology	2	0	2
Total		14	3	23

Semester-IV

Code	Subject	Credit Hours		Contact Hours
		T	P	
CT-221	Soil Mechanics	3	1	6
CT-222	Highway and Transportation Engineering	2	1	5
CT-223	Quantity Surveying and Contract Document	3	0	3
CT-224	Material Testing Repair and Maintenance	2	0	2

Scheme of Studies: BS Civil Technology

CT-225	Hydrology	2	0	2
Total		12	2	18

Semester-V

Code	Subject	Credit Hours		Contact Hours
		T	P	
CT-311	Irrigation and Hydraulic Engineering	3	1	6
CT-312	Reinforced Concrete Structures	3	1	6
CT-313	Steel Structures	3	0	3
CT-314	Computer Aided Building Modeling and Design	0	1	3
CT-315	Water Supply & Waste Water Management	3	1	6
Total		12	4	24

Semester-VI

Code	Subject	Credit Hours		Contact Hours
		T	P	
CT-321	Environmental Management	3	1	6
CT-322	Introduction to Earth Quake Engineering	1	0	1
CT-323	Project Management	2	1	5
CT-324	Engineering Economics	3	0	3
HU-325	Pak. Studies	2	0	2
Total		11	2	17

Semester-VII

Code	Subject	Credit Hours		Contact Hours
		T	P	
CT-411	Foundations and Pavements	3	1	6
CT-412	Project	0	6	18
Total		3	7	24

Semester-VIII

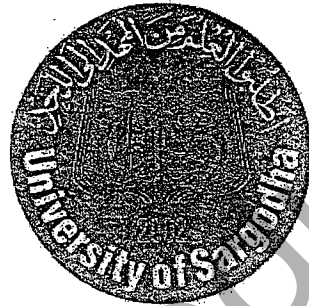
Code	Subject	Credit Hours		Contact Hours
		T	P	
CT-421	Supervised Industrial Training	0	36	108
Total		0	36	108

Total Credit Hours = 136

Course Outlines BS CIVIL TECHNOLOGY

	APPLIED MATHEMATICS-I.....	1
	COMPUTER APPLICATIONS.....	1
24	COMMUNICATION SKILLS-I.....	2
	CIVIL ENGINEERING DRAWING.....	3
	ISLAMIC STUDIES.....	3
	MATERIALS AND METHODS OF CONSTRUCTION	5
	APPLIED MECHANICS.....	6
27	CONCRETE TECHNOLOGY.....	7
	SURVEYING.....	8
	COMMUNICATION SKILLS-II.....	9
28	APPLIED MATHEMATICS-II.....	10
	THEORY OF STRUCTURES	11
	FLUID MECHANICS.....	12
	MECHANICS OF MATERIALS	13
	ENGINEERING GEOLOGY.....	14
	SOIL MECHANICS	15
31	HIGHWAY AND TRANSPORTATION ENGINEERING	16
	QUANTITY SURVEYING AND CONTRACT DOCUMENT.....	17
	MATERIAL TESTING REPAIR AND MAINTENANCE	18
	HYDROLOGY	19
	IRRIGATION AND HYDRAULIC ENGINEERING.....	20
32	REINFORCED CONCRETE STRUCTURES	21
	STEEL STRUCTURES	21
	COMPUTER AIDED BUILDING MODELING AND DESIGN	22
	WATER SUPPLY & WASTE WATER MANAGEMENT	23
	ENVIRONMENTAL MANAGEMENT.....	24
33	INTRODUCTION TO EARTH QUAKE ENGINEERING	25
	PROJECT MANAGEMENT	26
	ENGINEERING ECONOMICS	26
	PAKISTAN STUDIES.....	27
34	FOUNDATIONS AND PAVEMENTS	29
	PROJECT.....	30
35	(SUPERVISED INDUSTRIAL TRAINING.....	31

Course Curriculum BS Civil TECHNOLOGY



Fall 2014

UNIVERSITY OF SARGODHA

University College of Engineering and Technology

Department of Technical Education

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Applied Mathematics-I

Course Code: HU-111

Credit Hours: 3

Objectives:

1. To review the knowledge and practice the skills acquired in diploma Courses
2. To understand the concept and use of differential equations
3. To learn different methods to solve differential equations
4. To understand the concept of complex numbers and their applications

Course Outlines:

1. **Review of the following:** Integral Calculus, Differential Calculus Matrices and Determinant, Vector Algebra and Analytical Geometry
2. **Introduction to Differential Equations Basic Concepts:** Geometric Interpretations, Separable Equations, Exact Differential Equations, Linear First Order Differential Equations, Bernoulli's Differential Equations, Families of Curves, Applications
3. **Higher Order Differential Equations:** Homogeneous Linear Equations of Second Order, Non- Homogeneous equations, Application of Higher Linear Differential Equations
4. **Partial Differential Equations:** Basic Concepts, Solution by Separable Variables, Classification
5. **Complex Numbers:** Invented Number Systems, The Argand Diagram, Complex Variables, Derivatives, Complex Series, Applications

Text Book:

1. Thomas G. B. and Finney R. L. "Calculus and Analytic Geometry"
(latest edition)

Reference Books:

1. Kreyszig E. "Advanced Engineering Mathematics", John Wiley and Sons, USA (latest edition)
2. Cohen H. L. "Mathematics for Scientists and Engineers", Prentice-Hall, UK (latest edition)

Computer Applications

Course Code: CS-112

Credit Hours: 1+1

Objectives:

1. To review the knowledge and practice the skills acquired in diploma Courses
2. To practice the use of BASIC language and Spreadsheet software in different applications
3. To learn the concept of CAD/CAM and related applications
4. Familiarization with commercially available softwares in the relevant field

Course Outlines:

Department of Technical Education, BS Civil Technology

1. **Review of the following knowledge/skill:** Electronic Data Processing, Operating System, BASIC language
2. **Practice in using Word Processing Software:** Character and Paragraph Formatting, Tables and Columns, Page Setup and Print Setup, Inserting Objects Styles, Index and TOC Customization
3. **Practice in using Spreadsheet Software:** Data Types, Entering and Editing data General Calculations, Statistical Analysis, Graphics
4. **CAD/CAM Applications (Technology Related)**
5. **Familiarization with Commercially available Softwares In the relevant field**

Text Book:

1. Gottfried R. S., "Programming with Basic", Schaum's Outline Series (Latest Edition)
2. User's Manuals for Word Processing Software, Spreadsheet Software and Technology Specific Softwares

Reference Books:

1. Tucker A. B., Bernat A., Cupper R. D. and Scragg G. W., "Fundamentals of Computing", McGraw Hill Book Company (Latest Edition)
2. IBM Dictionary of Computing (Latest Edition).
3. Bradley J. C., "QUICK BASIC", Wm. C. Brown Publishers, USA (Latest Edition)

Communication Skills-I

Course Code: HU-113

Credit Hours: 3

Objectives:

1. To understand the importance and basic concepts of communication
2. To enhance the listening skills and to become active listener
3. To enhance the reading skills and to become active reader
4. To improve the writing skills in general

Course Outlines:

1. **Introduction to Communication:** Importance, Theories, Barriers, Components
2. **The Seven C's for Effective Communication**
3. **Listening Skills:** Blocks, Thinking and Feeling Notes Taking, Giving Feedback
4. **Reading Skills:** Active Reading Techniques, Skimming, General Reading and Careful Reading
5. **Introduction to Writing Skills:** Planning, Drafting and Editing Emphasis and Connections
6. **Grammar and Vocabulary:** Technical and Business Vocabulary, Constructing Formal Sentences

Text Book:

Department of Technical Education, BS Civil Technology

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P., "Effective Business Communications", McGraw-Hill, USA (Latest Edition).

