

CURRICULUM
OF
CIVIL ENGINEERING

BS/BE
MS/ME

(Revised 2012)



HIGHER EDUCATION COMMISSION
ISLAMABAD

CURRICULUM DIVISION, HEC

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PREFACE

The curriculum of subject is described as a throbbing pulse of a nation. By viewing curriculum one can judge the stage of development and its pace of socio-economic development of a nation. With the advent of new technology, the world has turned into a global village. In view of tremendous research taking place world over new ideas and information pours in like of a stream of fresh water, making it imperative to update the curricula after regular intervals, for introducing latest development and innovation in the relevant field of knowledge.

In exercise of the powers conferred under Section 3 Sub-Section 2 (ii) of Act of Parliament No. X of 1976 titled “**Supervision of Curricula and Textbooks and Maintenance of Standard of Education**” the erstwhile University Grants Commission was designated as competent authority to develop review and revise curricula beyond Class-XII. With the repeal of UGC Act, the same function was assigned to the Higher Education Commission under its Ordinance of 2002 Section 10 Sub-Section 1 (v).

In compliance with the above provisions, the HEC undertakes revamping and refurbishing of curricula after regular intervals in a democratic manner involving universities/DAs, research and development institutions and local Chamber of Commerce and Industry. The intellectual inputs by expatriate Pakistanis working in universities and R&D institutions of technically advanced countries are also invited to contribute and their views are incorporated where considered appropriate by the National Curriculum Revision Committee (NCRC).

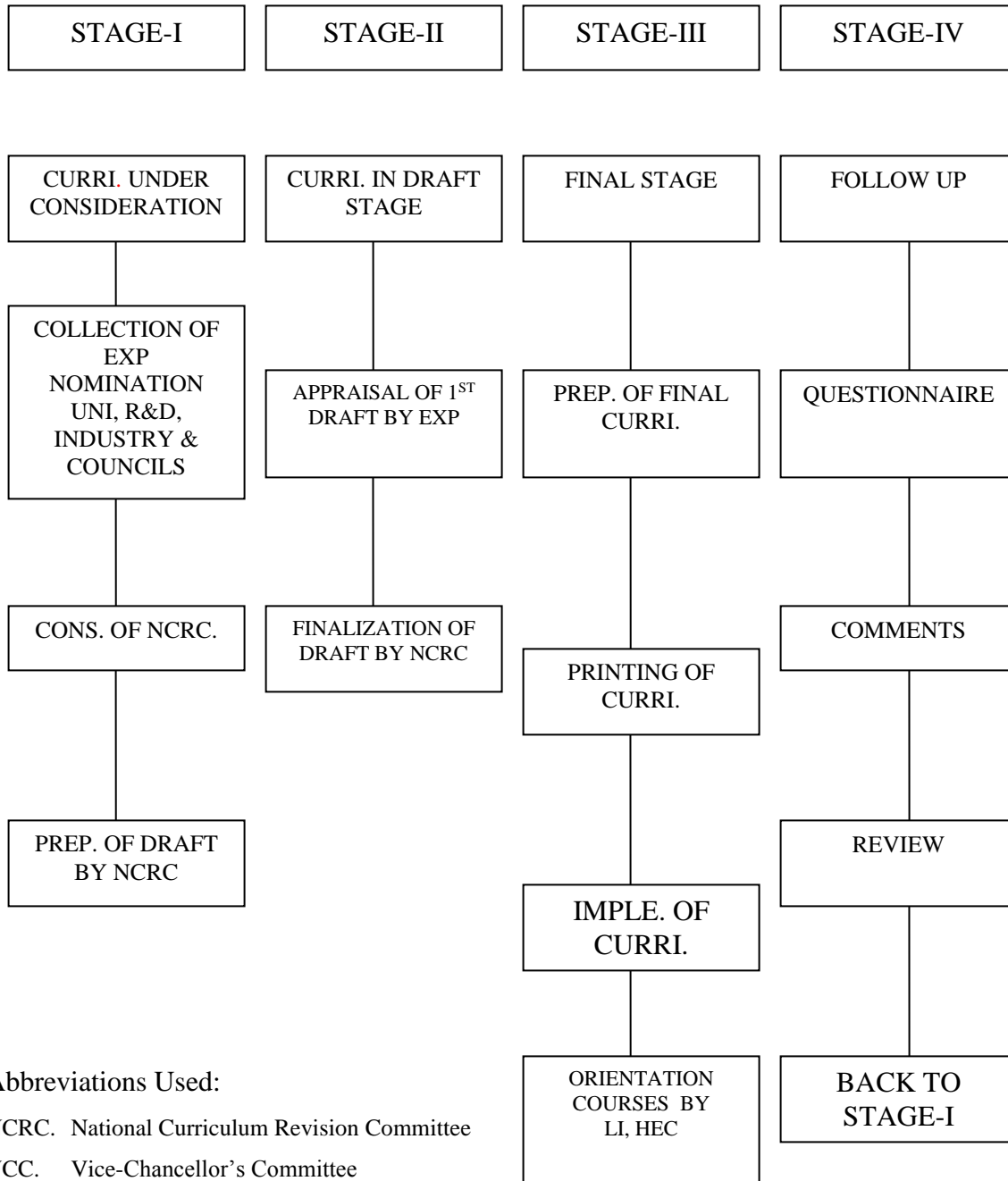
A committee of experts comprising of conveners from the National Curriculum Revision of HEC in Basic, Applied Social Sciences and Engineering disciplines met in April 2007 and developed a unified template to standardize degree programmes in the country to bring the national curriculum at par with international standards, and to fulfill the needs of the local industries. It also aimed to give a basic, broad based knowledge to the students to ensure the quality of education. The BS degree shall be of 4 years duration, and will require the completion of 130-136 credit hours.

In line with above, NCRC comprising senior university faculty and experts from various stakeholders and the respective accreditation councils has finalized the curriculum for Civil Engineering. The same is being recommended for adoption by the universities/DAs channelizing through relevant statutory bodies of the universities.

MUHAMMAD JAVED KHAN
Adviser (Academics)

April, 2012

CURRICULUM DEVELOPMENT



Abbreviations Used:

- NCRC. National Curriculum Revision Committee
- VCC. Vice-Chancellor’s Committee
- EXP. Experts
- COL. Colleges
- UNI. Universities
- PREP. Preparation
- REC. Recommendations
- LI Learning Innovation
- R&D Research & Development Organization
- HEC Higher Education Commission

...n Revision Committee in Civil Engineering HEC, Regional Centre, Lahore to finalize ...n Civil Engineering. The purpose of this ... the light of suggestion/comments received ... the draft curriculum prepared in the 3-15, 2011.

The following participated in these meetings: -

Dr. Abdul Sattar Shakir, Professor & Dean, Faculty of Civil Engineering, University of Engineering & Technology, Lahore	Convener
Dr. Anwar Khitab, Assistant Professor, Department of Civil Engineering, Wah Engineering College, University of Wah, Quaid Avenue, The Mall, Wah Cantt.	Secretary/Member
Dr. Anwar-ul-Haq Muneeb, Professor & Head, Department of Civil Engineering, National University of Computer & Emerging Sciences (NUCES), Lahore Campus, Block-B, Faisal Town, Lahore	Member
Dr. Khalid Farooq, Professor, Department of Civil Engineering, University of Engineering & Technology, Lahore	Member
Dr. Liaqat Ali Qureshi, Professor Department of Civil Engineering, University of Engineering & Technology, Taxila	Member
Dr. Rizwan Farooqui, Professor & Co-Chair, Department of Civil Engineering, NED University of Engineering & Technology, University Road, Karachi 75270	Member
Dr. M. Mahboob, Professor, Department of Civil Engineering, Mehran University of Engineering & Technology, Jamshoro, Sindh	Member
Dr. Mahboob Ali Ch. Professor & Dean, Faculty of Engineering, University of Lahore,	Member

Lahore

Dr. Shahid Iqbal,
Associate Professor
Military College of Engineering,
Risalpur
(National University of Sciences & Technology)

Member

Mr. Muhammad Nasir Khurshid,
Assistant Professor, Civil Engineering,
University of Lahore
1-km, Raiwind Road, Thokar Niaz Baig,
Lahore

Member

Mr. Muhammad Afzal,
Manager, Industrial Sector,
National Engineering Services (Pvt) Ltd,
NESPAK, 13th Floor, N.I.C. Building,
Abbasi Shaheed Road,
Off. Shahrah-e-Faisal,
Karachi

Member

Dr. Mansoor Imam
Associate Professor
Department of Civil Engineering,
Sir Syed University of Engineering and Technology,
University Road,
Karachi

Member

Meeting started with recitation from the Holy Quran by Prof. Dr. Mahboob Ali Ch.

Dr. M. Tahir Ali Shah, Deputy Director (Curriculum) HEC, briefed the participants about the guidelines of HEC in relation to revision and development of curriculum. He further added that the objective of this exercise is to develop a unified curriculum for civil engineering which can cater for the needs of national development. The finalized curriculum would be referred to the universities/institutions of higher education as guidelines for adoption before start of the next academic session. The NCRC was given the task to review and finalize civil engineering curriculum in the light of template/framework proposed and approved by Higher Education Commission (HEC) and Pakistan Engineering Council (PEC).

The Committee was also informed about the academic activities of HEC for improvement of education i.e. pre-service & in-service teachers training courses; exchange of teachers from University to University, University to R&D organizations and University to Industry etc., writing of monographs on topics of syllabi. The main aim of the HEC is to promote the higher education in Pakistan. Therefore, the idea to get the maximum benefit from the Commission's various schemes was also emphasized during the deliberations of the Committee. The Committee was requested to include latest books in the proposed curriculum.

The Committee unanimously selected Prof. Dr. Abdul Sattar Shakir, Dean, Faculty of Civil Engineering, UET, Lahore as its Convener and Dr. Anwar Khitab, Assistant Professor, Department of Civil Engineering, Wah Engineering College, Wah Cantt. as Secretary.

The Committee took up the agenda and deliberated on the detailed outline of BSc/BE in Civil Engineering. The draft scheme of studies, objectives of studies, model syllabus and its recommendations of NCRC are detailed below:-

OBJECTIVES OF THE PROGRAMME

- To impart state-of-the-art knowledge to the students in the field of Civil Engineering and produce competent civil engineers who will play vital role in the national development.
- To provide critical learning for a broad function in various areas of Civil Engineering, including structural, environmental, geotechnical, water resources, and transportation engineering and construction management.
- To make them aware of the advancement of engineering knowledge in the developed countries so that they may keep themselves abreast with such developments.
- To impress upon them the spirit of discipline, teach them the code of ethics of the engineering profession and impress upon them to follow it during their practical life.
- To prepare graduate engineers to be competitive in both national and international market by inculcating the engineering and managerial skills.

EXPECTED OUTCOMES

- The Civil Engineering programme provides the necessary technical skills in engineering design/analysis as well as mathematics and basic sciences consistent with Higher Education Commission (HEC) and Pakistan Engineering Council (PEC) accreditation standards and national technological needs.
- A Civil Engineering graduate would be able to undertake planning, design, construction, operations and maintenance of urban and rural infrastructure by applying his/her knowledge in all stages of Civil Engineering and inter-disciplinary projects.

METHODS OF INSTRUCTIONS AND LEARNING ENVIRONMENT

This shall comprise the following:-

- Classroom lectures, duly supported by audio-visual aids, demonstrations and relevant handouts.

- Assignments and tutorials requiring use of reference materials and internet facility.
- Term projects and class presentations.
- Laboratory experiments, field work and design exercises.
- Instructional visits to appropriate establishments, installations, construction sites, field stations, industries etc.
- Extension lectures and class room discussions by renowned professionals.
- Enhanced use of modern computing facilities in the institutions.
- The notebooks/field books/graphs and drawing sheets pertaining to the field work and practical should be completed within the allocated time and submitted to the teacher. In case of field visit the students shall be required to write a visit report which shall be graded.

ASSESSMENT

1. Classroom attendance, question-answer session at the end of the lecture, occasional but regular class assignments, class tests, homework assignments, quizzes etc., should be considered for the award of sessional marks.
2. The classroom evaluation is to be on the basis of attendance of the students as well as class participation since it would reflect the keenness of the students in pursuance of his studies.
3. The academic pursuit and achievements of a student in a semester/academic year are to be evaluated by holding tests and examinations.
4. Examination of at least final year courses should be evaluated by external examiners from outside the university, in addition to internal examiner.
5. Final year projects shall be evaluated by both external and internal examiners.

OPERATIONAL FRAMEWORK

1. Following the HEC guidelines, an operational framework is developed which includes both engineering and non-engineering courses as detailed in summary table titled "**BSc/BE CIVIL ENGINEERING PROGRAMME**".
2. Every Engineering University in Pakistan covers different areas in respect of professional civil engineering applications. However objectives of Bachelor of Civil Engineering Courses are same. Considering this aspect, the courses suggested are such that the civil engineering graduates from all universities are at par and at the same time be prepared to meet the national and international requirements. The curriculum designed has the room for individual universities to adjust courses as per their local requirements.

- 3. Number of contact hours:** The contact hours for study of courses are kept for university to university, considering the variation in local requirements. The following scheme is recommended:

1 credit hour of theory class = 1 contact hour

1 credit hour of lab / design class / practical = 3 contact hours

These above given contact hours cover theory lectures, design classes and practical periods.

- 4.** The evaluation of the students will be made on the basis of grading system as per guidelines of the HEC.

- 5. Course Contents:**

Course contents of each course are being provided as guidelines to meet the requirement of uniformity. However the universities are at liberty to formulate their respective course plans.

- 6. Practicals/Design Classes/Field Work:**

The Laboratory Experiments/Practicals/Design Classes/Field Works shall be in conformance with the contents of the respective course.