Reference Books:

1. T Norman S., "We're in Business", Longman Group Ltd., UK (Latest Edition).
2. Thomson A. J. and Martinet A. V., "A Practical English Grammar", Oxford University Press, UK (Latest Edition)

Civil Engineering Drawing

Course Code: CT-114

Credit Hours: 1 + 2

Introduction:

A use and care of drawing instruments, standard drawing office practice, Principles of orthographic projection related to simple solids.

Course Outlines:

Descriptive Geometry: Lines in space and in planes showing their traces and true inclination to planes of projection, Plane curves, Cycloids, Hypocycloid, Involute, 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

Building Drawing: Introduction to architectural and structural drawings of simple buildings

Symbols and Abbreviations: Building materials; Electric and plumbing symbols and abbreviations

List of Practicals:

Preparation of working drawings

Reference Books:

N.D. Butt, "Engineering Drawing"

ISLAMIC STUDIES

Course Code: HU-115

Credit Hours: 2

Objectives:

1. To provide Basic information about Islamic Studies
2. To enhance understanding of the students regarding Islamic Civilization
3. To improve Students skill to perform prayers and other worships

4. To enhance the skill of the students for understanding of issues related to faith and religious life

Detail of Courses:

1. **Introduction to Quranic Studies:** Basic Concepts of Quran, History of Quran, Uloom-ul-Quran
2. **Study of Selected Text of Holy Quran:** Verses of Surah Al-Baqra Related to Faith (Verse No-284-286), Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18), Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11), Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77), Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)
3. **Study of Selected Text of Holy Quran:** Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.), Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment, Verses of Surah Al-Saf Related to Tafakar, Tadabar (Verse No-1,14)
4. **Seerat of Holy Prophet (S.A.W) –I:** Life of Muhammad Bin Abdullah (Before Prophet Hood), Life of Holy Prophet (S.A.W) in Makkah, Important Lessons Derived from the life of Holy Prophet in Makkah
5. **Seerat of Holy Prophet (S.A.W) –II:** Life of Holy Prophet (S.A.W) in Madina, Important Events of Life Holy Prophet in Madina. Important Lessons Derived from the life of Holy Prophet in Madina
6. **Introduction To Sunnah:** Basic Concepts of Hadith, History of Hadith, Kinds of Hadith, Uloom –ul-Hadith, Sunnah & Hadith, Legal Position of Sunnah
7. **Selected Study from Text of Hadith Introduction To Islamic Law & Jurisprudence:** Basic Concepts of Islamic Law & Jurisprudence, History & Importance of Islamic Law & Jurisprudence, Sources of Islamic Law & Jurisprudence, Nature of Differences in Islamic Law, Islam and Sectarianism
8. **Islamic Culture & Civilization:** Basic Concepts of Islamic Culture & Civilization, Historical Development of Islamic Culture & Civilization, Characteristics of Islamic Culture & Civilization, Islamic Culture & Civilization and Contemporary Issues
9. **Islam & Science:** Basic Concepts of Islam & Science, Contributions of Muslims in the Development of Science, Quranic & Science
10. **Islamic Economic System:** Basic Concepts of Islamic Economic System, Means of Distribution of wealth in Islamic Economics, Islamic Concept of Riba, Islamic Ways of Trade & Commerce
11. **Political System of Islam:** Basic Concepts of Islamic Political System, Islamic Concept of Sovereignty, Basic Institutions of Govt. in Islam
12. **Islamic History:** Period of Khlaft-E-Rashida, Period of Ummayyads, Period of Abbasids
13. **Social System of Islam:** Basic Concepts of Social System of Islam, Elements of Family, Ethical Values of Islam

Reference Books:

1. Hameed ullah Muhammad, "Emergence of Islam", IRI, Islamabad
2. Hameed ullah Muhammad, "Muslim Conduct of State"
3. Hameed ullah Muhammad, "Introduction to Islam"

4. Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law", leaf Publication Islamabad, Pakistan.
5. Ahmad Hasan, "Principles of Islamic Jurisprudence", Islamic Research Institute, International Islamic University, Islamabad (1993)
6. Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes", Islamic Book Service (1982)
7. H.S. Bhatia, "Studies in Islamic Law, Religion and Society", Deep & Deep Publications New Delhi (1989)
8. Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia", Allama Iqbal Open University, Islamabad (2001)

Materials and Methods of Construction

Course Code: CT-116

Credit Hours: 3

Objectives:

1. To develop an understanding of the properties, uses and behavior of the building materials, standards for material quality, various tests on materials.
2. To develop the basic understanding of construction techniques and methods of building construction with particular reference to R.C. work, brick work, flooring, damp-proofing, roofing and stairs

Course Outlines:

1. **Bricks, Blocks and Tiles:** Manufacture of bricks and blocks and its classifications, standard tests of bricks and blocks and characteristics of good bricks and blocks, process of manufacture of tiles. Ceramic materials
2. **Stones:** Characteristics of good quality stones, dressing of building stones, properties and uses of common construction stones used in Pakistan. Location of stone queries in Pakistan
3. **Aggregate:** Properties of aggregates for Roads, Railways and Concrete , Los Angeles Abrasion Test, crushing strength, gradation, soundness test for aggregates
4. **Water, Lime, Cement & Timber:** Qualities of water used for concrete mixes. Tests and uses of lime. Methods of manufacture and storage of cement in different conditions. Classification and grading of sand and its bulking, cement sand mortars used for building construction. Characteristics, properties and performance of Pakistani timber used in constructions. Seasoning and preservation of wood. Use of plywood, hard board and chipboard in constructions
5. **Paints and Varnishes:** Types of paints, Composition, preparation and application of paints, varnishes and distempers in building works
6. **Metals:** Characteristics and uses of Ferrous and non- Ferrous metals and their alloys. Composition and uses of mild steel, and aluminum in buildings
7. **Glass and Plastics:** Varieties, properties and uses of glass, plastics. Properties and uses of asphalt, bitumen, rubber, asbestos and its products, plastic pipes .
8. **Masonry:** Bonds in brick masonry and their formation in building construction, Scaffolding and its importance in construction work. Columns, lintels and slab construction in buildings

9. **Construction:** Foundation for walls and piers. Load bearing walls in brick and masonry construction, composite walls cavity construction, concrete framed structures panel walls, Reinforced concrete materials in roof and floor construction, Damp proofing of walls and ceiling. Fire resistant construction. Cofferdams construction

List of Practicals:

1. Practicing hand tools for construction
2. Standard consistency test of cement.
3. Formation of different brick bonds
4. Formation of Standard sizes of blocks.
5. Determination of water absorption of a brick.
6. Determination of efflorescence of brick.
7. Determination of compressive strength of brick and block.
8. Determination of moisture content of wood.
9. Determination of specific gravity of wood.
10. Determination of fineness of Cement.
11. Determination of fineness modulus of various sands.

Recommended Books:

1. R. C. Smith and C. K. Andres, "Materials of Construction", McGraw Hill. January 1987 (Latest Edition)
2. Edward B. Allen, "Fundamental of Building Construction: Material and Methods" (Latest Edition)
3. McKay, "Building Construction Vol. I to Vol. IV" (Latest Edition)
4. Mitchell, "Building Construction" (Latest Edition)
5. Huntington, "Building Construction" (Latest Edition)
6. Neil Jackson, "Civil Engineering Materials" (Latest Edition)
7. P. D. Domone, "Construction Materials", University College, London (Latest Edition)
8. Z. H. Syed, "Materials of Construction" (Latest Edition)

APPLIED MECHANICS

Course Code: CT-121

Credit Hours: 3 + 1

Course Outlines:

Introduction to Statics: Mechanics: Basic concepts, Scalar and vector, Vector addition, subtraction and product, concept and unit of measurements of mass, force, time, space

Force System: Force: Introduction, Two-dimensional force system, Rectangular components, Law of triangle, parallelogram, moment, couple, resultants, solution of problems

Equilibrium: Equilibrium in two dimensions, Equilibrium conditions, Free body diagram, solution of problems

Beams: Definition, Types of beams, Bending moment and shearing force in simply supported beams and cantilevers, Solution of problems

Geometrical Properties of Plane Area: Introduction, Center of gravity and centroid, Moment of inertia for an area, Parallel-Axis theorem for an area, Radius of gyration of an area, Solution of problems

Kinematics of Rectilinear and Curvilinear Motion: Introduction, Displacement, Types of motion, Speed, velocity, acceleration, Equation of motion under uniform acceleration, Normal and tangent acceleration, Solution of problems.