FRAMEWORK FOR 4-YEAR IN BS/BE CIVIL ENGINEERING PROGRAMME

Duration:	4 years
Number of Semesters	8
Number of weeks per semester:	18 (16 for teaching and 2 for examinations)
Total number of credit hours:	136
Number of credit hours per semester:	14-20
Engineering Course:	69 per cent
Non-Engineering Course:	31 per cent

Non-Engineering Domain									
Knowledge Area	Sub Area	Name of Course	Lec CH	Lab CH	Credit Hours	Total Courses	Total Credits	% Area	% Overall
Humanities	English	English Language Skills	2	0	2	3	5		
		Technical Communication Skills	2	0	2				
		Technical Report Writing and Presentation Skills	0	1	1				
	Culture	Islamic Studies	2	0	2	2	3		
		Pakistan Studies	1	0	1				
	Social Sciences	Social Science – I	2	0	2	2	4		
		Social Science – II	2	0	2				
Management Sciences	Professional Practice	Construction Management	3	0	3	3	9		
		Hydrology & Water Resources Management	3	1	4				
		Hazards and Disaster Management	2	0	2				
Natural Sciences	Math	Applied Calculus/ Math-I	3	0	3	8	21		
		Differential Equations/ Math-II	3	0	3				
		Engineering Economics Math-III	2	0	2				
		Numerical Analysis/ Math-IV	3	0	3				

		Probability & Statistics/ Math-V	2	0	2				
	Physics	Engineering Mechanics	3	1	4				
	Elective-I	Engineering Geology	2	0	2				
	Elective-II	Geo Informatics	1	1	2				
Total						18	42		

Lec CH: Lecture Credit Hours

Lab CH: Laboratory Credit Hours

Knowledge Area	Sub Area	Name of Course	Lec CH	Lab CH	Credit Hours	Total Courses	Total Credits	% Area	% Overall
Computing	Fundamentals	Computer Programing	1	2	3	3	9		
	Estimation	Quantity Surveying & Estimation	2	1	3				
	Design	Civil Engg. Drawing & Graphics	1	2	3				
Engineering Foundation	--	Civil Engg Materials	2	1	3	8	28		
		Engineering Drawing	2	2	4				
		Engineering Surveying	2	2	4				
		Mechanics of Solids-I	2	1	3				
		Structural Analysis-I	3	0	3				
		Soil Mechanics	3	1	4				
		Fluid Mechanics	3	1	4				
		Construction Engineering	2	1	3				
Major Based Core (Breadth)	--	Advanced Engineering Surveying	2	1	3	6	20		
		Advanced Fluid Mechanics	3	1	4				
		Plain & Reinforced Concrete-I	3	1	4				
		Environmental Engineering- I	2	1	3				
		Transportation Planning & Engineering	3	0	3				
		Structural Analysis-II	3	0	3				

Major Based Core (Depth)	--	Plain & Reinforced Concrete-II	3	1	4	7	24		
		Mechanics of Solids-II	2	1	3				
		Geo Technical & Foundation Engineering	3	1	4				
		Highway & Traffic Engineering	3	1	4				
		Environmental Engineering-II	2	0	2				
		Steel Structures	3	0	3				
		Hydraulics & Irrigation Engineering	3	1	4				
Inter-Disciplinary Engineering Breadth (Electives)	--	Basic Electro-Mechanical Engineering	3	1	4	2	7		
		Architecture & Town Planning	3	0	3				
Civil Engineering Project	--	Civil Engineering Project	0	3	3	1	6		
		Civil Engineering Project	0	3	3				
Total						27	94		

SUMMARY-CIVIL ENGINEERING

Domain	Name of Course	Total Courses	Total Credit Hours	% Overall
Non-Engineering	Humanities	7	12	31
	Management Sciences	3	9	
	Natural Sciences	8	21	
	Sub Total	18	42	
Engineering	Computing	3	9	69
	Engineering Foundation	8	28	
	Major Based Core (Breadth)	6	20	
	Major Based Core (Depth)	7	24	
	Inter-Disciplinary Engineering Breadth (Electives)	2	7	
	Civil Engineering Project	1	6	
	Industrial Training/Internship (Summer)	0	0	
	Sub Total	27	94	
Total		45	136	100.00

SCHEME OF STUDIES OF CIVIL ENGINEERING FOR BS/BE LEVEL

Course No	Course Outline	Knowledge Area	Sub Area	Credit Hours (Theory + Practical)	Contact Hours (Theory + Practical)	Total Credit Hours
SEMESTER-I						
1	Civil Engineering Materials	Engineering Foundation	F-I	2+1	2+3=5	3
2	Basic Electro-Mechanical Engineering	IDEE	IDEE-I	3+1	3+3=6	4
3	Engineering Drawing	Engineering Foundation	F – II	2+2	2+6=8	4
4	English Language Skills	Humanities	English-I	2+0	2+0=2	2
5	Applied Calculus / Maths-I	Natural Sciences	Math-I	3+0	3+0=3	3
6	Pakistan Studies	Humanities	Culture-I	1+0	1+0=1	1
				13+4	13+12	17
SEMESTER-II						
7	Engineering Surveying	Engineering Foundation	F – III	2+2	2+6=8	4
8	Engineering Geology	Natural Sciences-I	Elective-I	3+0	3+0=3	3
9	Islamic Studies	Humanities	Culture-II	2+0	2+0=2	2
10	Engineering Mechanics	Natural Sciences	Physics	3+1	3+3=6	4
11	Differential Equations / Maths-II	Natural Sciences	Math-II	3+0	3+0=3	3
				13+3	13+9	16

SEMESTER-III						
12	Computer Programing	Computing	Fundamentals	1+2	1+6=7	3
13	Civil Engg. Drawing & Graphics	Computing	Design	1+2	1+6=7	3
14	Advanced Engineering Surveying	Breadth	B – I	2+1	2+3=5	3
15	Mechanics of	Engineering	F – IV	2+1	2+3=5	3

	Solids-I	Foundation				
16	Engineering Economics	Natural Sciences	Math-III	2+0	2+0=2	2
				8+6	8+18	14
SEMESTER-IV						
17	Quantity Surveying & Estimation	Computing	Estimation	2+1	2+3=5	3
18	Structural Analysis-I	Engineering Foundation	F – V	3+0	3+0=3	3
19	Soil Mechanics	Engineering Foundation	F – VI	3+1	3+3=6	4
20	Social Sciences – I *	Humanities	SS – I	2+0	2+0=2	2
21	Numerical Analysis / Maths-IV	Natural Sciences	Math - IV	3+0	3+0=3	3
22	Fluid Mechanics	Engineering Foundation	F – VII	3+1	3+3=6	4
				16+3	16+9	19
SEMESTER-V						
23	Probability & Statistics/ Math IV	Natural Sciences	Math-V	3+0	3+0=3	3
24	Advanced Fluid Mechanics	Breadth	B – II	3+1	3+3=6	4
25	Technical Communication Skills	Humanities	English-II	2+0	2+0=2	2
26	Social Sciences – II *	Humanities	SS – II	2+0	2+0=2	2
27	Plain & Reinforced Concrete-I	Breadth	B – III	3+1	3+3=6	4
28	Construction Engineering	Engineering Foundation	F-VIII	2+1	2+3=5	3
				15+3	15+9	18

Course No	Course Outline	Knowledge Area	Sub Area	Credit Hours (Theory + Practical)	Contact Hours (Theory + Practical)	Total Credit Hours
SEMESTER-VI						
29	Construction Management	Management Sciences	Professional Practice-I	3+0	3+0=3	3
30	Mechanics of Solid-II	Depth	D-I	2+1	2+3=5	3
31	Pain & Reinforced Concrete-II	Depth	D-II	3+1	3+3=6	4
32	Transportation Planning & Engineering	Breadth	B- IV	3+0	3+0=3	3
33	Hydrology & Water Resources Management	Management Sciences	Professional Practice-II	3+1	3+3=6	4
34	Structural Analysis-II	Breadth	B-V	3+0	3+0=3	3
				17+3	17+9	20
SEMESTER-VII						
35	Environmental Engineering-I	Breadth	B –VI	2+1	2+3=5	3
36	Technical Report Writing & Presentation Skills	Humanities	English- III	0+1	0+3=3	1
37	Architecture & Town Planning	IDEE	IDEE-II	3+0	3+0=3	3
38	Geotechnical & Foundation Engineering	Depth	D – III	3+1	3+3=6	4
39	Highway & Traffic Engineering	Depth	D – IV	3+1	3+3=6	4
(45)	Civil Engineering Project	Civil Engineering Project	--	0+3	0+9=9	3
				11+7	11+21	18
SEMESTER-VIII						
40	Geo Informatics	Natural Science	Elective-II	1+1	1+3=4	2
41	Environmental Engineering-II	Depth	D – V	2+0	2+0=2	2
42	Steel Structures	Depth	D – VI	3+0	3+0=3	3
43	Hydraulics & Irrigation Engineering	Depth	D – VII	3+1	3+3=6	4
44	Hazards and Disaster	Management Sciences		2+0	2+0=2	2

	Management					
45	Civil Engineering Project	Civil Engineering Project	--	0+3	0+9=9	3
				9+5	9+15	14

Total Credit Hours = 136

* **Any one from the list at Annex "A"**

Abbreviations used:

1. SS - Social Science
2. F - Foundations
3. NS - Natural Science
4. B - Breadth
5. IDEE - Inter-disciplinary Engineering Elective.
6. D - Depth

DETAIL OF COURSES

1. Title of the Course: CIVIL ENGINEERING MATERIALS

Credit Hours: 2+1= 3

Specific Objectives of course:

- To familiarize students about the characteristics of construction materials used in civil engineering.
- To develop the skills for identification of suitable construction materials for civil engineering projects.

Course Outline:

Materials and properties: Introduction of materials, Construction materials, Physical properties, Mechanical properties, Chemical properties, Electrical & Thermal properties

Stone: Introduction, Types, Applications, Characteristics of good building stones, Artificial stones

Cement and Lime: Introduction and manufacture of Ordinary Portland cement, Constituents of cement, Types of cement, Cement hydration, Properties and field tests of cement, Special cements, Introduction and manufacture of lime, Setting and hardening of lime, Applications of lime, Comparison of lime and cement,

Fine and coarse aggregates: Definition and Introduction of aggregates, Mechanical properties of aggregates, Physical properties of aggregates, Importance and methods of grading of aggregates

Cementitious materials: Introduction about mortars, Methods of preparation of mortars, Properties and application of mortars, Introduction about concrete, Components and manufacture of concrete, Properties of concrete, Types of concrete, Effects of various chemicals on concrete

Ceramics and Bricks: History and evolution of ceramics, Manufacture of ceramics, Properties and applications of ceramics in buildings, History and evolution of bricks, Properties and applications of bricks, Brick dimensions, Manufacture and classification of bricks.

Plastics: Structure of plastics, Polymer technology, Types, Properties, Use of plastics as construction material

Glass: Constituents of glass, Methods of manufacture, Types, Use and significance in civil engineering, Advantages and drawbacks

Wood: Structure of tree, General characteristics, Types, Seasoning of wood, Preservation of wood, Lamination of wood.

Paints: Objectives, Composition, Types, Consideration in choosing a particular paint, Introduction, objectives and applications of varnish

Metals: Introduction about metals, Non-ferrous metals: Aluminium, Copper, Zinc, Lead, Nickel, Ferrous metals: Iron, Cast iron and steel, Manufacture of steel, Types of steel, Heat treatment to steel, Hot and cold rolled steels, Stainless steel, Important failures in steels

Thermometry and acoustics: Mode of Heat transfer in buildings, Thermal conductivity and diffusivity of building materials, Insulation in houses, Types of insulations, Acoustic insulation, Properties of good sound proof materials, Noise Reduction Coefficients of building materials

Miscellaneous Construction Materials: Asbestos, Plaster of Paris, Abrasives, Rubber, Cork, Bitumen, Asphalt, Road metal

Lab Outline: The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Edward Allen, Joseph Iano; Fundamental of Building Construction Materials and Methods; John Wiley & Sons. NY 2004
2. William F., Smith, Principles of Materials Science & Engineering, McGraw Hill, 1995
3. Duggal, S. K., Building Materials, New Age International. 2009.

**2. Title of the Course: **BASIC ELECTRO-MECHANICAL
ENGINEERING****

Credit Hours: 3+1 = 4

Specific Objectives of Course:

- To enable students to acquire basic knowledge of electrical and mechanical engineering relevant to civil engineering.

Course Outline:

Electrical Engineering Component:

Electrical Elements and Circuits: Electric current, voltage, power and energy, Ohm's law, inductance, capacitance, Kirchoff's laws. Introduction to node voltage and loop current methods, AC single and poly-phase system, DC machines, AC Synchronous Machines, AC Induction Machines, Transformers, Converting Machines.

Power Plant Installations and Distribution System: Power Systems layout, generation, transmission, distribution and utilization of electric power, Introduction to domestic electrification.

Electronics: Diode. Transistor and simple rectifier circuit. Principles of House wiring and Industrial wiring, Illumination. Electrical know how related to experimental design instrumentations like corrosion rate measurements, strain gauges, LDT's, LVDT's. etc.

Mechanical Engineering Component:

Basic Concepts: Fundamentals of Heat Transfer, Conduction, Convection, Radiation, Thermal Conductivity, Overall Heat Transfer Coefficients, Practical Equations, Laws of Thermodynamics, Internal Combustion Engines.

Heating Ventilation and Air Conditioning (HVAC): Introduction to HVAC components. Heating and cooling load and its calculations; Comfort charts; Outline of A.C. systems; Consideration for air-conditioning in buildings; natural Ventilations; Insulating materials

Lab Outline: The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Basic Mechanical Engineering Elements by Griffith J. Paul
2. Basic Electrical Engineering by Dltoro, 2nd Edition, 2001, Prentice Hall.
3. Ryner Joel , Applied Thermodynamics, 5th Edition, 1996, Longman
4. T. D. & Mcconkey, Applied Thermodynamics, 5th Edition, 2004, Longman
5. Basic Electrical Technology by T. K. Nagasarkar & Suhkija, 2nd Edition, 2007
6. Theraja, B. L. Electrical Technology, S. Chand. 2008

3. Title of the Course: ENGINEERING DRAWING

Credit Hours: 2+2= 4

Specific Objectives of course:

- To enable students to learn basics of engineering drawing.
- To develop the skills to understand fundamentals of structural drawings

Course Outline:

Introduction: Introduction to the subject and drawing equipment. Lettering and dimensioning, graphic symbols, free hand sketches and isometric views. Method of sections including assembly sections, Introduction to machine drawing.

Projections: Development of surfaces. Orthographic projection, orthogonal projections of simple solids in simple position, oblique and auxiliary planes. Isometric and pictorial projections of solid figures, making of free hand sketches from solid objects and from orthographic projections. Intersection of surfaces.

Architectural Drawing: Introduction to Civil Engineering drawing, preparation of plan, elevation and sections for simple buildings. Pattern of laying reinforcement in structural members, plumbing and electrification details.

Lab Outline: Preparation of various drawing sheets related to the course outline will be carried out.

Recommended Books:

1. Horchsel R. P; Engineering Drawing and Geometry, John Willy & Sons, 2nd Edition, 2002.
2. Jensen C.H and Mason F. H. S “Drafting Fundamentals”, McGraw Hill, 5th Edition.
3. N. D. Bhatt; Engineering Drawing, 50th Edition (2010), Charotar Book Stall
4. Parkinson, A. C. A First Year Engineering Drawing. English language Book Society. Reprint 1964.

4. Title of the Course: ENGLISH LANGUAGE SKILLS

Credit Hours: 2+0 = 2

Specific Objectives of course:

- To enhance English language skills.

Course Outline:

- Consulting a dictionary for spelling, pronunciation and meanings,
- Reading skills: skimming, scanning, intensive reading and improving reading speed,
- Library resources, listing books (bibliography),
- Sentence; subject and predicate, kinds,
- Types and parts of speech, use of articles,
- Practice in writing a unified correct sentence,
- Punctuation and spellings,
- Analysis of sentence structure,
- Clauses, verbs (transitive and intransitive),
- Translation (Urdu into English),
- Paragraph writing,
- Practice in writing a good, unified and coherent paragraph,
- Comprehension; answer to questions on a given text,
- Summary and précis making,
- Showing of documentaries; reviews of the same,

Recommended Books:

1. Shafi, S., Mansoor, S. and Irfan, H, 1994. Skill Worker: Student Activity Book: BA English for Paper B. 1st Ed. Caravan Book House Lahore, Pakistan.
2. Polymer English Grammar and Composition for BA/BSc1994. 1st Ed. Polymer Publication Lahore, Pakistan.

5. Title of the Course: **APPLIED CALCULUS/MATH-I**

Credit Hours: 3+0=3

Specific Objective of Course:

- To learn fundamentals of mathematics, calculus and analytical geometry.

Course Contents:

Complex Numbers: Basic Operations, Graphical Representations, Polar and Exponential Forms of Complex Numbers, De'Moivre's Theorem with Applications.

Functions: Hyperbolic Functions and their Graphical representation, Hyperbolic and Trigonometric identities and their relationship, Exponential Functions.

Differentiation: Differentiation and Successive Differentiation and its Application to Rate, Speed and Acceleration, Leibnitz's Theorem and its Applications, Equations of Tangents and Normals, Curvature, Radius and Centre of Curvature, Maxima and Minima of Function of one Variable and its Applications, Convexity and Concavity, Points of Inflexion, Concept of Infinite Series, Taylor's and McLaurin's Series and Expansion of Functions, Errors and Approximations and Limiting Values of Functions.

Partial Differentiation: Partial Differential Coefficient and Chain Rule, Partial Differentiation of an Implicit Function, Total Differential, Euler's Theorem, Applications to Small Errors and Approximations, Statement of Taylor's Theorem of Two Independent Variable and its Applications.

Integral Calculus: Standard Integrals, Function of a Linear Function, Integration by Substitution, by Partial Fractions and by Parts, Integration of Trigonometric Functions, Definite Integrals and their Properties and Reduction Formulae, Curve Tracing in Rectangular and Polar Coordinates.

Integration Applications: Volumes of Solids Of Revolution, Centroid of a Plane Figure, Centre of Gravity of a Solid of Revolution, Lengths of Curves, Surface Revolution, Rules of Pappus, Moment of Inertia, Radius of Gyration, Parallel Axes Theorem, Perpendicular Axes Theorem, Second Moment of Area, Composite Figures, Centres of Pressure and Depth of Centre of Pressure.

Analytical Solid Geometry: Rectangular Co-ordinate Systems in Three Dimensions, Direction Cosines, Plane (Straight Line) and Sphere.

Recommended Books:

1. Schaum's series, Calculus, Schum's Series (Latest Edition)
2. Schaum's series, Complex, Schum's series, (Latest Edition)
3. Antom, H. Calculus and Analytic Geometry, John Wiley and Sons. (Latest Edition)
4. Talpur, Calculus and Analytic Geometry, Ferozsons (Latest Edition)
5. Yousuf, S. M. Mathematical Methods, Ilmi Kutab Khana (Latest Edition)

6. Title of the Course: **PAKISTAN STUDIES**

Credit Hours: 1+0 = 1

Specific Objectives of course:

- To develop vision of Historical Perspective, Government, Politics, Contemporary Pakistan, ideology of Pakistan.
- To 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-e-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. 1999-2008
- g. 2008-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. Mehmood, Safdar. Pakistan Kayyun Toota, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, Lahore.
4. Sayed, Khalid Bin. The Political System of Pakistan. Boston: Houghton Mifflin, 1967.
5. Haq, Noor ul. Making of Pakistan: The Military Perspective. Islamabad: National Commission on Historical and Cultural Research, 1993.

7. Title of the Course: **ENGINEERING SURVEYING**

Credit Hours: 2+2= 4

Specific Objectives of Course:

- To enable students to understand theory and practice of land surveying.
- To enable students in reading and preparing surveying maps.
- To develop skills to use modern survey instruments.

Course Outline:

Introduction: Introduction to land surveying, definitions of basic surveying terms, branches and their application, Instruments used.

Techniques: Distance measurement techniques, Theodolite and its Types, Traversing and Triangulation, Bearings and Meridians, Plane Table Surveying. Computation of areas and volumes by various methods.

Modern Methods in Surveying: Principles of EDM Operation, EDM Characteristics, Total Stations, Field procedures for Total Stations in Topographic Surveys, Construction layout using Total Stations.

Leveling and Contouring: Methods and types of levels, Precise leveling. Methods and applications of contouring.

Surveying Drafting and Computations: Maps and Plans, Plotting, Contour Maps, Profiles, Cross- sections, Prismoidal formula, Computations of area and volumes by graphical analysis and use of surveying software.

Field Work: Horizontal and Vertical control, Construction Surveys, Railways, Highways, Pipelines and other infrastructures, Layout of buildings and structures.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Wolf P. R. & Ghilani C. D. Elementary Surveying-An introduction to Geometrics, 11th Edition, Prentice Hall, USA, 2004.
2. Kavanagh, B. Surveying principles and Application, Prentice Hall (8th Edition), 2008
3. Irvine, W. Surveying for Construction, McGraw-Hill (4th Edition), 1995
4. Davis, R. E. Surveying Theory and Practice, McGraw-Hill (7th Edition), 1966
5. Russel, P. W. and Brinker, C., Elementary Surveying, Harper Collins (9th Edition), 1997
6. James M. Anderson and Edward M. Mikhail, Introduction to Surveying, International Student Edition, 1984, McGraw Hill Book Company.

8. Title of the Course: **ENGINEERING GEOLOGY**

Credit Hours: 3+0= 3

Prerequisites:

Specific Objectives of course:

- To understand composition of various minerals, rocks and their properties.
- To develop a solid base for application of geology to engineering problems.

Course Outline:

Introduction to Geology: The Earth as a planet, Process of external and internal origin (Volcanic, Metamorphic, Sedimentary)

Importance of Geology for Civil Engineering Projects: Physical properties and identification of common rock forming minerals

Rocks formation and classification: According to the mode of occurrences and their compositions

Weathering and Erosion: Weathering classification: fresh, slightly weathered, moderately weathered etc. Formation of Meanders. Cycle of Erosion.

Discontinuity classification: Joints, faults and other fractures, micro structural features: lamination, cleavages, and foliations. Spacing of discontinuities: close, wide, medium etc., Folds, unconformities. Effects of folding, faulting and jointing on civil engineering projects and their recognition in the field.

Description of Rock masses as thickly bedded or thinly bedded: Identification of filling in joints: sand, clay and breccias etc. Color of grains, description with respect to the rock color, identification as a coarse grained, hardness classification.

Geological classification and identification of Rocks by geological names: Identification and subordinate constitutions in rock samples such as seams or branches of other types of minerals for example, Dolomite, Lime stone, Calcareous sand stone, sand.

Classification of Durability of Rocks in Dry and wet condition with durability test:

Engineering and physical properties of rocks. Geological technical properties of rocks used as building stones, as decorative stones and as industrial rocks such as color, luster, streak, specific gravity, water absorption and unit weight etc.

Brief Introduction to structural Geology: Plate Tectonics with respect to the global application, earthquakes, causes of earthquakes, protective measures against earthquakes zoning of earthquakes in Pakistan, Seismic Waves, Classification of Earthquakes, Earthquake Intensity Scales (modified Mercalli Scale), Geology of Aquifers, Wells, Springs and Ground Water Conditions.

Role of geology in selection of sites for dams, reservoirs, tunnels, ports/harbors and other civil engineering structures:

Land Slides: Definition, Causes of land Slides, Types of Land Slides, Protective Measures for Land Slides, Engineering Considerations.

Glaciers and Glaciations: Origin of Glacial Ice, Types of Glaciers, Movement of Glaciers, Glacial Erosion, Engineering Considerations.

Volcanoes: Formation of Volcanoes, Types of Volcanoes, Nature and Types of Eruption, Products of Eruptions, Engineering Considerations.

Brief introduction to geology of Pakistan

Recommended Books:

1. Blyth, F. G. H. Geology for Engineers, Butterworth-Heinemann, 7th Edition, 1984
2. Bell, Engineering Geology, Butterworth-Heinemann, 2nd Edition, 2006
3. Krynine, Principles of Engineering Geology & Geotechnics, McGraw-Hills Inc. 1957

9. Title of the Course: ISLAMIC STUDIES (Compulsory)

Credit Hours: 2+0 = 2

Prerequisites:

Specific Objectives of course:

- 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.

Course Outline:

INTRODUCTION TO QURANIC STUDIES

- 1) Basic Concepts of Quran
- 2) History of Quran
- 3) Uloom-ul -Quran

STUDY OF SELECTED TEXT OF HOLLY QURAN

- 1) Verses of Surah Al-Baqra Related to Faith (Verse No-284-286)
- 2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- 3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- 4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- 5) Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)

STUDY OF SELECTED TEXT OF HOLLY QURAN

- 1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- 2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- 3) Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

SEERAT OF HOLY PROPHET (S.A.W) I

- 1) Life of Muhammad Bin Abdullah (Before Prophet Hood)
- 2) Life of Holy Prophet (S.A.W) in Makkah
- 3) Important Lessons Derived from the life of Holy Prophet in Makkah

SEERAT OF HOLY PROPHET (S.A.W) II

- 1) Life of Holy Prophet (S.A.W) in Madina
- 2) Important Events of Life Holy Prophet in Madina
- 3) Important Lessons Derived from the life of Holy Prophet in Madina

INTRODUCTION TO SUNNAH

- 1) Basic Concepts of Hadith
- 2) History of Hadith
- 3) Kinds of Hadith
- 4) Uloom-ul-Hadith
- 5) Sunnah & Hadith
- 6) Legal Position of Sunnah

SELLECTED STUDY FROM TEXT OF HADITH

INTRODUCTION TO ISLAMIC LAW & JURISPRUDENCE

- 1) Basic Concepts of Islamic Law & Jurisprudence
- 2) History & Importance of Islamic Law & Jurisprudence
- 3) Sources of Islamic Law & Jurisprudence
- 4) Nature of Differences in Islamic Law
- 5) Islam and Sectarianism

ISLAMIC CULTURE & CIVILIZATION

- 1) Basic Concepts of Islamic Culture & Civilization
- 2) Historical Development of Islamic Culture & Civilization
- 3) Characteristics of Islamic Culture & Civilization
- 4) Islamic Culture & Civilization and Contemporary Issues

ISLAM & SCIENCE

- 1) Basic Concepts of Islam & Science
- 2) Contributions of Muslims in the Development of Science
- 3) Quran & Science

ISLAMIC ECONOMIC SYSTEM

- 1) Basic Concepts of Islamic Economic System
- 2) Means of Distribution of wealth in Islamic Economics
- 3) Islamic Concept of Riba
- 4) Islamic Ways of Trade & Commerce

POLITICAL SYSTEM OF ISLAM

- 1) Basic Concepts of Islamic Political System
- 2) Islamic Concept of Sovereignty
- 3) Basic Institutions of Govt. in Islam

ISLAMIC HISTORY

- 1) Period of Khlaft-e-Rashida
- 2) Period of Ummayyads
- 3) Period of Abbasids

SOCIAL SYSTEM OF ISLAM

- 1) Basic Concepts of Social System Of Islam
- 2) Elements of Family
- 3) Ethical Values of Islam

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

10. Title of the Course ENGINEERING MECHANICS

Credit Hours: 3+1=4

Specific Objectives of course:

- To enable students to understand relationships of physical processes, kinetics and kinematics.
- To develop skills to use the basic principles of mechanics in engineering applications.

Course Outline:

Basic Concepts: Concepts of space, time, mass, velocity, acceleration and force. Scalar and vector quantities, Newton's laws of motion, Law of gravitation.

System of Forces: Resultant and resolution of co-planer forces using parallelogram, triangle & polygon law and funicular polygon. Simple cases of resultant and resolution of forces in space, Conditions of equilibrium of co-planar forces, analytical and graphical formulations.

Equilibrium of Rigid Bodies: Free body concept, conditions of support and attachment to other bodies, Support Reactions under different types of loading, Introduction to shear force and bending moment diagrams. Degree of restraint and static determinacy. Statically determinate problems especially of civil engineering importance, Equilibrium of two-force and three-force bodies.

Kinematics: Work, energy and power. Virtual work formulation of equilibrium of coplanar force. Potential energy, energy criterion for equilibrium, stability of equilibrium, application to simple cases.

Rigid Bodies: Geometrical properties of plane areas, first moment of area, centroid, second moment of area, principal axes, polar second moment of area and radius of gyration.

Friction: Coulomb's theory of friction. Problems involving friction on flat and curved surfaces.

Application of Principles of Dynamics: Rectilinear and curvilinear motion, Newton's equation of motion, Dynamic equilibrium

Introduction to practical use of the above principles and properties.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Hibbeler, R. C. Engineering Mechanics- Statics and Dynamics, Prentice Hall. (10th Edition), 2003
2. Ferdinand P. Beer and E. Russel Johnston Jr. "Vector Mechanics for Engineers", 7th Edition, 2008
3. F. L. Singer, Engineering Mechanics, 4th ed, Harper and Row Publisher, 1987.
4. J. L. Mariam & L. G. Kraige; Engineering Mechanics Statics and Dynamics; John Wiley & Sons, 6th Edition, 2007

11. Title of the Course: DIFFERENTIAL EQUATIONS / MATHS-II

Credit Hours: 3+0=3

Specific Objectives of course:

- To introduce basic techniques pertaining to matrices
- To learn formulation/solution of differential equations and Fourier series.

Course Outline:

Matrices: Basic concept, addition of matrices and its multiplication with a scalar number, Partitioning of matrices, Matrix multiplication and its properties, Special

matrices, transpose of a matrix, Adjoin and inverse of a square matrix, Row operations Echelon & reduced Echelon form of matrix, rank of matrix, Application of Matrices, Eigen values and Eigenvectors

1st Order Differential Equations: Basic concepts, formation 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 1st order and equations reducible to the linear form, Bernoulli's equations and orthogonal trajectories, engineering application.

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 equations by operator D methods, Special cases, Cauchy's differential equations, Simultaneous differential equations, Simple application of differential equations in Engineering.

Partial Differential Equations: 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 functions with arbitrary periods, Odd and even functions and their Fourier series, Half range expansions of Fourier series.

Recommended Books:

1. Ervin Kreyszig. Advanced Engineering Mathematics, John Wiley and Sons, (10th Edition), 2010.
2. Speigal M. R., Theory and Problems of Laplace Transforms, Schaum's Outline Series, 1992.