Friction: Introduction, Types of friction, Laws of solid friction, Co-efficient of friction, Solution of problems.

Work and Energy: Work, Energy, Power, Impulse, Momentum, Simple harmonic motion and free vibration. Introduction to simple trusses and cables, Solution of problems

List of Practicals:

1. To determine the resultant of forces.
2. To study the law of moment and equilibrium conditions.
3. To determine the reaction of a simply supported beam.
4. To determine the tension in the simple cable.
5. To determine the reaction of a simply supported truss.
6. To determine the forces in the member of the truss.
7. To draw the shear force and bending moment diagram for one, two and three point load given in experiment no.3.
8. To study the projectile motion.

Recommended Books:

Hibler, RC, "Engineering Mechanics", Prentice Hall

CONCRETE TECHNOLOGY

Course Code: CT-122

Credit Hours: 3 + 1

Objectives:

1. To develop an understanding of the composition and behavior of plain and reinforced concrete.
2. To understand various methods of proportioning of constituent materials for a required concrete quality.
3. To analyze the problems of transportation, pouring, bleeding of concrete.
4. To understand methods of curing and compaction and factors affecting strength of concrete.
5. To know the benefits of testing of concrete and to understand the procedure of quality control.

Course Outlines:

1. **Concrete Properties and Its Behavior:** Properties of aggregates, cement and concrete, properties of fresh and hardened concrete, strength, elastic behavior, shrinkage and creep and durability to chemical and physical attacks. Methods

of testing concrete cylinders and cubes in compression. Effects of impurities in water and in aggregates on the performance and durability of concrete. Effect of water/cement ratio upon workability and strength of concrete.

2. **Mix Design:** Introduction to concrete cubes and cylinders. Design mix and the effect of varying proportions of the component parts. Procedure for design of concrete mix (ACI, British Standard Specifications). Laboratory and site testing for assessing the quality, performance and strength of a design mix
3. **Properties of Concrete:** Field practices and quality control, temperature, shrinkage, creep and fatigue, modulus of rupture, light weight, normal weight and heavy weight concrete, additives and admixtures, durability and workability of concrete, underwater concreting, prefabrication of concrete.
4. **Pre-stressed Concrete:** Materials and their properties; Pre stressing system and anchorages; Losses of Prestress; Design of simple beam for flexure; methods of prestressing.

List of Practicals:

1. Preparation of a cement paste of Standard Consistency.
2. Determination of Initial and Final setting time of cement.
3. Determination of the consistency of a freshly mixed concrete through slump Test.
4. Determination of the Workability of a freshly mixed concrete through compacting factor test.
5. Determination of the compressive strength of concrete cube.
6. Determination of the compressive strength of concrete cylinder.
7. Comparison of cube and cylinder strength.
8. Test on modulus of rupture on beam specimens.
9. Determination of Aggregate Impact Value.
10. Sieve analysis of coarse aggregate.
11. Sieve analysis of fine aggregate.
12. Determination of fineness modulus of coarse and fine aggregate from different sources.

Recommended Books:

1. M. Neville, "Properties of Concrete", Wiley John & Sons. (Latest Edition)
2. H. Nilson, "Design of Concrete Structures", McGraw Hill. (Latest Edition)

Surveying

Course Code: CT-123

Credit Hours: 2+2

Objective:

1. To develop an understanding of surveying & leveling theory and practice
2. To develop an ability to translate survey information for design and construction purposes
3. To develop a skill in the use of survey instruments

Course Outline:

1. **Survey Instruments:** Study and use of conventional surveying instruments

and EDM devices

2. **Triangulation and Traversing:** Selection of station base line measurement, computations, adjustment, plotting and detailing of triangulation. Introduction and use of Total station. Introduction to GPS
3. **Leveling:** Introduction to leveling, precise leveling, profile leveling. Errors and correction in leveling, plotting long sections and cross-sections, Trigonometrical leveling and contouring
4. **Techeometry:** System of techeometry, applications of techeometer in surveying, computation of horizontal and vertical measurements
5. **Setting Out Works:** Setting out curves (horizontal and vertical), demarcation for buildings, bridges, sewer lines, route lines and tunnels
6. **Hydrographic Surveying:** Introduction to hydrographic surveying and instruments, sounding methods
7. **Astronomy:** Introduction to true north, latitude, longitude and time.

List of Practicals

1. To acquaint with the minor instruments
2. Study and use of conventional instruments & EDM surveying instruments
3. Temporary and permanent adjustment of level and theodolite
4. Plotting contour map of an area
5. Traversing of an area by theodolite and total station
6. Leveling and computation by collimation method and rise and fall method
7. Triangulation by theodolite
8. Setting out of Simple Circular Curve by chain and tape using method of offsets from long chord
9. Setting out of Simple Circular Curve by chain and tape using method of offsets from the Tangents
10. Layout of a Building using Tape

Recommended Books:

1. R. E. Davis, J. Anderson, F.S. Foote, "Surveying Theory and Practice", McGraw Hill (Latest Edition)
2. Jack C. McCormac, "Surveying"(Latest Edition)
3. R. H. Wirshing, Roy Wirshing, James R. Wirshing, "Schaum"s Outline of Introductory Surveying" (Latest Edition)
4. Barry F. Kavanagh, "Surveying: With Construction Applications", Prentice Hall. (Latest Edition)
5. David Clark, "Plane and Geodetic Survey Vol. I and II", Trans-Atlantic Publications. (Latest Edition)
6. T.P.kanetker, "Surveying and Leveling"

Communication Skills-II

Course Code: HU-124

Credit Hours: 2

Course Outline:

Communication Environment: Organizational Structure, International Communication, Nondiscriminatory Communication, Communication Channels.

Communication and Technology: Presentation Graphics and Word Processing, Fax, E-mail, Internet and Voice Mail, CD-ROM and Online Databases, Teleconferencing, Audio Visual Aids.

Presentation Skills: Defining objective, audience analysis, style and tone, credibility, opening, closing and main ideas, use of Audio Visual Aids.

Meetings and Interviews: Participating in Meetings, Chairing a Meeting, Asking and Answering Questions in Meetings, Preparing Resumes, Preparing for Interviews, Asking and Answering Questions in Interviews.

Letters and Memos: Formats, Positive and Negative Messages, Persuasive Communication, Requests.

Technical Report Writing: Introduction and Importance, General Formats, Short and Long Reports, Proposals, Quoting References.

Recommended Books:

1. Murphy H. A., Hildebrandt, H. W. and Thomas J.P., "Effective Business Communications", McGraw Hill USA
2. Morrissey G.L., Sechrest T.L. and Warman W.B., "LOUD AND CLEAR", Addison-Wesley Publishing Company, USA
3. Beebe S.A. and Beebe S.J., "PUBLIC SPEAKING", Allyn and Bacon, USA.