12. Title of the Course: COMPUTER PROGRAMMING

Credit Hours: 1+2=3

Specific Objectives of Course:

- To enable students to learn computer languages and Microsoft Office.
- To develop skills of computer programming and its applications in elementary civil engineering problems.

Course Outline:

Introduction to personal computer setup: Introduction to Operating systems, Computer programming, Program structure and flow charts.

Programming Language: Fundamentals of Visual C++ /Visual Basic, arithmetic operations and functions, input/output statements, decision making statements & loop

functions and subroutines, data types and file formats, Programming of simple and elementary civil engineering problems.

Introduction to Microsoft Office

Lab Outline:

Exercises on Programming Tools and use of web as an academic resources.

Recommended Books:

1. Gottfried, BS Programming with Structured Basics (Schaum Series), McGraw-Hill. (1st Edition)
2. Deitel & Deitel, T. R. Nieto, Visual C++ 6 (2nd Edition), 1992
3. Steven Holzner , Black Book of C++ (Latest Edition)
4. Evangelos Petroustos, Mastering Visual Basic 6, Sybex Computer Books Inc. USA, 1998

13. Title of the Course: CIVIL ENGINEERING DRAWING & GRAPHICS

Credit Hours: 1+2= 3

Prerequisites: Engineering Drawing

Specific Objectives of course:

- To enable students to prepare and understand architectural and structural drawings.
- To have sufficient knowledge of working drawings related to civil engineering projects.

Course Outline:

General: Need and requirement of drawings for civil Engineering projects. General nature of drawings, components, symbols and nomenclature needed for specific drawings such as architectural, structural, plumbing, electrical, air-conditioning, roads and earth work etc. Drawings at different stages of projects, elements of perspective drawing

Civil Engineering Drawing: General description of working drawings related to civil engineering projects. e.g. hydraulic structures, drainage structures, , highway and motor way drawings.

Building Drawing: Elements of architectural planning and design, conceptual, schematic and working drawings and details of residential, commercial, religious, recreational, industrial, clinical, hospital, and educational buildings, details of doors, windows, staircases etc.

Elements of structural drawing and detailing: Preparation of foundation plan, structural framing, slab details, staircase details, water tanks, beam and column elevations and sections mostly pertaining to reinforced concrete structures. Details of steel roof truss, connection details and fabrication drawings. Plumbing and electrical detailing pertaining to small residential units.

Computer Aided Drafting: General and basic know how related to computer aided drafting, e.g. co-ordinate system, drawings setup procedure, basic draw commands, basic edit commands, layers, creating text and defining styles options, block and drawing import/export options, cross hatching, save and plot (2D) and isometric drawings

Introduction to Building Information Modelling

Lab Outline:

Preparation of various drawing sheets related to the course outline will be carried out.

Recommended Books:

1. M. Chakarborti, Civil Engineering Drawing, UBS Publications.
2. Gurcharan Singh, Civil Engineering Drawing, (latest edition). Malik Book Dept., Lahore
3. George Ormura, Mastering AutoCad 2000, (latest edition). Sybex, 1999
4. Boughton, B. Reinforced Concrete Detailer's Manual (Reference Book), HarperCollins, Publishers Ltd. London

14. Title of the Course: ADVANCED ENGINEERING SURVEYING

Credit Hours: 2+1= 3

Prerequisites: Engineering Surveying

Specific Objectives of course:

- To acquire knowledge of control surveys and their use in advanced branches of surveying.
- To apply principles of surveying and modern tools in related field problems.

Course Outline:

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

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

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

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

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

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

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

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Wolf P. R. & Ghilani C. D., Elementary Surveying – An introduction to Geomatics, 11th Edition, Prentice Hall, USA, 2004.
2. Thomas, M. Lillesand & Ralph W. Kiefer Remote Sensing and Images Interpretation, 5th edition, John Wiley & Sons, Inc. (2005),
3. Kavanagh Barry, Surveying with Construction Applications, 7th Edition, Pearsons Education (2010)

15. Title of the Course: **MECHANICS OF SOLIDS-I**

Credit Hours: 2+1=3

Prerequisites: Engineering Mechanics

Specific Objectives of course:

- To enable students to learn fundamentals regarding strength of materials.
- To enhance skills of utilizing material of appropriate strength for civil engineering application.

Course Outline:

Simple Stress and Strain: Kinds of stresses and strains, Difference between stress and pressure, Load Extension Diagrams for different Materials, Hook's Law, Moduli of elasticity, Lateral strain, Volumetric Strain, Poisson's Ratio, Temperature stresses and Compound bars.

Analysis of Beams: Shear force and bending moment diagrams of beams under different loading conditions, Theory of simple bending, Moment of resistance and section modulus, Applications of flexure formula, Shear Stresses in Beams, Shear Centre, Shear Flow.

Column and Struts: A short and long axially loaded columns, their modes of failure, and conditions, equivalent length, Euler's formula, and Empirical formula like Rankine Gordon Formula etc., Slenderness Ratio.

Circular Shafts: Theory of Torsion for solid and hollow circular shafts.

Springs: Open coil springs, closed coil springs, leaf springs.

Strain Energy: Strain Energy due to direct loads, shear force, bending moments, torque and impact loads.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Pytel, A. & F. L. Singer, Strength of Material, Harper & Row Publishers, New York.
2. Hibbler, R. C., Mechanics of Materials, Prentice Hall, 6th Edition, 2004.
3. Warnock, F. V., Benham, P. P., Mechanics of Solids and Strength of Materials, Pitman Publishing, 1970.
4. James M. Gere & Barry. J. Goodno, Mechanics of Materials, 7th Edition, 2008, CL Engineering
5. James M. Gere & Stephen P. Timoshenko, Mechanics of Materials, 4th Edition, 1997, PWS Pub Co.

16. Title of the Course: **Engineering Economics**

Credit Hours: 2+0=2

Specific Objectives of course:

- To introduce the fundamentals of engineering economics.
- To enable students to perform economic analysis of different projects.

Course Outline:

Fundamentals of Engineering Economics: Basic concepts and principles of Economics, Micro-economics theory, the problems of financial scarcity, Basic concept of Engineering Economy, Consumer and Producer goods, Goods and services, Price-supply-demand-relationship, Equilibrium, Elasticity of demand & supply, Measures of economic worth, Non-monetary values, Theory of pricing, Theory of production and laws of return.

Capital Financing and Allocation: Funding, funding agencies and planning commission, Capital Budgeting, Allocation of capital among independent projects, financing with debt capital, Financing with equity capital, Trading on equity, Financial leveraging

Business Organization and Industrial Relationship: Types of ownership, types of stocks, partnership and joint companies, Banking and Specialized credit institution; Labour problems, labour organization, prevention and settlement of disputes, Markets, competition and monopoly.

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

Selection between Alternatives: Time value of money and financial rate of return, present value, future value and annuities, Rate of Return Analysis, Incremental Analysis, Cost-Benefit Analysis, Payback Period, Sensitivity and Breakeven Analysis, alternatives having different lives, making of buy decisions and replacement decisions.

Recommended Books:

17. Title of the Course: **QUANTITY SURVEYING & ESTIMATION**

Credit Hours: 2+1= 3

Specific Objectives of course:

- To enhance the ability of students to learn the various principles of computations related to quantity surveying.
- To enhance skill of students in preparing detail estimates and bill of quantities for various civil engineering projects.
- To familiarize students with tender and contract documents.

Course Outline:

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

Bill of Quantities (BOQ) & Measurement Book (MB): Types and methods of estimates, working out quantities, rates and cost analysis of construction materials; Contents and preparation of bills of quantities for different projects like irrigation, roads, sanitary, building etc. and maintaining of Measurement Books. Measurement, specification and costing of sitework, excavation, backfill, concrete, masonry, carpentry, and finishes works; Overview and discussion of estimating procedures and considerations for concrete retaining wall, steel truss, road, sewer and water mains pipe works. Escalation, Contingency, Priced bill of quantity.

Tendering: Preparation of civil engineering contracts and tender documents.

Evaluation of proposals and contracts.

Overview of Contract Law and Dispute Resolution: Contract express and implied terms; breach of contract; liability for negligence; statutory and regulatory laws affecting construction; rights and liabilities of project key stakeholders. Overview of engineering and professional registration, contractor licensing, insurance and bonds. Liquidated damages and penalty/ bonus clauses. Delays; acceleration; suspension of work; termination. Changes, Claims, Alternate Dispute Resolutions Techniques.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. S. Dutta, Estimating and Costing in Civil Engineering, 24th Ed. SOS Free Stock, 1999
2. D. D. Kohli, Estimating, Costing and Accounts, 9th Ed. S. Chand & Co. Pvt. Ltd.
3. Keith Collier, Fundamentals of construction. Estimating & Cost Accounting, Prentice Hall, 1975
4. Jimmie Hinze, Construction Contracts, 3rd Edition, 2010, McGraw-Hill

5. Marks Kalin, Robert S. Weygant, Harold J. Rosen & John R. Regenar, Construction Specifications Writing: Principles and Procedures, 2010, Wiley.

18. Title of the Course: **STRUCTURAL ANALYSIS-I**

Credit Hours: 3+0 = 3

Specific Objectives of course:

- To enable students to learn basics of analysis of determinate structures.
- To enhance the skills of analyzing determinate structures under various loading conditions.

Course Outline:

Introduction to structural analysis: Types of structures, structural idealisation and loads. Redundancy and stability of structures.

Analysis of Determinate pin Jointed Structures: Method of joints, method of sections, method of moment and shears and graphical method.

Analysis of Statically Determinate Rigid Jointed Plane Frames: Shear force, bending moment and axial force diagrams for these structures.

Moving Loads: Influence lines for reactions, shear force and bending moment in statically determinate beams and paneled girders, influence lines for member forces in pin jointed frames, Calculation of maximum stress function (reaction, shear, bending moment, axial force) in these structures.

Three Hinged Arches, Cables and Suspension Bridges: Basic considerations in analysis and design. Moving loads on three hinged arches and suspension bridge.

Rotation and Deflection: Rotation and deflection of beams by moment area method, conjugate beam method, double integration method, Castigliano's second theorem. Rotation and deflection of plane trusses and frames. Principle of virtual work, unit load method, graphical method.

Recommended Books:

1. H. H. West, Fundamentals of Structural Analysis, John Willey-New York, 2nd Edition, 2002
2. Alexander Chajes, Structural Analysis, , N. J: Prentice Hall, 3rd Edition, 1995
3. W. J. Spencer, Fundamental Structural Analysis, Palgrave Macmillon, 1988 New York, Inc.
4. R. C. Hibbler, Structural Analysis, Prentice Hall, 7th Edition,
5. K. M. LEET & Chia-Ming Uang, Fundamentals Structural Analysis Prentice Hall, 7th Edition, 2009
6. Wang, C. K., Indeterminate Structures Analysis, McGraw-Hill.

19. Title of the Course: **SOIL MECHANICS**

Credit Hours: 3+1 = 4

Specific Objectives of course:

- To enable students to learn soil properties and its behaviour under loading.
- To apply the laws of mechanics to soils so that the engineers can design and construct safe structures on or with soil.

Course Outline:

Introduction: Applications in engineering practice, soil formation: mechanical and chemical weathering agents. Types of soil deposits & their properties, soil structure and clay minerals.

Index properties of soil: Water content, voids ratio, porosity, degree of saturation, specific gravity, unit weight and their determination. Mass-volume relationships.

Soil Classification: Importance of soil classification. Grain size distribution by sieve analysis and hydrometric analysis, Atterberg's limits, classification systems.

Geotechnical Investigation: Purpose, phases and scope. Methods of soil exploration: probing, test trenches/pits, auger boring, wash boring, rotary drilling. Disturbed and undisturbed samples. Introduction to Geotechnical report writing.

Permeability and Seepage: Darcy's law, factors affecting permeability, laboratory and field determination of permeability. Introduction to flow nets. Estimation of seepage quantity and gradients.

Stress Distribution in Soils: Geo-static stresses, total stress and pore pressure, effective stress, capillarity and its effects. Vertical stresses induced due to structural loads: Boussinesq & Westergaard's theory. Pressure bulb, Stress distribution diagrams on horizontal and vertical planes. Induced stress at a point outside the loaded area: use of influence charts and 2:1 method.

Shear Strength: Concept, parameters, Coulomb's law, shear strength of cohesive and non-cohesive soils. Factors affecting shear strength of soil and its applications in engineering. Laboratory and field tests for determination of shear strength.

Compaction: Mechanism, moisture density relationship, compaction standards, laboratory tests, factors affecting compaction, field control and measurements of in-situ density. Field compaction equipment. Relative density, relative compaction & compaction specification

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Donald P. Coduto Geotechnical Engineering (Principles and practices)
2. Whitlow, R., Basic Soil Mechanics, Longman Scientific & Technical
3. Smith, G. N. Elements of Soil Mechanics, Oxford BSP, Professional Books.
4. Smith, G. N. Elements of Foundation Design, Granada Publisher.
5. Braja M. Das, Principles of Geotechnical Engineering, 5th edition, Thomson-Engineering
6. J. E. Bowls, Physical and geotechnical properties of soils, McGraw-Hills Inc.
7. Lamb & Whitman, Soil Mechanics, John Willey & Sons.

21. Title of the Course: NUMERICAL ANALYSIS

Credit Hours: 3+0=3

Specific Objectives of course:

To introduce various techniques for solving linear, non-linear and difference equations using various numerical methods.

Course Outline:

Solution of Non-Linear Equations: Bisection method, Newton's method, Secant method, Method of false position, Method of successive approximation.

Finite Differences: Finite differences, Difference operators and tables, Differences of polynomials, Newton's and Gauss interpolating techniques for equally spaced data, Simple theorems on divided differences, Newton's formula for unequal intervals, Lagrange's formula of interpolation, Numerical differentiation.

Numerical Integration: Review of integration concept and their physical significance for Engineering, Trapezoidal and Simpson's rule numerical integration techniques.

Solution of Linear Simultaneous Equations: Jacobi's method, Gauss-Seidal method, Sparse matrices, Solution of differential equations, Euler and modified Euler methods, Runge-Kutta method.

Complex Variables: Limit, continuity, zeros and poles, Cauchy-Reimann Equations, Conformal transformations, contour integration.

Recommended Books:

1. Complex Variables by Murray R. Spiegel, Schaum Series
2. Numerical Analysis by Scheid, Schaum Series

22. Title of the Course: FLUID MECHANICS

Credit Hours: 3+1 = 4

Specific Objectives of course:

- To enable students to learn basics of fluid mechanics for civil engineering applications.

Course Outline:

Introduction: Solids and fluids (liquids and gases). Units and dimensions. Physical properties of fluids; density, specific weight, specific volume, specific gravity, surface tension, compressibility. Viscosity, measurement of viscosity, Newton's equation of viscosity. Hydrostatics, kinematics, hydrodynamics, hydraulics.