Applied Mathematics-II

Course Code: HU-211

Credit Hours: 3

Objective:

To develop an understanding of the knowledge/skill of Mathematics and to apply these in engineering problems

Course Outline:

1. **Differential Calculus:** Concepts of limit and continuity, review of ordinary differentiation. Partial differentiation. Chain rules. Taylor and McLaurin's series. Power series expansions of elementary functions
2. **Integral Calculus:** Integration as reverse process of differentiation, techniques of integration. Definite integral
3. **Application of Differentiation:** Differentials. Small increments and error estimates. Linearization. Maxima and minima. Optimization in physical problems. Curvature
4. **Application of Integration:** Area between curves, volume of solids, length of arc and area of surface of revolution. Theorems of Pappus and Guldinus. Centroid; momentum. Moment of inertia. Theorems of parallel and perpendicular axes. Mean and root mean square values
5. **Differential Equations:** Classification of differential equations. First order differential equation. Separable, homogeneous, exact, linear, 2nd order linear differential equation. Methods of undetermined coefficient and variation of parameters. Higher order differential equations. Applications to physical and

engineering problems

6. **Matrices:** Algebra of matrices. Systems of linear equations. Eigenvalues and eigenvectors. Singularity. Algebra of complex numbers. Complex plane. D'Moiver's theorem. Hyperbolic functions. Complex elementary functions. Differentiability

Recommended Books:

1. Kreyszing E, "Advanced Engineering Mathematics", John Wiley and Sons, USA (Latest Edition)
2. Thomas G. B. and Finney R. L, "Calculus and Analytic Geometry" (Latest Edition)
3. Cohen H. L, "Mathematics For Scientists And Engineers", Prentice-Hall, UK (Latest Edition).

Theory of Structures

Course Code: CT-212

Credit Hours: 3 + 1

Objective:

1. To develop the understanding of the behavior of determinate structures with reference to beams and frames
2. To provide the concept of statically indeterminate structures illustrating their application to structures like beams, trusses and rigid frames
3. To understand the behavior of arches and suspension cables

Course Outline:

1. **Determinacy of Structures:** Static stability and determinacy of structures
2. **Analysis of Determinate Structures:** Common types of trusses, analysis of truss by method of joints. Analysis of frames, Arches, Cables and Suspension bridges
3. **Moment Distribution Method:** Concept, stiffness and carry-over factors, distribution factors, analysis of continuous beams and frames without sidesway
4. **Influence Lines:** Concept of influence lines, influence line diagrams for statically determinate beams and its application. Maximum shear force and bending moment for moving loads
5. **Rotation and Deflection:** Rotation and deflection of beams by Unit Load Method, Moment- Area Method and Conjugate beam method
6. **Beams and frames under complex loading:** Bending moment and shear force diagrams for statically determinate beams and frames under complex loading

List of Practicals

Practicing problems for beams, frames, cables suspension bridges and trusses

Recommended Books:

1. C. K. Wang, "Statically Indeterminate Structures", McGraw Hill (Latest Edition)

2. Yuan-Yu Hsieh, "Elementary Theory of Structures", Prentice Hall, Inc. (Latest Edition)
3. Timoshenko, "Theory of Structures", McGraw Hill (Latest Edition)
4. H. I. Laursen, "Structural Analysis", McGraw Hill (Latest Edition)
5. J. C. McCormac, "Theory of Structures", Harper & Colins Publishers (Latest Edition).

Fluid Mechanics

Course Code: CT-213

Credit Hours: 3 + 1

Objective:

1. To provide a broad concept of fluid mechanics.
2. To enable students to solve problems relating to pipe flow and open channel flow.

Course Outline:

1. **Introduction:** Applications of fluid mechanics. Units and dimensions
2. **Physical Properties of Fluids:** Density, specific weight and specific gravity. Viscosity. Newton's law of viscosity
3. **Fluid Statics:** Pressure. Absolute and gauge pressure. Measurement of pressure, Piezometer, manometer, differential manometer and bourdon gauge. Buoyancy, Metacentre and Metacentre height.
4. **Fluid Kinematics:** Basic concepts from steady and unsteady flow. Laminar and turbulent flow. Uniform and non-uniform flow. Velocity and discharge. Continuity equation
5. **Hydrodynamics:** Different forms of energy in a flowing liquid, Energy head, Bernoulli's equation and its applications
6. **Flow Measurement:** Measurement of velocity. Pitot tube. Measurement of discharge through orifices, notches, weirs and venturimeter
7. **Steady Flow Through Pipes:** Darcy Weisbach equation for flow in pipes. Hazen William's formula. Losses in pipelines, hydraulic grade lines and energy lines
8. **Uniform Flow in Open Channels:** Chazy's and Manning equation. Most efficient economical rectangular and trapezoidal sections

List of Practicals

1. Determination of viscosity of a given liquid using viscometer
2. Determination of velocity through Pitot tube
3. Determination of coefficient of discharge using venturimeter
4. Determination of coefficient of discharge of the orifices
5. Determination of coefficient of discharge using rectangular notch
6. Determination of discharge using V-notch
7. To investigate the validity of the Bernoulli's equation for steady flow of water.

Recommended Books:

1. N. B. Webber, "Fluid Mechanics for Civil Engineers", Chapman & Hall, (Latest Edition)

2. Dougherty, Franzine and Fennimore, "Fluid Mechanics with Engineering Applications", McGraw Hill, New York (Latest Edition)
3. J. A. Fox, "An Introduction to Engineering Fluid Mechanics", Macmillan Company (Latest Edition)
4. B. S. Massey, Wan Nost, "Mechanics of Fluids", Reinhold International Rand hold Company Ltd., London (Latest Edition)
5. J. W. Ireland, "Mechanics of Fluids", Bulterworth & Company, London (Latest Edition).

Mechanics of Materials

Course Code: CT-214

Credit Hours: 3 + 1

Objective:

1. To develop an understanding of analysis of the magnitudes and distribution of internal forces in the body by the concept of free body diagram under external loads
2. To calculate the shearing force and bending moment in simply supported and cantilever beams
3. Understanding of equilibrium conditions

Course Outline:

Simple Stress & Strain: Kind of stresses and strain, Hook's law, Modulus of elasticity, Lateral & Volumetric strain, Poison's ratio, Load extension diagrams for different materials, Temperature stresses and compound bars

Principle Stress & Strain: Construction of Mohr's circle for stress & strain

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

Slope and Deflection of Beams: Relation between slope deflection and radius of curvature. Slope and deflection of a beam using Integration method

Strain Energy: Strain energy due to direct loads, shear force, bending moment and torque. Stresses due to impact load

Transfer of Torque in Structural Member: Theory of torsion in circular shafts. Derivation of torsion equation and its application to solid and hollow circular cross-section. Sources of torsion in structures

Columns and Struts: Behaviour of short and long columns. Euler's theory of buckling of long columns and other empirical formulae

List of Practicals

1. To perform tensile test on a mild steel specimen and to determine yield strength, ultimate strength, rupture strength and percentage elongation
2. Hardness test on a given metal specimen using Avery's Rockwell testing machine
3. To perform the Izod Impact Test for the given metals
4. To perform the Charpy's Impact Test for the given metals
5. To determine shear strength of a half-inch dia steel bar
6. To determine the modulus of elasticity of the material of given rectangular

- beam
7. To determine modulus of rigidity of the material of given specimen with circular cross-section
 8. To perform Bending test on wooden beam

Engineering Geology

Course Code: CT-215

Credit Hours: 2

Objective:

To understand geology or various minerals and rocks and their properties
To learn to select proper site for civil engineering structures

Course Outline:

1. Introduction. Introduction to Geology. Importance of Geology in civil engineering projects. Sedimentary, igneous and metamorphic rocks. Volcanic activity. Internal structure of the Earth. Engineering and physical properties of rocks. Identification of common rock forming minerals Classification of Rocks and Minerals. Colour of grain with respect to rock colour Chart of Geological Society of America. Identification of grains (coarse, medium and fine) of sedimentary rocks. Hardness classification (very soft, soft etc) with respect to simple field tests and uniaxial compression strength. Identification of rocks by megascopic studies. Identification of subordinate constituents in rock samples
2. Structural Geology. Introduction to structural Geology and plate tectonics. Causes and effects of earthquakes. Protective measures against earthquakes. Sequence and principles of stratigraphy, earthquake zoning for Pakistan. Land-sliding and its causes
3. Hydrogeology: wells, springs, streams and ground water conditions. Causes of glaciers and their types.
4. Geology in Civil Technology. Role of geology in selection of sites for dams, reservoirs, tunnels and other important civil engineering structures, such as highways, airfield and bridges
5. Ground subsidence: Mining subsidence due to alteration of fluid levels. Methods of avoiding mine collapses. Introduction to blasting. Engineering geology of tunnels, geological survey prior to tunneling, lining of tunnels and its section. Selection of tunnel site and its requirements, case histories, brief introduction to local geology

Recommended Books:

1. Blyth, F G H, "A Geology for Engineers", 7th Arnold International student edition
2. Legget, R F, "Geology and Engineering", 3rd edition McGraw Hill International edition
3. Krynine, D Pm "Principles of Engineering Geology and Geotechniqcs", 1st Edition McGraw Hill International edition.

Soil Mechanics

Course Code: CT-221

Credit Hours: 3 + 1

Objective:

1. To develop a basic understanding of the composition, classification, structure and properties of soils
2. To obtain knowledge of application of soil mechanics in civil engineering works
3. To acquire the laboratory skills for determination of soil properties

Course Outline:

1. **Introduction:** Definition, role of Soil Mechanics in design and construction of Civil Engineering projects. Soil formation, principal soil deposits. Soil structure and texture
2. **Index Properties of Soil & Soil Classification:** Principle properties of soil (natural moisture content, density, specific gravity, void ratio, porosity, degree of saturation). Volumetric and volume weight relationships. Index properties of soil (Grainsize distribution, consistency limits). Purpose of soil classification, engineering soil classification systems (ASTM or USCS, AASHTO)
3. **Permeability & Seepage:** Definition, scope, Darcy's law, laboratory and field methods of determining permeability, seepage, seepage control, filters
4. **Stresses in Soil:** Geostatic stresses, total and effective stresses, stress from surface loads. Lateral stress, Stress influence charts/diagrams and their uses
5. **Compressibility & Shear Strength:** Definitions, consolidation, consolidation test and data reduction, naturally consolidated clayey and partially consolidated clayey soils, settlement and rate of settlement. Shear strength of soil, Coulomb's law, shear strength parameters (c & ϕ), cohesive and non-cohesive soils. Laboratory and field evaluation of (c & ϕ). Utility of shear strength parameters
6. **Compaction & Ground Improvement:** Moisture density relationship, laboratory and field compaction methods. Compaction control during construction, factors affecting compaction, ground improvement techniques – dynamic compaction, pre-loading, vibrator
7. **Site Selection and Exploration:** Scope and objective, exploration methods, field tests (SPT, CPT, Plate load Test, Pressure meter, Dilatometer Test)

List of Practicals

1. Determination of moisture content of a soil sample
2. Determination of Liquid limit of a soil sample
3. Determination of Plastic limit of a soil sample
4. Determination of Shrinkage limit of a soil sample
5. Determination of Specific Gravity of a soil sample
6. Determination of Grain size distribution of a Fine Grain Soil by Hydrometer Analysis
7. Proctor's compaction test and modified compaction test
8. Direct shear test of a soil sample
9. Unconfined compression test of a soil sample. 12- Determination of Field density

10. Tri-axial compression test of a soil sample. 14- Consolidation test of a soil sample.

Recommended Books:

1. M. S. Qureshi & Aziz Akbar, "Fundamentals of Soil Mechanics", A-1 Publishers, Urdu Bazar, Lahore. (Latest Edition)
2. A. R. Jumikis, "Soil Mechanics" (Latest Edition)
3. D. W. Taylor, "Fundamental of Soil Mechanics" (Latest Edition)
4. T. W. Lambe, Robert V. Whitman, "Soil Mechanics" John Willey & Sons. (Latest Edition)

Highway and Transportation Engineering

Course Code: CT-222

Credit Hours: 2 + 1

Objective:

1. To develop an understanding of the fundamentals of highway geometry and to apply it in the design of Highways & Railways
2. To produce an ability to use the survey works in the development of layouts of Highways & Railways

Course Outline:

1. **Road Standards:** NHA, AASHTO and Road Note 31, recommendations for the design of roads regarding:
 - i. Design parameters.
 - ii. Cross-sectional elements of roads such as lane widths, shoulder widths, median widths, edge clearance, ROW (right of way) requirements, sight distances
 - iii. Road layout parameters
 - iv. Road camber gradient and super levation
 - v. Vertical and horizontal alignment of road
2. **Geometric Design:** Geometric aspects of highways, design of transportation facilities based on operational capacity, site constraints and safety considerations. Layout of circular transition and vertical curves. Traffic surveys for design and improvement of roads
3. **Intersections:** Factors influencing the layout of junctions and design of islands, provision of junctions on single carriageway and dual carriageway sites. Parking spaces, underpasses, motorways, flyovers, motorway intersections. Widening of roads on curves
4. **Road Drainage and Protection:** Surface and sub-surface road drainage, camber and grade for highways surface drainage and proper sub-grade for sub-surface drainage, drainage structures of the required capacity for cross drainage
5. **Airports:** Factors affecting site selection and layout of airport with respect to geographical, aeronautical, socio-political and economical conditions. Wheel loads of different aircrafts. Introduction to pavements and typical cross-sections. Introduction to layout of airport buildings

6. **Railways:** Track structure, railway alignment & grades, cross-section of railway tracks & their laying, points, crossing and level crossing. Modern method of laying railway tracks. Railway organization in Pakistan.

List of Practicals

1. Drawing of roads and railway in cuttings and fillings
2. Exercises in drawing layouts of intersections and islands
3. Exercises to calculate the quantities of materials required for various types of pavements and various sections of highways
4. Drawing sheet showing plans and profile of a road
5. Drawing sheet showing general layout of airport buildings
6. Detail drawings of different rail fastenings
7. Exercises for provision of transition curves and re-alignments of curves.

Recommended Books:

1. C. H. Oglesby, Russell G. Hicks, "Highway Engineering", ISBN: 047102936X. John Wiley & Sons. January 1982 (Latest Edition)
2. AASHTO Staff, "A Policy on Geometric Design of Highways & Streets", ISBN: 1560510013. January 1990 (Latest Edition)
3. Baker, "Hand Books of Highway Engineering" (Latest Edition)
4. S. K. Sharma, "Railways, Bridges and Tunnels" (Latest Edition)
5. Roads, Railways, Bridges and Tunnels by Deshpande Antia and Shahna (Latest Edition)
6. Highway Design Manual, Highway Department, Govt. of the Punjab (latest edition).

Quantity Surveying and Contract Document

Course Code: CT-223

Credit Hours: 3

Objective:

1. To develop an ability to measure construction works in an orderly manner
2. To develop a systematic approach of cost estimation of a construction job
3. To develop an understanding of preparing of contract documents and managing/execution of civil engineering works

Course Outline:

1. Earth Work Quantities: Working out earthwork quantities for various civil engineering constructions. Calculating quantities for road embankments in plain and hilly areas and for irrigation channels
2. Rate Analysis: Scheduled and non-scheduled rates. Analysis of rates, abstract of costs. Significance of rate analysis and its application to market rates of material and labor. Rate analysis for various items of civil engineering works
3. Cost Estimates: Systematic and logical approach to the estimating and costing of civil engineering works, rough cost & detailed estimates, bill of quantities and part bills for construction, costs and profit margins to be considered in the cost estimates. Estimates for roads, buildings, reservoirs, water supply, drainage projects, steel works and bridge construction. Estimates using

- computer spreadsheets
4. **Contract Documents:** Introduction to work contracts and tendering. Types of contracts. Requirements of a specific contract, drawings necessary for a contract and those required during the execution of work. Tender documents, construction specifications, bill of quantities and other setting out data required for a contract. Time scheduling of different construction activities for the execution of the projects. General conditions of contract and special conditions of contract. Safety and control aspects required in the execution of the contract
 5. Introduction of different planning commission performas and measurement books
 6. Labour output, incentives and laws.