Fluid Statics: Pressure intensity and pressure head: pressure and specific weight relationship, absolute and gauge pressure, measurement of pressure, Piezo-meter, manometer, pressure transducers. Differential manometer and Borden gauge.

Forces on Immersed Bodies: Forces on submerged planes & curved surfaces and their applications, Drag and Lift forces, buoyancy and floatation. Equilibrium of floating and submerged bodies.

Fluid Kinematics: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow. Pathline, streamlines and stream tubes. Velocity and discharge. Control volume, Equation of continuity for compressible and incompressible fluids.

Hydrodynamics: Different forms of energy in a flowing liquid, head, Bernoulli's equation and its application, Energy line and Hydraulic Gradient Line, Introduction to density currents, free and forced vortex, Forces on pressure conduits, reducers and bends, stationary and moving blades, torques in rotating machines.

Flow Measurement: Orifices and mouthpieces, sharp-crested weirs and notches, pitot tube and pitot static tube, venturimeter, velocity methods.

Steady Flow through Pipes: Darcy-weisbach equation for flow in pipes. Losses in pipe lines, hydraulic grade lines and energy lines. Pipes in series and parallel. Transmission of energy through pipes. Introduction to computer aided analysis of pipe networks.

Uniform Flow in Open Channels: Chezy's and Manning's equations, Bazin's and Kutter's equations, Most economical rectangular and trapezoidal section.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Daugherty, R. L., J. B. Franzini and Fenimore, Fluid Mechanics with Engineering Application, McGraw-Hill New York (Latest Edition)
2. Monson Young, Fundamentals of Fluid Mechanics, (Latest Edition)
3. Douglas, Fluid Mechanics, McGraw-Hill Inc.
4. Jack P. Fundamentals of Fluid Mechanics, McGraw-Hill Inc.
5. Merle Potter, Mechanics of Fluid, CL- Engineering (2011)

23. Title of the Course: PROBABILITY & STATISTICS

Credit Hours: 3+0 = 3

Specific Objectives of course:

- To learn techniques of probability and statistical analysis of the data.

Course Outline:

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, 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.

Recommended Books:

1. Statistical methods for engineers by McCuen, Richard Prentice Hall
2. Basic Statistics for Business & Economics by Douglas A Lind, Irwin Publishers

24. Title of the Course: **ADVANCED FLUID MECHANICS**

Credit Hours: 3+1 = 4

Prerequisites: Fluid Mechanics

Specific Objectives of course:

- To enable students to learn advanced principles of fluid mechanics for broader application to civil engineering projects.

Course Outline:

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

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

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

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

Centrifugal Pumps: Types, Classifications, construction features, operation and efficiencies, Specific speed and characteristic curves.

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

Introduction to related software.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Daugherty, R. L. Franzini B. & Finnemore E. J., Fluid Mechanics, McGraw Hill Book Co.
2. Douglas, Fluid Mechanics, McGraw-Hill Inc.
3. Jack P., Fundamentals of Fluid Mechanics, McGraw-Hill Inc.
4. Merle Potter, Mechanics of Fluid, CL- Engineering (2011)

25. Title of the Course: **TECHNICAL COMMUNICATION SKILLS**

Credit Hours: 2+0= 2

Specific Objectives of course:

- To inculcate in students the skills of organizing material, writing a report, and presenting their work for better technical communication

Course Outline:

Paragraph writing

Practice in writing a good, unified and coherent paragraph

Essay writing

Introduction

CV and job application

Translation skills

Urdu to English

Study skills

Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension

Academic skills

Letter / memo writing and minutes of the meeting, use of library and internet recourses

Presentation skills

Personality development (emphasis on content, style and pronunciation)

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.

Note: documentaries to be shown for discussion and review

Recommended Books:

1. Ellen, K. 2002. Maximize Your Presentation Skills: How to Speak, Look and Act on Your Way to the Top, Prima Lifestyles - 2005
2. Hargie, O. (ed.) Handbook of Communications Skills, Routledge
3. Mandel, S. 2000. Effective Presentation Skills: A Practical Guide Better Speaking, Crisp Publications
4. Mark, P. 1996. Presenting in English. Hove: Language Teaching Publications.

27. Title of the Course: **PLAIN & REINFORCED CONCRETE-I**

Credit Hours: 3+1 = 4

Specific Objectives of course:

- To familiarize the students with the fundamental properties of concrete.
- To enable students to design various structural concrete members

Course Outline:

Constituent Materials & Properties: Concrete constituent material and its mechanical properties, Properties of freshly mixed concrete. Durability aspects and factors contributing towards durability, Creep and Shrinkage of Concrete, Mix Design, Quality Control, Additives and Admixtures, Air Entrainment, Lightweight Concrete, Hot and Cold Weather Concrete, Precast Concrete with special reference to Cement Concrete Blocks, Determination of fundamental structural properties of concrete and non-destructive testing (NDT).

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: Shear stress in reinforced concrete sections, models and analogies towards solution of diagonal tension problem, Design for diagonal tension.

Bond, Anchorage & Development Length: 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.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Hassoun, M. N. Design of Reinforced Concrete Structures, PWS Engineering
2. Wang, C. K. & Charles G. S. Reinforced Concrete Design, Harper and Row.
3. Arthur H Nilson, David Darwin, Charles W. Dolan, Arthur Nilson, Charles Dolan, Design of Concrete Structures. 2003, McGraw-Hill
4. F. K. Kong, Reinforce & Prestressed Concrete, 2nd Ed., Van National Reinhold, UK
5. A. M. Neville, Properties of Concrete, 4th ed, John Wiley

28. Title of the Course: Construction Engineering

Credit Hours: 2+1 = 3

Specific Objectives of course:

- To familiarize students about different construction methodologies and equipment to be used in carrying out a construction project.
- To develop ability of students to carry out the construction projects according to drawings and specifications.

Course Outline:

Introduction: Construction projects, Project goals and objectives, Project categories, Building permits, codes and construction standards, Sustainability.

Construction Equipment: Types of equipment, analysis of capital and operating costs, Depreciation and its methods of estimation. Investment costs, Maintenance and repair costs. Productivity and cost effectiveness.

Construction Aspects of Engineering Projects and Layout Techniques: An overview of construction aspects for different types of engineering projects, e.g., buildings, retaining structures, hydraulic structures and pavements. Site selection and orientation of building, Grading considerations, Layout techniques with special reference to buildings.

Construction Methodologies: Methodologies for Excavation in different types of soils and solution of particular problems arising out of condition of sub-soil at site e.g. de-watering, shoring and bracing, sheet piling etc., In-situ and pre-cast concrete construction of buildings, slab on grade, plain cement concrete floors, Planar and non-planar roofing systems. Masonry, doors, windows, floors, 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.

Introduction to advanced construction technologies.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Fundamentals of Building Construction: Materials and Methods, 5th Edition. Edward Allen
2. Building Construction: Principles, Materials, and Systems 2009 Update. Medan Mehta, Walter Scarborough and Diane Armpriest.
3. Construction Methods and Management. Stephens W. Nunnally
4. Huntington, W. C. Building Construction, John Wiley & Sons. (Latest Edition)
5. R. L. Peurifoy, W. B. Ledbetter, C. J. Schexnayder, Cliff J. Schexnayder. Construction Planning Equipment and Method. 5th Edition, McGraw-Hill Companies
6. Thompson J. F., Building Construction, Butterworld London.

29. Title of the Course: **CONSTRUCTION MANAGEMENT**

Credit Hours: 3+0 = 3

Specific Objectives of course:

- To develop ability of students in planning and management techniques for various construction projects.

Course Outline:

Introduction: The construction industry, nature and challenges, key players, Management issues and need for improved organization and management structures with particular reference to local construction industry, project management objectives, processes and responsibilities, Project Life Cycle (PLC), Value engineering, normal track versus fast track construction

Project Scoping, Bidding and Preconstruction Planning: Defining project scope, Pre-Qualification process, Bidding process, overview of preconstruction planning aspects including area and site investigation, constructability review, site layout planning, contractor's site (team) organization chart, preliminary schedules, mobilization plan.

Project Planning, Scheduling and Controlling by Deterministic Models:

Work Breakdown Structure; Project activities and their types; Estimating activity durations, Establishing activity sequencing; Arrow Diagramming Method (ADM) overview; Precedence Diagramming Method (PDM), Scheduling using Rectangular bar chart; CPM Scheduling; Determining the minimum total cost of a project; Resource scheduling and leveling; Cost loaded schedule, S-curve, Cash flow analysis, Project control during construction; Record keeping, Project supervision; Schedule and Cost Control,

Project Planning, Scheduling and Controlling by Probabilistic Models:

Program Evaluation & Review Technique (PERT), Statistical tools including mean, variance and standard Deviation, Probability distribution, Beta curves and center limit theorem.

Introduction to use of computer software in project planning and management

Recommended Books:

1. Frederick E. Gould, Managing the construction process: estimating, scheduling, and project control, , Pearson Prentice Hall 2010
2. Jimmie W. Hinze, Construction Planning and Scheduling, 3rd Edition
3. William R. Mincks, Hal Johnston, Construction Jobsite Management, 3rd Edition.
4. Jimmie Hinze, Construction Contracts, 3rd Edition 2010.

30. Title of the Course: MECHANICS OF SOLIDS-II

Credit Hours: 2+1 = 3

Prerequisites: Mechanics of Solids-I

Specific Objectives of course:

- To develop ability of students to carry out analysis of complex state of stress.
- To familiarize students about the stability, analysis and failure modes of structure elements.

Course Outline:

Stress Analysis: Analysis of Stress and Strain at a point due to combined effect of axial force, shear force, bending and twisting moment. Mohr's circle for stress and strain, relationships between elastic constants, strain rosette solution.

Introduction to Theory of Elasticity: Stress tensor, plane stress and plane strain problems and formulation of stress function.

Theory of Yielding/Failure (Plastic Limit Analysis): for ductile and brittle materials.

Cylinders: Thin, Thick and Compound Cylinders

Column: Stability of columns, conditions of equilibrium, eccentrically loaded columns, initially imperfect columns.

Flat Plates: Introduction, Stress Resultants in a flat plate, strain displacement Relations, Stress-strain-temperature relation of isotropic elastic plates, Strain Energy of plate, Solution of rectangular and circular problems Bending and Buckling of plates.

Curved Beams: Introduction to circumferential and radial stresses in curved beams, Correction of Circumferential Stress in curved beams having I, T-cross section, Unsymmetrical bending, Deflection of curved beams.

Torsion of Thin Walled Tubes and Non-Circular Members: Saint Venant's semi inverse method, Prandtl's Elastic Membrane Analogy, Narrow Rectangular Cross-section, Hollow Thin Walled Torsion Members.

Fatigue: Fatigue due to cyclic loading, Discontinuities and Stress Concentration, Corrosion Fatigue, Low Cyclic Fatigue and ϵ -N relations.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Pytel, A. & Ferdinand L. Singer, Strength of Material, Harper and Row HarperCollins College Div; 4th Sub Edition (February 1987)
2. Arthur P. Boresi. & Richard J. Schmidt, Advanced Mechanics of Materials, John Wiley; 6th Edition (October 22, 2002)
3. R. C. Hibbeler, Mechanics of Materials, Prentice Hall; 8th edition (April 1, 2010)
4. James M. Gere & Barry. J. Goodno, Mechanics of Materials, 7th Edition, 2008, CL Engineering
5. James M. Gere & Stephen P. Timoshenko,, Mechanics of Materials, 4th Edition, 1997, PWS Pub Co.

31. Title of the Course: PLAIN AND REINFORCED CONCRETE-II

Credit Hours: 3+1 = 4

Prerequisites: Plain and Reinforced Concrete-I

Specific Objectives of course:

- To enable students to design various reinforced and pre-stressed structural elements using conventional and advanced design approaches.

Course Outline:

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 and mat footings, piles and pile caps, Bouyant Footings.

Stairs, Water tanks, Reservoirs: Analysis and Design of Various Types of Stairs and Staircases, water tanks and reservoirs.

Prestressing Principles & Design Philosophy: Principles of prestressing, properties of high strength materials, Importance of high strength concrete and steel used in prestressing, Behavioral aspects of prestressed beams and comparison with reinforced concrete beams, post tensioning and pre-tensioning techniques, Profiles of post-tensioned tendons, bonded and non-bonded tendons, comparison and hard-ware requirements. Prestress losses, immediate and time dependent losses, lump sum and detailed estimation of prestress loss. Analysis and design of prestressed beams.

Introduction to earthquake resistant design of structures.

Introduction to underwater concreting.

Design of cantilever retaining walls.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Nilson A. H., Design of Prestressed concrete, John Wiley and Sons, Wiley, 1987
2. James G. MacGregor . Reinforced Concrete Design, Prentice Hall, 6th Edition, 2011
3. Chu-Kia Wang, Charles G. Salmon, José A. Pincheira, Reinforced Concrete Design, Wiley; 7th Edition 2006.

32. Title of the Course: TRANSPORTATION ENGINEERING

Credit Hours: 3+0 = 3

Specific Objectives of course:

- To provide background knowledge of transportation engineering with detailed and thorough understanding of framework of various transportation systems

Course Outline:

Introduction to Transportation Systems and Planning: Modes of transportation; Need and scope of comprehensive plan; Phases of planning, Principles of planning; Communication (rail-road network & airport), port and harbour facilities, street traffic and design.

Railway Engineering: Elements of track. Types of gauges; Types of rail sections. Rail joints. Creep and wear of rail; Fish Plate, bearing plates and check rails; Types of sleepers, their merits and demerits. Sleeper density, spacing and stiffness of

track; Types of ballast. Requirements for good ballast, Renewal of ballast. Formation of single and double track. Formation failures; Selection of site for a railway station. Layout of stations and yards; Modern methods for construction of tracks. Maintenance, tools and organization.

Airport Engineering: Type & elements of Airport planning, Factors affecting Airport Site Selection; Airport Classification; Airport Drainage Systems; Various Runway Configurations.

Coastal Engineering: Classification of harbours; Ports and harbours of Pakistan; Design principles and requirements of harbours; Wharves and jetties; Breakwaters and groynes; Channel regulation and demarcation; Types of docks and their construction; Transit sheds and warehouses.

Recommended Books:

1. Jason C. Yu, Transportation Engineering Introduction to Planning, Design and Operations, Elsevier Science Ltd. (June 1982).
2. Horonjeff, R. Planning and Design of Airports, McGraw-Hill Professional; 4th Edition (December 1, 1993).
3. Gregory P. Tsinker, Port Engineering Planning Construction Maintenance and Security, John Wiley, 2004.
4. William Walter Hey, Railway Engineering, Wiley; 2nd Edition (June 16, 1982)

33. Title of the Course: HYDROLOGY & WATER RESOURCES MANAGEMENT

Credit Hours: 3+1 = 4

Specific Objectives of course:

- To enable students to learn broad areas of hydrological engineering and principles of water management particularly in irrigated agriculture.