Recommended Books:

1. R. L. Peurifoy, "Estimating Construction Costs", McGraw Hill. (Latest dition)
2. Daniel and W. Mead, "Contract Specifications" (Latest Edition)
3. H. Adeli and A. Karim, "Construction Scheduling, Cost Optimization and Management" (Latest Edition)
4. MES/Pak PWD Schedule of Rates (Latest Edition)
5. WAPDA Drafting Standards (Latest Edition).

Material Testing Repair and Maintenance

Course Code: CT-224

Credit Hours: 2

Objective:

1. To know about the failure of building structures and their measures
2. To understand the rules and regulations of maintenance

Course Outline:

Material Testing: Destructive and Non-destructive test, Mechanical properties, Method of testing of Fatigue test, impact and hardness test, tensile test and mild steel specimen.

Repair and Maintenance of Civil Works: Introduction to different types of failures in building structures and their causes, Assessment of damage by different methods including non- destructive methods, Introduction to Rules and Regulations of Maintenance, Repair and Maintenance Measures.

Recommended Books:

1. S.K.Sharma, "Building Construction"
2. Different Practicing Codes used in different department of Civil Works like (P & D, PWD etc).

Hydrology

Course Code: CT-225

Credit Hours: 2

Objective:

1. To provide a broad concept of basic hydrology
2. To enable students to calculate surface runoff and ground water flows

Course Outline:

1. **Introduction:** Definition and significance of hydrology. The hydrologic cycle and hydrologic equation
2. **Meteorology:** Atmosphere and its composition. Measurement of air temperature, relative humidity, radiation, sunshine and atmospheric pressure
3. **Precipitation:** Types and measurement of precipitation. Rain gauges, Variations in precipitation. Computation of average precipitation
4. **Evaporation and Transpiration:** Factors affecting evaporation, Determination of evaporation. Evapotranspiration and potential vapo transpiration. Variations in evapotranspiration and transpiration
5. **Stream Flow:** Units of measurement. Water stage and its measurement. Site selection for water stage. Selection of control and metering section. Methods of measurement of stream flow. Stream flow and its measurement
6. **Runoff:** Factors affecting storm runoff. Methods of estimating storm runoff. Introduction to unit hydrograph. Rational method for calculation of runoff. Introduction to low flow and flood flow frequency. Frequency- duration analysis, Introduction to intensity-duration-frequency function for precipitation
7. **Groundwater Flow:** Zones of underground water. Water table Sources of groundwater. Types of aquifers. Various types of wells. Equilibrium equations for flow of water into wells. Tubewell and its components. Borehole pumping test. Development of tubewells

List of Practicals

1. Determination of velocity and discharge using current meter
2. Determination of velocity and discharge using floats
3. Study of the barometer
4. Study of the rainfall gauge
5. Measurement of wind velocity
6. Measurement of humidity
7. Measurement of atmospheric temperature

Recommended Books:

1. Linsley, Kohler and Paulhus, "Hydrology for Engineers", McGraw Hill, New York, 1982 (Latest Edition)
2. Chow, "Handbook of Applied Hydrology", McGraw Hill, New York (Latest Edition)
3. Viessman, Lewis and Knapp, "Introduction to Hydrology", Harper and Row, New York (Latest Edition).

Irrigation and Hydraulic Engineering

Course Code: CT-311

Credit Hours: 3 + 1

Objective:

1. To apply the understanding of fluid mechanics in the analysis & design of hydraulic structures
2. To develop an understanding of irrigation resources and apply for head works & barrages

Course Outline:

1. **Non-Uniform Flow:** Non-uniform flow and its variation with the slope of bed and shape and size of cross-section. Energy equation for gradually varied flow
Hydraulic jump
2. **Unsteady Flow:** Types of unsteady flow, water hammer, rate of discharge under varying head, compressible fluids in pipes
3. **Hydraulic Similitude:** Geometric, kinematics and dynamic similarities, physical and numerical models
4. **Hydraulic Turbo Machines:** Impulse and reaction turbine. Hydraulic pumps (centrifugal and reciprocating), characteristics, Types and working with special reference to deep wells. Selection of pumps
5. **Irrigation and Irrigation Structures:** Resources of irrigation and discharge measurements. Theories of channel design, lining of channels. Silt control in irrigation canals, silt ejection and uniform distribution. Types of outlets and construction of falls, weirs and barrages, canal head regulator. Canal alignment and cross drainage structures. Types of cross drainage works
6. **Irrigation Storage Works:** Review of river regulation, reservoir, operation and silting of reservoirs. Analysis and design of gravity dams
7. **Water Logging and Drainage:** Soil salinity, water logging their environmental impact & assessment. Introduction to Drainage and Drainage system

List of Practicals

1. Design of channels in alluvial soil
2. Study of canal fall
3. Study of outlet
4. Study of a barrage on pervious foundation
5. Determination of loss of total head in converging and diverging flow
6. Measurement of velocity with pitot tube in a closed conduit
7. To determine the discharge in orifice under varying head
8. Study of Hydraulic Jump
9. To study flow channel (by Hydraulic Bench)
10. To study flow over weir (by Hydraulic Bench)

Recommended Books:

1. Dr. Iqbal Ali, "Irrigation and Hydraulic Structures (Theory, Design and Practice)", Institute of Environmental Engineering & Research, NED University of Engineering & Technology, Karachi (Latest Edition)
2. Iqtidar H. Siddiqi, "Irrigation Canals" (Latest Edition)
3. V. B. Piryani, "Fundamentals of Irrigation Engineering"(Latest Edition)

Course Outline:

Introduction: Steel properties, design loads and load factors; Types and shapes of structural steel members; specifications and design codes, safety factors

Tension members: Design and analysis of tension member

Flexural members: Design of laterally supported and unsupported beams; deflection check

Compression members: Design and analysis of axially and eccentrically loaded short and long columns

Connections: Types of high strength bolts and rivets; Friction and bearing type connections; Continuous beam to beam and beam to column connection

New Design Codes: Introduction to LRFD method (load resistance factor design)

Recommended Books:

1. Z. A. Siddiqi, M. A. Chaudhry and M. Ashraf, "Steel Structures", Civil Engineering Series Publishers (Latest Edition)
2. Z. A. Siddiqi, M. A. Chaudhry & M. Ashraf, "RFD Steel Design Aids in SI Units", Civil Engineering Series Publishers
3. Jack C. McCormac, "Structural Steel Design LRFD Method (Second Edition)", Harper Collins Publishers. ISBN: 0065016270. January 1994
4. E. H. Gaylord, C. N. Gaylord, "Design of Steel Structures", McGraw Hill, 1991
5. Charles G. Salmon, John E. Johnson, "Steel Structures Design & Behavior"
6. Fredrick S. Merritt, "Structural Steel Designers Handbook"
7. William T. Segui, "RFD Steel Design", PWS Publishers. ISBN: 053493353X. January 1993
8. John E. Lothers, "Design in Structural Steel"

Computer Aided Building Modeling and Design

Course Code: CT-314

Credit Hours: 0 + 1

Objective:

To enhance the capabilities of student to independently prepare the building drawings and develop an ability to analyze and design structures by commercially used computer packages

Course Outline:

Fundamentals of CAD: Introduction, the design process, application of computers for design, creating the manufacturing data base, benefits of CAD

Hardware in CAD: The design workstation, graphics terminal, operator input devices, plotters and other output devices, the central processing unit, secondary storage

Computer Graphics Software and Data Base: The software configuration of a graphics system, functions of a graphic package, constructing the geometry, data base structure and content, wire- frame versus solid modeling,

other CAD features and CAD/CAM integration

Mathematical Elements of CAD: Two dimensional transformations, Translation, Scaling, and Rotation, Concatenation, Various techniques for design optimization, finite element analysis / modeling

Design Software: Use of different software packages employed in several Civil Engineering applications

Water Supply & Waste Water Management

Course Code: CT-315

Credit Hours: 3 + 1

Objective:

1. To introduce basic concepts relating to the provisions of water supply and wastewater collection facilities
2. To enable students to design water supply and wastewater collection systems.

Course Outline:

1. **Introduction:** Water supply and wastewater collection systems and their importance with respect to human health. Water borne diseases. Types of impurities and their effects on human health standards, WHO standards
2. **Estimation of Water Demand:** Water consumption. Components of water consumption. Factors affecting consumption. Fire demand. Variations in demand: average daily consumption, maximum daily consumption and peak hourly consumption. Commonly used values of water consumption. Local design guidelines. Design period: factors affecting design period. Commonly used design period and local criteria. Population forecasting: mathematical and graphical methods of forecasting population. Population density
3. **Source of Water:** Ground and surface source. Selection of water sources with respect to quantity and quality considerations
4. **Collection and Distribution of Water:** Intake structure: reservoir, river and canal intakes. Methods of water distribution. Components and layout of water distribution system. Storage capacity of overhead reservoirs. Use of Hazen William formula for the design of water distributions systems. Hardy Cross method. Types of pipes and their use in water distribution. Pipe joints, service connection. Valves and fire hydrants. Construction of water distribution systems. Disinfections of old and new pipes. Waste water surveys and tracing of leakages. Pipes in series and parallel, head losses, major losses, minor losses
5. **Estimation of Wastewater Quantities:** General considerations. Classification of sewage and sewer systems. Combined and separate sewer systems. Estimation of sanitary sewage quantities. Estimation of storm flow: the rational method, runoff coefficients
6. **Design of Sewer Systems:** Layout of sewers. Sewer appurtenances: manholes, drop-manholes and storm water inlets. Design criteria for sanitary and storm sewers. Self-cleansing velocity. Use of Manning's Equation for the design of sanitary and storm sewers. Construction of sewers: types of beddings, joints and laying of sewers. Sewer testing. Sewer cleaning equipment

List of Practicals

1. Forecasting population of various cities using different methods
2. Detailed study of different types of valves
3. Detailed study of different pipe material and joints for water supply and sewerage
4. Design of a transmission main
5. Design of water distribution system for a housing scheme
6. Design of a sanitary sewer system
7. Design of storm sewer system
8. Preparation of drawings for different bedding of sewers
9. Preparation of working drawings for manholes, drop manholes and storm water inlets.

Recommended Books:

1. E. W. Steel and L. J. McGhee., "Water Supply and Sewerage", McGraw Hill, New York. 1979 (Latest Edition)
2. M. J. Hammer, "Water and Wastewater Technology", John Wiley & Sons. New York, 1986 (Latest Edition)
3. Metcalf and Eddy, "Wastewater Engineering: Collection and Pumping of Wastewater", McGraw Hill, New York, 1981 (Latest Edition)

Environmental Management

Course Code: CT-321

Credit Hours: 3 + 1

Course Outline:

1. Introduction to solid waste, classification of solid waste. Collection methods, transfer and transportation of solid waste, type of equipment, recycling, reuse and disposal of solid waste, BOD and COD
2. Air pollution: Introduction to air pollution, sources of air pollution, its effects, classification and control
3. Introduction to EIA functions of Environmental Pollution Council, role of provincial EPAs, Environmental Protection Act, 1977, National Environmental Quality Standards
4. Introduction to noise pollution and its mitigation measures
5. Environmental health and safety.

List of Practicals

1. To determine the Bio-Chemical Oxygen Demand of waste water sample
2. To determine the amount of suspended solids in drinking water and waste water sample by photometric method
3. To determine the amount of settleable solids in waste sample
4. To determine the turbidity of continuous flow by Low Range Turbidimeter
5. To determine the amount of volatile suspended solids (MLVSS) in waste water sample by gravimetric method
6. Determination of Oil and Grease by Partition-Gravimetric Method in wastewater
7. Determination of the impact of discharges on the surface water (river, canal etc)

8. Composition of solid waste (percentage)
9. Energy Value
10. Moisture content
11. Nox and Sox by hand meters
12. Carbon monoxide by hand meters.

Recommended Books:

1. Peavy, "Introduction to Environmental Engineering", McGraw Hill
2. Mckenze, "Environmental Engineering", McGraw Hill
3. IUCN, "Environmental Profile of Pakistan"
4. IUCN, "National Conservation Strategy"
5. ILO laws regulations

Introduction to Earth Quake Engineering

Course Code: CT-322

Credit Hours: 1

Objective:

1. To provide a fundamental understanding of causes responsible for occurrence of Earthquake.
2. To provide basic knowledge about the response of buildings when subjected to Seismic excitations
3. To identify the type of seismic damages in buildings
4. To provide knowledge about various methods of strengthening the building structure against earthquake

Course Outline:

Introduction, Earthquake magnitude & intensity, importance of ground conditions, Nature of seismic forces, Factors affecting the severity of seismic forces, Damping, response spectrum, Ductility, Resisting seismic forces, capacity design, Role of diaphragm, Bond beams, Collectors and ties, Shear walls, Braced frames, Moment resisting frames, Non-structural elements, Retrofitting its objectives, approaches & Techniques, seismic isolation, Dampers, Theory of plate Tectonics, Lumped mass and distributed mass, Single Degree of Freedom (SDOF) and Multiple Degree of Freedom (MDOF), Seismic waves

Recommended Books:

1. Pankaj Agarwal and Manish Shrihande, "Earthquake resistant design of structures", Prentice Hall of India
2. Andrew Charleson, "Seismic Design for Architects", ISBN: 978-0- 7506-8550-4

Project Management

Course Code: CT-323

Credit Hours: 2 + 1

Objective:

1. To learn the basic concepts of management
2. To understand the importance of productivity and related concepts
3. Introduction to project management and inventory management
4. Familiarization with human resource management

Course Outline:

1. **Introduction:** Management, Science or Art, History of Managements, Management Functions
2. **Organizational Structure:** Types of Organizations Organizational Hierarchy, Properties of Narrow and Wide Organizations
3. **Production Processes:** Types of Production, Scale of Production, Selection of Technology, Input Requirements, Capacity Utilization
4. **Productivity:** Basic Concepts, Classification, Quantitative Measurement, Productivity Improvement
5. **Project Management:** Properties of Projects, Project Life Cycle, Project Network Analysis, Resource Requirements, Monitoring and Control, Use of Computer
6. **Inventory Management:** Inventory Replenishment, Economic Lot Size, Re-order Point, Safety Stock Level, JIT, Use of Computer
7. **Human Resource Management:** Management Styles, Psychological Types, Recruitment and Training, Job Evaluation, Performance Appraisal, Motivation and Incentives

Recommended Books:

1. Babcock D. L., "MANAGING ENGINEERING AND TECHNOLOGY", Prentice Hall, UK (Latest Edition).
2. Zuberi M. H., "INDUSTRIAL MANAGEMENT", Rabbani Printing Press, Lahore (Latest Edition).
3. Bateman T. S. and Snell S. A., "MANAGEMENT: BUILDING COMPETITIVE ADVANTAGE", Times Mirror Higher Education Group, USA (Latest Edition)
4. Spinner M., "ELEMENTS OF PROJECT MANAGEMENT", Prentice Hall, UK (Latest Edition)

Engineering Economics

Course Code: CT-324

Credit Hours: 3

Objective:

1. To understand value and cost concepts
2. To acquire the knowledge and skills related to the application of time value for money

3. To acquire the knowledge and skills related to the application of costing, financing and risk
4. To acquire the knowledge and skills related to the application of depreciation, obsolescence and replacement factors

Course Outline:

1. **Value and Cost Concepts:** Terminology, The General Economic Environment Cost Driven Design Optimization
2. **Time Value for Money:** The Concept of Equivalence, Present Value, Future Value Uniform series, Discounted Cash Flow
3. **Applications of Money-Time Relationships**
4. **Cost/Benefit Ratio**
5. **Depreciation and Obsolescence**
6. **Costing:** Cost Factors, Product Cost and Selling Price Project Cash Flows, Absorption Costing, Marginal Costing, Breakeven Analysis
7. **Replacement Analysis:** Factors to be Considered, Economic Life of Asset, Comparison and Replacement
8. **Risk Analysis:** Sources of Uncertainty, Sensitivity Analysis, Optimistic-Pessimistic Estimates, Risk Adjustment
9. **Capital Financing:** Financing with Debt Capital, Financing with Equity Capital Leasing, Capital Allocation