Course Outline:

Introduction: Hydrology, hydrologic cycle and the water balance equation, practical uses of hydrology, importance of hydrology.

Water Resources: Planning and development of water resources projects. Domestic, Industrial, Agricultural and other water usages, Water resources in Pakistan.

Water Management: Water management practices at basin level, canal level and farm level.

Meteorology: The atmosphere and its composition, dew point and its measurement devices. Saturation deficit. The general circulation of wind system, the monsoons and western disturbances. Measurement of air temperature, relative humidity, radiation, sunshine, atmospheric pressure and wind velocity & direction.

Precipitation: Types of precipitation, factors necessary for the formation of precipitation, measurement of precipitation, interpretation of precipitation data, computation of average rainfall over a basin.

Evaporation and Transpiration: Factors affecting evaporation, measurement of evaporation, evapo-transpiration.

Stream Flow: Water Stage and its measurement, selection of site for stage recorder, selection of control and metering section, methods of measurement of stream flow, interpretation of stream flow data, return period.

Runoff & Hydrographs: Factors affecting runoff, estimating the volume of storm runoff. Characteristics of Hydrograph, components of a hydrograph, hydrograph separation, estimating the volume of direct runoff, introduction to unit hydrograph concept, S-curve, Application of probability in determining maxima/minima of discharge. Types of histogram and distribution.

Stream Flow Routing: Introduction to floods and its causes, frequency and duration analysis. Reservoir routing, channel routing. Flood Control, Introduction to Hydrological Modeling.

Groundwater: Introduction, sources and discharge of ground water. Water table and artesian aquifer, ground water hydraulics, pumping test, tube well technology.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Warren Viessman, Jr. and Gary L. Lewis, Introduction to Hydrology, 5th Edition Prentice Hall
2. R. K. Linsley, Max A. Kohler, and Joseph L. Paulhus, Hydrology for Engineers, McGraw-Hill Education (ISE Editions); International 2 Revised edition (June 1, 1982)
3. Linsley, R. K., J. Franzini, Water Resources Engineering, McGraw Hill; 4th Edition (June 1, 1992).

34. Title of the Course: STRUCTURAL ANALYSIS-II

Credit Hours: 3+0 = 3

Prerequisites: Structural Analysis-I

Specific Objectives of course:

- To familiarize students with various methods of analysis of indeterminate structures.
- To develop the skills for using the state-of-the-art methods of structural analysis.

Course Outline:

Analysis of Indeterminate Structures Using Force Approach: Compatibility methods for beams and frames with and without support settlement. Analysis of indeterminate trusses.

Analysis of Indeterminate Structures Using Stiffness Approach: Moment distribution for beams and frames for prismatic and non-prismatic members with and without side-sway and support settlement, Slope deflection method for beams and frames with and without support settlement.

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

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

Introduction to Plastic analysis of structures.

Analysis of two-hinged arches.

Influence Line Diagram (ILD) for Indeterminate Members.

Recommended Books:

1. Hibbeler, R. C. Structural Analysis, Prentice Hall; 8th Edition (March 7, 2011).
2. Wang, C. K. Intermediate Structural Analysis, McGraw-Hill Education - Europe (January 1, 1984).
3. West, H. H. Analysis of Structures: An Integration of Classical and Modern Methods , John Wiley and Sons Ltd; 2nd Edition (August 23, 1989).

35. Title of the Course: ENVIRONMENTAL ENGINEERING-I

Credit Hours: 2+1 = 3

Prerequisites: Fluid Mechanics

Specific Objectives of course:

- To introduce the concept of environmental pollution, contamination and its sources particularly in context to water.
- To learn principles of environmental engineering applied to the design and implementation of water supply schemes.

Course Outline:

Introduction to Environment, Water and Sanitary Engineering

Water Pollution: Water chemistry and characteristics, Introduction to sources of pollution, Effects on water quality, Control parameters.

Water Demand and Supply: Population forecast; Water uses & consumption; Types and variations in demand; Maximum demand & fire demand.

Water Quality: Water impurities & their health significance; Water quality guidelines/standards (US. & WHO, etc); water quality monitoring.

Water Sampling and Testing: Sampling techniques and examination of water (physical, chemical and microbiological parameters), Water borne diseases.

Water Treatment: Treatment of surface & ground water, screening, (types of settling), coagulation and flocculation, Filtration, Design aspects of slow sand and rapid sand filters; and their operations, Pressure filters, Membrane Technology (Reverse Osmosis, Ultrafiltration).

Miscellaneous Water Treatment Techniques: Fluoridation, Iron & Manganese removal; Water softening methods; Water disinfection and chemicals; Chlorination; Emergency treatment methods. Ozone, Ultraviolet.

Water Distribution: Layout and design of water transmission works and distribution networks, service reservoirs, Fixtures and their installation; Tapping of water mains, Urban and Rural Water Supply. Introduction to Air & Noise Pollution

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Mackenzie L. Davis, David A. Cornwell, Introduction to Environmental Engineering, McGraw-Hill Science/Engineering/Math; 4th Edition (October 3, 2006)
2. Terence J. McGhee, Water Supply and Sewerage, 6th edition, McGraw Hill
3. Howard S. Peavy, D. R. Rowe, George Tchobanoglous, Environmental Engineering, McGraw-Hill Publishing Company; 7th Edition (March 1987)

36. Title of the Course: TECHNICAL REPORT WRITING & PRESENTATION SKILLS

Credit Hours: 0+1 = 1

Prerequisites: Technical Communication Skills

Specific Objectives of course:

- To enhance language and technical report writing skills.

Course Outline:

Presentation skills

Essay writing

Descriptive, narrative, discursive, argumentative

Academic writing

How to write a proposal for research paper/term paper

How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)

Technical Report writing

Progress report writing

Note: Extensive reading is required for vocabulary building

Recommended Books:

1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).
2. College Writing Skills by John Langan. McGraw-Hill Higher Education. 2004.
3. Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
4. The Mercury Reader. A Custom Publication. Compiled by northern Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharon. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students)

37. Title of the Course: **ARCHITECTURE & TOWN PLANNING**

Credit Hours: 3 + 0 = 3

Specific Objectives of course:

- To understand ancient and modern form of living.
- To impart knowledge related to planning and development of inhabitant areas.

Course Outline:

Architecture: Historical Development. General introduction to history of architecture; Emergence/Development of Islamic Architecture. Geographical, climatic, religious, social and historical influences. Architectural beauty.

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

Factors: Proportion, colour and balance.

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

General Treatment to Plan of Buildings: Walls and their construction; Openings and their position, character and shape; Roofs and their development and employment; Columns and their position, form and decoration; Moulding and their form decoration; Ornament as applied to any buildings.

Town Planning: Definitions; Trends in Urban growth; Objectives of town planning; Modern planning in Pakistan and abroad.

Preliminary Studies: Study of natural resources, economic resources, legal and administrative problems, civic surveys and preparation of relevant maps.

Land Use Patterns: Various theories of land use pattern. Location of Parks and recreation facilities, public and semi-public buildings, civic centers, commercial centers, local shopping centers, public schools, industry & residential areas.

Street Patterns: Lay out of street, road crossing & lighting; Community planning.

City Extensions: Sub Urban development, Neighborhood Units, Satellite Towns and Garden City

Urban Planning: Issues related to inner city urban design and emergence/upgradation of squatter settlements.

Recommended Books:

1. Dan Cruickshank, Sir Banister Fletcher's A History of Architecture, Architectural Press; 20th Edition (September 25, 1996)
2. Leonard Benevolo; Origins of Modern Town Planning, MIT Press, 15-Aug-1971
3. Sir Rymond Unwin, Town Planning in Practice, FQ Legacy Books (December 31, 2010)

38. Title of the Course: GEOTECHNICAL & FOUNDATION ENGINEERING

Credit Hours: 3+1 = 4

Prerequisites: Soil Mechanics

Specific Objectives of course:

- To enhance the skills related to bearing capacity and settlement evaluation of soils.
- To apply principles of soil mechanics to engineering problems pertaining to retaining structures, foundations and embankments.

Course Outline:

Earth Pressures: Definition, pressure at rest, active and passive earth pressures. Coulomb's and Rankine's theories. Bell's equation for cohesive frictional soils. Earth pressure diagrams for different loading configurations.

Bearing Capacity of Soils: Definition of: gross, net, ultimate, safe and allowable bearing capacity.

Methods of obtaining bearing capacity: presumptive values from codes, from plate load test. Bearing capacity theories. Bearing capacity from SPT and CPT data.

Settlement Analysis: Definition, total settlement, differential settlement, angular distortion, immediate settlement. Primary and secondary consolidation settlements. Normally and pre-consolidated soils. Mechanics of consolidation, theory of one dimensional consolidation, assumptions and validity,

Oedometer test: determination of compression index and coefficient of consolidation, magnitude and time rate of consolidation settlement. Causes of settlement and methods of controlling settlement. Allowable total and differential settlement.

Slope Stability: Types of slopes, Factors affecting stability and remedies. Types of failure.

Methods of analysis: Ordinary methods of slices, Taylor's stability number method, Swedish circle method.

Earth and Rock Fill Dams: Definition of an earth dam, types of earth and rock fill dams, Components of an earth dam and their functions. General design considerations and typical cross-sections.

Introduction to deep foundations: Types of piles, load carrying capacity of piles, group action, negative skin friction, pile load test.

Soil Improvement: Basic principles, objectives and methods.

Soil Dynamics: sources of dynamic loading, spring-mass-dashpot system, application to machine foundations, liquefaction.

Introduction to Geotechnical Computer Software

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Foundation Analysis and Design by Joseph E. Bowles (5th Edition), McGraw-Hill

2. Principles of Foundation Engineering by Braja M. Das 5th Ed, Thomson-Engineering
3. Soil Mechanics in Engineering Practice by K. Terzaghi and R. B. Peck John Wiley and Sons, 3rd edition
4. Elements of Foundation Design by G. N. Smith and E. L. Pole. Harper Collins Distribution Services (February 12, 1981)
5. Donald P. Coduto, Foundation Design: Principles and Practices, Prentice Hall; 2nd Edition (July 20, 2000).

39. Title of the Course: HIGHWAY AND TRAFFIC ENGINEERING

Credit Hours: 3+1 = 4

Prerequisites: Surveying-II

Specific Objectives of course:

- To equip students with knowledge related to highway design, construction, maintenance and traffic operations

Course Outline:

Introduction to Road Systems: Location Survey in Rural and Urban Areas; Urban Location Controls; Highway Planning. Roads in Hilly Areas.

Highway Engineering: Highway Components, Elements of a typical cross-section of road. Types of cross-section; Highway location; Classification of Highways; Highway Materials, Types & Characteristics, Specifications & tests, Introduction to resilient behavior.

Geometric Design: Design controls and criteria; Sight distance requirements; Horizontal curves; Super elevation; Transition curve; Curve widening; Grade line; Vertical curves.

Pavement Design: Types of pavements. Wheel loads. Equivalent single axle load, Repetition and impact factors. Load distribution characteristics; Design of flexible and rigid pavements, Highway drainage, Pavement failures, Introduction to non-destructive testing, Pavement evaluation; Construction, Maintenance and rehabilitation;

Traffic Engineering: Operating and design speeds; Traffic flow parameters, their relationships and data collection methodologies, Traffic Survey; O & D Survey, Traffic Safety; At-grade and grade-separated intersections; Traffic control devices; Capacity analysis; Traffic management.

Introduction to relevant computer software..

Lab Outline:

The Design work, laboratory work and experiments related to above mentioned outline shall be covered in the laboratory/design classes.

Recommended Books:

1. Jason C. Yu, Transportation Engineering Introduction to Planning, Design and Operations, Elsevier Science Ltd (June 1982)
2. Croney D., The Design and Performance of Road Pavements, 3rd Edition McGraw-Hill Professional (September 4, 2008)
3. Salter R. J., Highway Traffic Analysis and Design, Palgrave Macmillan; 3rd Edition (September 1996).
4. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski Principles of Highway Engineering and Traffic Analysis, Wiley; 4th Edition (September 9, 2008).

40. Title of the Course: GEO INFORMATICS

Credit Hours: 1+1 = 2

Prerequisites: Surveying-II

Specific Objectives of course:

- To acquaint with state-of-the-art Geo-informatics and its diverse applications in engineering.

Course Outline:

Introduction to Geoinformatics 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.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Michael Kennedy (2002), The Global Positioning System and GIS: An ntrduct 2nd Edition, Taylor & Frances, New York, ISBN-0-415-28608-5
2. Thomas, M. Lillesand & Ralph W. Kiefer (2005), Remote Sensing and Image Interpretation, 5th edition, John Wiley & Sons, Inc.
3. Clarke, K. (2004) Getting Started with Geographic Information System, Prentices Hall, New York, 2nd Edition ISBN-1879102897
4. Chang, K. T., Introduction to Geographic Information Systems, 3rd Ed. McGraw-Hill Higher Education.

41. Title of the Course: ENVIRONMENTAL ENGINEERING-II

Credit Hours: 2 +0 = 2

Prerequisites: Environmental Engineering-I

Specific Objectives of course:

- To introduce knowledge of Environmental laws and regulations, required in context to pollution control and impact assessment requirement.
- Introduction to Impact Assessment concept and techniques
- To provide know-how to students to plan, design wastewater collection & treatment systems.
- To introduce the definitions and characteristics of solid wastes, concept of waste management and methods of safe disposal.

Course Outline:

Introduction to Environmental Legislation and Regulations

Basic definitions and differences in terms, International Acts, Treaties, Agendas and Accords, Environmental Protection Agency, Pakistan Environmental Protection Act 1997, National Environmental Quality Standards (NEQS)

Introduction to Environmental Impact Assessment

Definitions, activity, consequence, effect-impact; relationship, magnitude, duration and significance. Assessment types; IEE & EIA in context to PEPA applicable to development projects. EIA process; Scoping, Screening, EIA Study, EIA Analysis, Documentation and Presentation, Decision making. EIA Techniques, Environmental & Monitoring Plan

Estimation of Sewage Quantities: Population characteristics, population forecasting, waste water generation, Rainfall intensity formulas, hydrograph & weather flow, sewage quantities; Variations and rates of flows; Velocity gradient & limiting velocities.

Characteristics of Sewage: Sampling techniques and examination of wastewater (Physical, chemical and microbiological parameters), Biochemical Oxygen demand (BOD), Chemical Oxygen Demand (COD), Microbiology of sewage. Effluent disposal guideline and standards, Pakistan National Environmental Quality

Standards (NEQS) and International Standards.