Recommended Books:

1. DeGarmo E. P., Sullivan W. G., Bontadelli J. A. and Wicks E. M., "ENGINEERING ECONOMY", Prentice-Hall International, Inc., USA.
2. Morris C., "QUANTITATIVE APPROACHES IN BUSINESS STUDIES", Pitman Publishing, UK (Latest Edition)
3. Tung A. and Thomas P. A., "ENGINEERING ECONOMICS FOR CAPITAL INVESTMENT ANALYSIS", Prentice-Hall. UK (Latest Edition)
4. Horne J. C. V. and Wachowicz, Jr. J. M., "FUNDAMENTALS OF FINANCIAL MANAGEMENT". Prentice-Hall International, Inc., USA (Latest Edition)

Pakistan Studies

Course Code: HU-325

Credit Hours: 2

Objective:

1. Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
2. Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Outline:

1. Historical Perspective
 - a) Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah
 - b) Factors leading to Muslim separatism

- c) People and Land
 - i. Indus Civilization
 - ii. Muslim advent
 - iii. Location and geo-physical features.
- 2. Government and Politics in Pakistan Political and constitutional phases:
 - a) 1947-58
 - b) 1958-71
 - c) 1971-77
 - d) 1977-88
 - e) 1988-99
 - f) 1999 onward
- 3. Contemporary Pakistan
 - a) Economic institutions and issues
 - b) Society and social structure
 - c) Ethnicity
 - d) Foreign policy of Pakistan and challenges
 - e) Futuristic outlook of Pakistan

Recommended Books:

1. Burki, Shahid Javed. State & Society in Pakistan, The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. Pakistan Political Roots & Development. Lahore, 1994. Wilcox, Wayne. The Emergence of Banglades., Washington: American Enterprise, Institute of Public Policy Research, 1972.
5. Mehmood, Safdar. Pakistan Kayyun Toota, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
6. Amin, Tahir. Ethno - National Movement in Pakistan, Islamabad: Institute of Policy Studies, Islamabad.
7. Ziring, Lawrence. Enigma of Political Development. Kent England: WmDawson & sons Ltd, 1980.
8. Zahid, Ansar. History & Culture of Sindh. Karachi: Royal Book Company, 1980.
9. Afzal, M. Rafique. Political Parties in Pakistan, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
10. Sayeed, Khalid Bin. The Political System of Pakistan. Boston: Houghton Mifflin, 1967.
11. Aziz, K.K. Party, Politics in Pakistan, Islamabad: National Commission on Historical and Cultural Research, 1976.
12. Muhammad Waseem, Pakistan Under Martial Law, Lahore: Vanguard, 1987. Haq Noor ul. Making of Pakistan: The Military Perspective. Islamabad: National Commission on Historical and Cultural Research, 1993.

Foundations and Pavements

Course Code: CT-311

Credit Hours: 3 + 1

Objective:

1. To develop an ability of applying the layout and alignment parameters to the highway design and its construction
2. To develop an understanding of the design of rigid and flexible pavements
3. To understand the design of foundations

Course Outline:

1. FOUNDATIONS

- a) **Definitions:** Foundation, contact pressure, allowable bearing capacity, total and differential settlements, permissible settlement.
- b) **Foundation Types:** Shallow foundation, deep foundation. Choice of foundation, type and depth of foundation, foundation design requirements. Foundation design geotechnical design and structural design.
- c) **Shallow Foundation:** Types of shallow foundation, Design of Isolated and combined footing.
- d) **Deep Foundations:** Piles, caissons, piers, well foundation. Types of piles, pile capacity, pile group, proportioning of pile cap. Function of piles and their uses. Negative skin friction (down drag).
- e) **Lateral Earth Pressure:** Rankine's & coulomb's Theories of Lateral earth pressure; analysis of earth retaining structure, Types of retaining wall

2. PAVEMENTS:

- a) **Highway Loads:** Standard AASHTO loadings, local heavy vehicles, Axle loads, equivalent and design axle loads. Overview of new technologies involved in loads i.e. weight in motion.
- b) **Pavement Design:** Types of pavements for roads and Runways, Stresses in pavements, Principles underlying methods for the design of various elements of flexible and rigid pavements (AASHTO and British Standards) for highways and airports, materials for highways, development of subgrade, determination of subgrade reaction, CBR value of soil, construction equipment.
- c) **Construction Details:** Method of constructions of roadway and highway drainage. Relative merits and procedures. Climate and traffic effects, regulation and control of traffic, traffic signs, signals and pavement markings. Pavement management systems. Cold recycling and hot recycling techniques.

List of Practicals

1. Determination of "Flakiness Index" & "Elongation Index" of aggregates.
2. Test for angularity no. of aggregate.
3. Frictional properties of road surface.
4. Loss-Angeles Abrasion test on aggregate.
5. Determination of viscosity of a given binder using Englers Viscometer.
6. Specific gravity and water absorption test.
7. Penetration test on asphalt.
8. Ductility test on asphalt.

9. Determination of softening point of bitumen.
10. Determination of flash point of a sample of bitumen.
11. Determination of specific gravity of asphalt sample.
12. Marshall stability test.
13. Design problems.
14. Traffic surveys. .
15. CBR test.
16. Boring log with SPT values up to 30 ft.
17. Plate load test.

Recommended Books:

1. J. E. Bowles, "Foundation Analysis and Design", 5 McGraw Hill. ISBN: 0070068739. January, 1996. Edition
2. Ralph B. Peck, W.E. Hanson, "Foundation Engineering", Thomas H. Thornburn; John Willey & Sons, ISBN: 0471675857, January 1974
3. Michael. J. Tomlinson, "Foundation Design and Construction", Longman Publishing Group. ISBN: 058222697X. January 1996.
4. W. C. Teng, "Foundation Design", Prentice Hall. ISBN: 0133298051
5. John.N. Cernica, "Geotechnical Engineering: Foundation Design", John; Willey & Sons. ISBN: 0471308870. January 1994
6. E. J. Yoder and M. W. Witezak, "Principles of Pavement Design", ISBN: 0471977802, Wiley John & Sons. January 1975 (Latest Edition).
7. Yang H. Huang, "Pavement Analysis & Design" ISBN: 0136552757. January 1992 (Latest Edition).
8. Flexible Pavement Design and Management Materials Characterization, ISBN: 0309021286 (Latest Edition)
9. T. M. Matson, "Traffic Engineering", McGraw Hill. ISBN: 0070409102 (Latest Edition)
10. C. H. Oglesby, R. G. Hicks, "Highway Engineering", John Willey & Sons, ISBN: 047102936X. January 1982 (Latest Edition)
11. Flaherty, "Transportation Engineering"

Project

Course Code: CT-421

Credit Hours: 0 + 6

Objective:

To develop the ability of exercising the B-Technology program in the analysis and design of construction/highway projects

Course Outlines:

The project involves survey, analysis and design of Civil Engineering project. The student in close consultation with department faculty will complete the project using Library, Computer or Laboratory facilities. Progress reports and a comprehensive written report are required

Supervised Industrial Training

Course Code: CT-421

Credit Hours: 0 + 36

Objective:

1. To understand the Industrial Field and its System Implementation
2. To understand the basic factors involve in Industrial Based Systems.
3. To understand the basic functions & the applications of Systems and devices studied in theory.

Guidelines:

The students shall undergo Supervised Industrial Training (minimum duration of 36 Credit Hours)

The students are required to submit monthly Progress Report to the institute duly verified by their Industrial supervisor.

The institute is responsible to contact with all industrial supervisors to check the student's performance

At the end of the training, the students are required to submit a detailed report to the institute and undergo viva-voce examinations