Sewer system: Types, shapes, size and materials of sewers, pipe strengths and tests; Design, construction, laying and maintenance of sewage system; Separate & Combined systems; Sewer appurtenances.

Sewage Treatment and Disposal: Primary, secondary & tertiary treatment:

Screening grit chamber, skimming tanks & sedimentation tanks; Activated sludge treatment, tricking filters, Rotating biological contactors. Aerobic systems; lagoons and oxidation ponds, etc.

Sewage Disposal: Receiving body assimilation capacity; Stream pollution and self recovery, sludge handling, treatment & disposal; Effluent re-use.

Building drainage: Soil pipes, anti-siphon pipes and waste water pipes; sanitary fixtures and traps; House connection and testing of house drainage; Cross connection and back siphonage control.

Solid waste management: Types, characteristics, sources and quantities of solid waste; Collection, disposal (Landfill, incineration, RDF, waste to energy) and recycling.

Recommended Books:

1. Gerard Kiely, Environmental Engineering, McGraw-Hill International Edition, 1997
2. Integrated Solid Waste Management, by George Tchobanoglous, International Edition, McGraw-Hill (January 1, 1993)
3. Wood, C, Environmental Impact Assessment (A Comparative Review). Longman Scientific and Technical. 1995. Longman House Burnt Hill, Harlow Essex. UK.
4. Petts, J. and Eduljee, G., Environmental Impact Assessment for Waste Treatment and Disposal Facilities. 1994. John Willey & Sons Inc. UK.

42. Title of the Course: STEEL STRUCTURES

Credit Hours: 3+0 = 3

Specific Objectives of course:

- To acquaint students with use of steel as a structural component and develop their ability to design steel structures.

Course Outline:

Introduction: Use of steel as a structural material, hot rolled, cold formed and built up sections.

Fundamentals of Working Stress Method: Strength analysis and design of simple tension, compression and flexural members.

LRFD Method of Design: Factor of safety, loads and load combination. Concept of load and resistance factors, plastic design and limits on design. Analysis and design of tension members, calculation of net area, Analysis and design of columns, lacing and slay plates. Residual stresses, local and overall stability, Euler's buckling load in columns. Analysis and design of beams. Compact, non-compact and slender sections, lateral torsional buckling. Beam-column and axial-flexure interaction, second order effects, moment magnification. Plate girder proportioning and stiffener design including drawings. Welded, bolted and riveted truss connections, brackets, moment and shear connections. Design and drawing of a truss, purlin, roof sheet, cud bearing plate. Uplift of truss due to wind

Recommended Books:

1. Lothers, J. E. Steel Structures, National Book Foundation
2. Gaylord, E. H. and C. N. Gaylord, Design of Steel Structures , McGraw-Hill Companies; 3rd Sub-Edition (September 1, 1991)
3. Spiegel & L. Burner. Applied Structural Steel Design, Prentice Hall, 2002
4. William Segui, LRFD Steel Design, CL-Engineering; 4th Edition (November 21, 2006)
5. Charles G. Salmon, John E. Johnson, Faris A. Malhas, Steel Structures: Design and Behavior, 5th Edition (2008), Prentice Hall.

43. Title of the Course: HYDRAULICS & IRRIGATION ENGINEERING

Credit Hours: 3+1 = 4

Prerequisites:

Specific Objectives of course:

- To enable students to learn fundamentals of hydraulic engineering, particularly related to open channel flow, flow through pipes, dam and river engineering.
- To enhance the capabilities of students related to irrigation engineering and canal network.

Course Outline:

Steady Flow in Open Channel: Specific energy and critical depth, Dynamic equation of gradually varied flow, surface profiles and back water curves, Humps and constrictions, Hydraulic jump, Broad crested weirs, venturi flume and critical depth meters.

Unsteady Flow: Flow through pipes, orifices and over weirs under varying heads, Unsteady flow through pipe lines, water hammer, instantaneous and slow closure of valves, Surges in open channel.

Dimensional Analysis and Similitude: Similitude in hydraulic models, similitude requirements, geometric, kinematics and dynamics similarities, dimensionless numbers and their significance, Releigh's method, Buckingham's PI-theorem and its

application, physical models, techniques and analysis, introduction to numerical models.

Dams and Hydro Power Engineering: Selection of hydropower sites. Components and layout of hydropower schemes. Types of storage dams, forces on dams, design of gravity dams, Reservoir engineering, operation and regulation of storage reservoirs.

Sediment Transport in Channels, Sedimentation Problems in Reservoirs.

Canal Irrigation: Elementary concept about canal head works, selection of their site and layout, weirs and barrages, various components and functions. Measures adopted to control silt entry into canals, silt ejectors and excluders. Design of weirs on permeable foundations, sheet piles and cut off walls. Design of irrigation channels, Kennedy's and Lacey's Theories. Rational methods for design of irrigation channels. Comparison of various methods. Computer Aided design of irrigation channels.

Barrages and Headworks: Canal head regulators, falls, flumes, canal outlets. Cross drainage works: types and functions. Canal lining: advantages and types. Maintenance of irrigation canals. Monitoring of flows-telemetry system.

Water logging and salinity: Causes and effects of water logging, reclamation of water logged soils. Drains and tube wells. Causes and effects of salinity and alkalinity of lands in Pakistan. Reclamation methods. Drainage network in irrigated areas.

Drainage: Definition, Land reclamation, Surface Drainage, Subsurface Drainage, Estimation of discharge capacity of Cross-drainage structures, Disposal of drainage effluents.

Lab Outline:

The Design work and/or experiments related to above mentioned outline shall be covered in the Laboratory/Design class.

Recommended Books:

1. Warren Viessman, Jr. and Gary L. Lewis, Introduction to Hydrology, 5th Edition Prentice Hall
2. R. K. Linsley, Max A. Kohler, and Joseph L. Paulhus, Hydrology for Engineers, McGraw-Hill Education (ISE Editions); International 2nd Revised Edition (June 1, 1982)
3. Linsley, R. K., J. Franzini, Water Resources Engineering, McGraw-Hill; 4th Edition (June 1, 1992).
4. David, A. Chin, Water Resources Engineering, Prentice Hall; 2nd Edition (April 13, 2006).
5. Linslay, R. K. and Joseph, B. F. Water Resources Engineering, McGraw-Hill, Inc.

44. Title of the Course: HAZARDS AND DISASTER MANAGEMENT

Credit Hours: 2+0 = 2

Prerequisites:

Specific Objectives of course:

- To familiarize students with the basic concepts of natural and human induced hazards
- To enable students to learn the techniques for pre and post-disaster management.

Course Outline:

Introduction to Hazards and Disasters (earthquakes, floods, droughts, landslides, cyclones, etc.), Social & Economic Aspects of Natural and human induced hazards, Hazard and Disaster Investigation,

Disaster Management, Pre-Disaster Phase (Prevention, Mitigation & Preparedness), Disaster Phase (Response, relief and recovery), Post-Disaster Phase (Rehabilitation, Development), Damage assessment, Disaster management policies and institutional infrastructure from national to local level

Monitoring of Infra-structure facilities; strategies for protection against possible damages; maintenance for different infrastructure facilities. Rehabilitation and repair strategies, Predictions and preparedness strategies for natural disasters such as Earthquakes etc; Emergency management; Awareness Programs; Follow-on Disasters; Recovery plans; Strategies for protection, Risk and Vulnerability Analysis; Disaster Mitigation

Recommended Books:

1. Thomas D. Schneid, Disaster Management and preparedness, CRC Press; 1st Edition (November 22, 2000)
2. David Alexander, Principles of Emergency planning and Management, Published in the United State of America by Oxford University Press Inc. 1998 Madison Avenue, New York 10016
3. Timothy Beatley, Philip Berke, David J. Brower 1999 Natural Hazard Mitigation: Recasting Disaster Policy and Planning Island Press ISBN: 1559636025
4. Charlotte Benson, Edward J. Clay (2004) Understanding the Economic and Financial Impacts of Natural Disasters World Bank Publications ISBN: 0821356852
5. The primer on Disaster Risk management in Asia
6. Mr. Aloysius J. Rego Director of Knowledge Sharing and partnerships and Co-Team Leader of Disaster management System team Asian Disaster preparedness Center (ADPC) 2003.

45. Civil Engineering Project

Survey Camp:

A Survey camp is compulsory after completion of 4-semesters, in order to impart extensive field training regarding surveying. In survey camp student will make survey and prepare map of large areas independently.

Internship:

Course Outline MS/ME in Structural Engineering

1.	Structural Analysis
2.	Reinforced Concrete Structure
3.	Properties of Structural Materials
4.	Prestresses Concrete
5.	Steel Structures
6.	Non Linear Structural Analysis
7.	Finite element analysis
8.	Reliability based structural design
9.	Advance mechanics of solid
10.	Fibre reinforced polymers
11.	Structural Fire Engineering
12.	Analysis & Design of Masonry Structure
13.	Seismic Design of Structure
14.	Bridge Engineering
15.	Design of Structure
16.	Theory of Plates and Shells
17.	Structural Mechanics
18.	Stability of Structure
19.	Advanced Soil Mechanics
20.	Foundation Engineering – I
21.	Foundation Engineering – II
22.	Geotechnical Investigation
23.	Environmental Geo-techniques
24.	Hydraulic Structure
25.	Hydro Power Engineering
26.	Irrigation Engineering and Practices
27.	Application of RS & GIS in Civil Engineering
28.	Pavement Analysis and Design

Course Outline
MS/ME in Hydraulics & Irrigation Engineering

1.	Hydraulic Structure
2.	Advance Fluvial Hydraulics
3.	Hydropower Engineering
4.	Irrigation Engineering & Practices
5.	Applied Hydrology
6.	Sediment Transport
7.	Fluid Mechanics
8.	Drainage Engineering
9.	Computer Aided Design of Hydraulic Structure
10.	River Engineering & Flood Management
11.	Application of RS & GIS in Civil Engineering
12.	Soil Erosion & watershed Management
13.	Hydrological Modeling
14.	Water Resources Planning & Management
15.	Ground Water Engineering
16.	Reinforced Concrete Structure
17.	Properties of Structural Materials
18.	Bridge Engineering
19.	Advanced Soil Mechanics
20.	Dam Engineering
21.	Geotechnical Investigation
22.	Earth Reinforcement
23.	Earth retaining Structures
24.	Environmental Geo-techniques
25.	Pavement analysis and Design

Course Outline
MS/ME in Geo-Technical Engineering

1.	Advanced Soil Mechanics
2.	Foundation Engineering-I
3.	Foundation Engineering-II
4.	Dam Engineering
5.	Geotechnical Investigation
6.	Soil Improvement Techniques
7.	Earth retaining Structures
8.	Rock Engineering
9.	Environmental Geo-techniques
10.	Soil Dynamics
11.	Transportation Planning and Engineering
12.	Pavement Analysis and Design
13.	Airport Planning and Design
14.	Railway Engineering
15.	Highway Construction Materials and Equipment

16.	Harbour and Dock Engineering
17.	Bridge and Tunnel Engineering
18.	Statistical Analysis with Computer Application
19.	Hydraulic Structures
20.	Sediment Transport
21.	Soil Erosion & Watershed Management
22.	Ground Water Engineering
23.	Reinforced Concrete Structure
24.	Properties of Structural Material
25.	Prestressed Concrete

Course Outline

MS/ME in Transportation Engineering

1.	Transportation Planning and Engineering
2.	Geometric Design and Highway Safety
3.	Pavement Analysis and Design
4.	Traffic Engineering
5.	Airport Planning and Design
6.	Railway Engineering
7.	Pavement Evaluation and Rehabilitation
8.	Planning for Traffic Safety and Injury Prevention
9.	Pavement Management Systems
10.	Highway construction Materials & Equipment
11.	Harbour and Dock Engineering
12.	Bridge and Tunnel Engineering
13.	Asphalt Mix Design and Construction
14.	Pavement Distress identification and Preservation
15.	Statistical Analysis with Computer Application
16.	Advance Soil Mechanics
17.	Foundation Engineering-I
18.	Foundation Engineering-II
19.	Dam Engineering
20.	Geotechnical Investigation
21.	Soil Improvement Techniques
22.	Rock Engineering
23.	Reinforced Concrete Structures
24.	Pres-tressed Concrete Structures
25.	Seismic Design of Structures
26.	Draining Engineering
27.	Application of RS & GIS in Civil Engineering
28.	Soil Erosion & watershed Management

RECOMMENDATIONS

1. Every academic institution should have an Academic Calendar to be strictly followed throughout the academic year.
2. Use of available software for engineering applications should be encouraged.
3. Internship / training of 6 weeks should be considered necessary and may contribute towards 10% Final Year Project marks. The recommended final year project marks shall be 200 to maintain uniformity.
4. HEC should plan/facilitate for writing dedicated text books for each course designed by National Curriculum Committee.
5. HEC should consider facilitating internship / training to undergraduate students through appropriate funding. HEC may pursue the public and private sector involving provincial governments to entertain a large number of students for training / internship.
6. There should be Directorate of Industrial Liaison/Placement Bureau in every engineering institution/university working in coordination with HEC to promote, facilitate training/career opportunities for its students.
7. A mechanism may be evolved for evaluation of students by external examiners at appropriate levels.
8. Participation of specialists from the industries should be ensured by HEC for future curriculum revision exercises.
9. Renowned specialists from the academia/industries may be invited as guest speakers for extension lectures covering latest developments in the field.
10. Field visits to significant installations and infrastructure facilities should be arranged for students on regular basis.

List of Social Science Courses

Universities may opt courses according to their requirement and facilities:

- 1) Sociology (Sociology and Development)
- 2) Social Anthropology
- 3) Psychology
- 4) Critical thinking
- 5) Introduction to Philosophy
- 6) Organizational Behaviour
- 7) Entrepreneurship
- 8) **Professional Ethics** (Course needed to be added)

SOCIOLOGY

Sociology and Development

Objectives: The main objective of this course is to apprise potential engineers about social factors that contribute towards enhancing their professional performance for the good of society and the country. This course is culture specific and has to be taught within the context of local and national socio-economic environment. The engineers are expected to supervise several people in different capacities and their understanding about human behaviour is critical for their optimum performance. Modification of human behaviour or getting work done from sub-ordinates and seniors remain a major challenge for all the professional engineers. This course will enhance understanding about the determinants of human behaviour, which ultimately will result in improved individual efficiency.

1. Introduction to Sociology
 - 1.1 What is sociology?
 - 1.2 Nature, Scope, and Importance of Sociology
 - 1.3 Social Interactions
 - 1.4 Social Groups
 - 1.5 Social Institutions
2. Culture and Related Concepts
 - 2.1 Definition of Culture
 - 2.2 Types of Culture
 - 2.3 Elements of Culture
 - 2.4 Role of Culture in Organization
 - 2.5 Socialization and Personality
3. Interpersonal Relations
 - 3.1 Interpersonal Behaviour
 - 3.2 Formation of Personal Attitudes
 - 3.3 Language and Communication
 - 3.4 Motivations and Emotions
 - 3.5 Public Opinion
4. Social Stratification
 - 4.1 Factors of Social Stratification
 - 4.2 Caste and class

- 4.3 Power, Prestige, and Authority
- 4.4 Social Mobility
- 4.5 Migration
- 5. Human Ecology
 - 5.1 Ecological Processes
 - 5.2 Ecosystem and energy
 - 5.3 Ecosystem and Physical Environment
 - 5.4 Solid Waste Disposal
 - 5.5 Pollution
- 6. Population Dynamics
 - 6.1 World Population Growth and Distribution
 - 6.2 Population Dynamics in Pakistan
 - 6.3 Causes and Consequences of Urbanization
 - 6.4 Population Policy in Pakistan
 - 6.5 Population and Development
- 7. Community Development
 - 7.1 Meaning, Scope, and Subject Matter of Community Development
 - 7.2 Processes of Community Development
 - 7.3 Community Development Programs in Pakistan
 - 7.4 Community Organization and Related Services
 - 7.5 Cooperation and Conflict in Community Development
- 8. Deviance and Crime
 - 8.1 Crime as a Social and Cultural Phenomenon
 - 8.2 Crime and Social Organization
 - 8.3 Organized Crime
 - 8.4 Culture Based Crime
 - 8.5 Economics of Crime
- 9. Sociology of Change and Development
 - 9.1 What is Social Change and Development?
 - 9.2 Dynamics of Social Change
 - 9.3 Role of NGOs in Development
 - 9.4 World System and Development
 - 9.5 Gender and Development

Recommended Readings:

1. Allport, G. W. (1985). *The Historical Background of Modern Social Psychology*. New York, Random House.
2. Bernard, A. and T. Burgess (2004). *Sociology*, Cambridge University Press.
3. DuBrin, A. J. (2007). *Human Relations: Interpersonal Job Oriented Skills*. New York, Prentice Hall.
4. Gardezi, H. N., Ed. (1991). *Understanding Pakistan: The Colonial Factor in Societal Development*. Lahore, Maktaba Fikr-o-Danish.
5. Hafeez, S. (1991). *Changing Pakistan Society*. Karachi, Royal Book Company. Gardezi, H. N., Ed. (1991).
6. Jones, G. W. (2005). "Why are Population and Development Issues not Given Priority?" *Asia-Pasific Population Journal* 20 (1).

7. Macionis, J. J. (1999). Sociology 7th Edition, National Book Foundation, Islamabad
8. Maser, C. (1997). Sustainable Community Development: Principles and Concepts. Florida St. Lucie Press.
9. Nelson, N. and S. Wright (1995). Power and Participatory Development: Theory and Practice. London, Intermediate Technology Publications.
10. Syed, S. H. (2003). The State of Migration and Multiculturalism in Pakistan: The Need for Policy and Strategy. Islamabad, UNESCO: 1-30.
11. Utton, A. E. (1976). Human Ecology, West View Press.
12. Webster, A. (1990). Introduction to Sociology of Development. London, Nacmillan Education Ltd.
13. Weiss, A. M. (2001). Power and civil society in Pakistan, Oxford University press.

SOCIAL ANTHROPOLOGY

Objectives: The students are expected to learn anthropological skills for application by professional engineers and other related practitioners. Societal growth needs are to be understood within our own cultural environment. Such a body of applied knowledge will result in improving the professional performance of would-be engineers. As culture and society play an important role towards all human activities, this course will help students relate technical skills to the societal needs and requirements.

- I Introduction
 1. Anthropology and Social Anthropology
 2. Fields of Anthropology
 3. Anthropological Research Methods
 4. Social Anthropology and other Social Sciences
 5. Significance of Social Anthropology

- II Culture
 1. Definition, Properties and Taxonomy
 2. Evolution of Growth and Culture
 3. Evolution of Man: Religious and Modern Perspectives
 4. Evolution of Culture
 5. Culture and Personality

- III Evolution and Growth of Culture
 1. Evolution of Man
 2. Schools of Thought in Cultural Anthropology
 3. Acculturation
 4. Enculturation
 5. Ethnocentrism and Xenocentrism

- IV Language and Culture
 1. Communication
 2. Structural Linguistics
 3. Historical Linguistics
 4. Relationship between Language and Culture

5. Ethnography
- V Economic System
1. Global Economic System
 2. The Allocation of Resources
 3. The Conversion of Resources
 4. The Distribution of Goods and Services
 5. Poverty and Inequality
- VII Marriage and Family
1. Marriage and Mate Selection
 2. The Family: Types and Functions
 3. Kinship System
 4. Structure and Function of Family
 5. Gender Relations
- VIII Political Organization
1. Political Sociology
 2. Origin of Political Organization and Organizational System
 3. Types of Political Organizations
 4. Power Politics and Factionalism in Pakistan
 5. Resolution of Conflict
- IX Religion and Magic
1. The Universality of Religion
 2. Comparative Religions
 3. Religion and Society
 4. Religious Beliefs and Practices
 5. Witchcraft and Sorcery
- XI Culture Change
1. Forms of Art
 2. Expressive Culture
 3. Process of Cultural Change
 4. Cultural Change in the Modern World
 5. Cultural Change in Pakistani society

Recommended Books:

1. Ahmad, Akbar S. 1990. Pakistani Society, Karachi, Royal Books Co.
2. Bernard, H. Russel. 1994. Research Methods in Anthropology, Qualitative and Quantitative Approaches. London: Sage Publications
3. Bodley, John H. 1994. Cultural Anthropology, California: Mayfield Publishing Co.
4. Brogger, Jan. 1993. Social Anthropology and the Lonely Crowd. New Delhi: Reliance Publishing
5. Ember, Carol R. & Ember Melvin. 2005. Anthropology, 11th ed. Englewood Cliffs: Prentice Hall, Ince. Harper and Row
6. Harris Marvin. 1987. Cultural Anthropology. New York: Harper and Row
7. Harris Marvin. 1985. Culture, People, nature; An Introduction to General Anthropology London: Harper and Row
8. Haviland, W. A. (2005). Anthropology: The Human Challenge. New York, Thomson Learning Inc.

9. Hertzler J. O. 1981. The Social Structure of Islam. Cambridge: Cambridge University Press.
10. Keesing, Roger m. 1998. Cultural Anthropology: A contemporary perspective. 3rd ed. New York: Harcourt Brace College Publishers.
11. Kottak, Conard Phillip. 2002. Anthropology: The Exploration of Human Diversity. 9th ed. Boston: McGraw Hill Higher Education.
12. Kennedy, Charles H. 1992. Pakistan London: Westview Press,.
13. Marron, Stanley. 1057. Pakistani Society and Culture. New Heaven
14. Wilson, Richard A. 1996. Human Rights, Culture and Context: Anthropological Perspective. London: Pluto Press.

PSYCHOLOGY

Course-I Understanding Psychology and Human Behaviour 3 credit hrs

- What is Psychology?
- Nature, Scope and Application with Special Reference to Pakistan
- Different Schools of Psychology
- Methods of Psychology
- Learning
- Intelligence and Artificial Intelligence
- Personality and its Assessment
- Understanding Maladjustive Behaviour
- Positive Emotional States and Processes
- Stress Management and Anger Management

Recommended Books:

1. Atkinson R. C., & Smith E. E. (2000), Introduction to Psychology (13th Ed.), Harcourt Brace College Publishers.
2. Fernald, L. D., & Fernald, P. S. (2005), Introduction to Psychology, USA: WMC Brown Publishers.
3. Hergenhahn, B. R. (2001). An Introduction to the History of Psychology, New York: Wadsworth.
4. Goodwin, C. J, (2000) Research in Psychology: Methods and Design, (3rd Ed.), New York: John Wiley & Sons.
5. Synder, C. R., & Lopez, S. J. (2007) Positive Psychology, USA, Sage Publications.
6. Allen, B. P. (1997), Personality Theories: Development, Growth and Diversity, (2nd Ed.), Boston: Allyn & Bacon.
7. Cohen, R. J., & Swerdlik, M. E. (2005) Psychological Testing & Assessment (6th Ed.), New York: McGraw-Hill.
8. Corcini, R., (2000). Current Psychotherapies. London: Thompson & Co Publishers.
9. Comer, R. J. (2004). Abnormal Psychology, USA: Freeman & Company.

- The Environment of Critical Thinking
 - Perils of Haunted Mind
 - Self and the Power of the Group
 - Subjective and Social Relativism
 - Skepticism

- Making Sense of Arguments
 - Arguments Basics
 - Patterns
 - Diagramming Arguments
 - Assessing Long Arguments

- Reasons for Belief and Doubt
 - Conflict Experts and Evidence
 - Personal Experience
 - Fooling Ourselves
 - Claims in the News

- Faulty Reasoning
 - Irrelevant Premises
 - Genetic Fallacy, Composition, Division
 - Appeal to the Person, Equivocation, Appeal to Popularity
 - Appeal to Tradition, Appeal to Ignorance, Appeal to Emotion
 - Red Herring, Straw Man

- Unacceptable Premises
 - Begging the Question, False Dilemma
 - Slippery Slope, Hasty Generalization
 - Faulty Analogy

- Deductive Reasoning: Propositional Logic
 - Connectives and Truth Values
 - Conjunction, Disjunction, Negation
 - Conditional, Checking for Validity
 - Simple Arguments, Tricky Arguments
 - Streamlined Evaluation

- Deductive Reasoning: Categorical Logic
 - Statements and Classes
 - Translations and Standard Form
 - Terms, Quantifiers
 - Diagramming Categorical Statements
 - Sizing up Categorical Syllogisms

- Inductive Reasons
 - Enumerative Induction
 - Sample Size, Representativeness, Opinion Polls
 - Analogical Induction
 - Casual Arguments, Testing for Causes
 - Casual Confusions

- Inference to the Best Explanation
 - Explanations and Inference
 - Theories and Consistency
 - Theories and Criteria
 - Testability, Fruitfulness, Scope, Simplicity
 - Conservatism

- Judging Scientific Theories
 - Science and Not Science
 - The Scientific method, Testing Scientific Theories
 - Judging Scientific Theories
 - Copernicus versus Ptolemy, Evolution Versus Creationism
 - Science and Weird Theories
 - Making Weird Mistakes
 - Leaping to the Weirdest Theory, Mixing What Seems with What is
 - Misunderstanding the Possibilities
 - Judging Weird Theories
 - Crop Circles, Talking with the Dead

Recommended Books:

1. Vaughn Lewis, 2005, The Power of Critical Thinking, Oxford University Press.
2. Paulsen David W., Cederblom Jerry:2000, Critical Reasoning, Wadsworth
3. Restall Greg. 2005, Logic: An Introduction, Routledge

INTRODUCTION TO PHILOSOPHY

3 Credit Hrs

- Definition and Nature of Philosophy
- Theory of Knowledge
 - Opinion and Knowledge
 - Plato, the Republic Selection
 - Knowledge through Reason
 - Descartes Meditation on First Philosophy
 - Knowledge through Experience
 - Hume an Inquiry concerning Human Understanding (Selection)
 - Experience Structured by the Mind
 - Kant Critique of Pure Reason (Selection)
 - Knowing and Doing
 - James Pragmatism (Selection)
 - Knowledge and Emotion
 - Jaggar Love and Knowledge (Selection)

- Philosophy of Religion
 - Proving that Existence of God
 - Anselm, Aquinas, Paley, Dawkins (Selection)
 - Justifying Religious Beliefs
 - Pascal Pensees (Selection)
 - James The will to Believe Selection
 - Freud the Future of An Illusion (Selection)
 - Confronting the Problems of Evil

- Mackie Evil and Omnipotence (Complete)
- Hick Philosophy of Religion (Selection)
- Metaphysics
 - Idealism and Materialism
 - Berkeley Three Dialogues Between Hylas and Pholonous (Selection)
 - Armstrong Naturalism, Materialism and First Philosophy (Selection)
 - The Mid-Body Problem
 - Descartes Meditations on First Philosophy (Selection)
 - O’Hear Introduction to the Philosophy of Science (Selection)
 - Dennett The Origins of Selves (Complete)
 - Pali Canon (Selection)
 - Penelhum Religion and Rationality (Selection)
- Freedom to Choose
 - Libertarianism
 - James The Dilemma of Determinism (Selection)
 - Taylor Metaphysics (Selection)
 - Determinism
 - Hospers Meaning and Free Will (Selection)
 - Skinner Walden Two (Selection)
 - Compatibilism
 - Stace Religion and the Modern Mind (Selection)
 - Radhakrishnan Indian Philosophy (Selection)
- Ethics
 - Fulfilling Human Nature
 - Aristotle Nicomachean Ethics (selection)
 - Loving God
 - Augustine The Morals of the Catholic Church and the City of God (Selection)
 - Following Natural Law
 - Aquinas Summa Theologiae (Selection)
 - Doing One’s Duty
 - Kant Fundamental Principles of the Metaphysics of Morals (Selection)
 - Maximizing Utility
 - Mill Utilitarianism (Selection)
 - Turning Values of Upside Down
 - Nietzsche Human, All too Human and Beyond Good and Evil (Selection)
 - Creating Ourselves
 - Sartre Existentialism is a Humanism (Selection)
 - Hearing the Feminine Voice
 - Gilligan In a Different Voice (Selection)
 - Baier What do Women Want in a Moral Theory (Selection)
- Political and Social Philosophy
 - The State as Natural
 - Plato the Republic (Selection)
 - Aristotle Politics (Selection)
 - The State as a Social Contract

- Hobbes Philosophical Rudiments Concerning Government and Society (Selection)
- Locke the Second Treatise of Government (Selection)
- Liberty of the Individual
- Mill On Liberty (Selection)
- Alienation in Capitalism
- Marx Economic and Philosophic Manuscripts of 1844 (Selection)
- Justice and Social Trust
- Rawls A Theory of Justice (Selection)
- Nozick Anarchy, State, and Utopia (Selection)
- Held Rights and Goods (Selection)
- Women in Society
- Wollstonecraft A Vindication of the Rights of Women (Selection)
- De Behaviour The Second Sex (Selection)
- The Value of Philosophy
- Russel The Problems of Philosophy (Selection)
- Midgley Philosophical Plumbing (Selection)

RECOMMENDED BOOKS:

1. Abel Donald C., Stumpf Samuel Enoch, 2002. Elements of Philosophy: An Introduction, 4th Ed. McGraw Hill.
2. Scruton Roger, 2001. A short History of Modern Philosophy, 2nd Ed. Routledge.

ORGANIZATIONAL BEHAVIOUR

3 Credit Hrs

- Introduction to Organizational Behaviour
 - Organizational Disciplines and topics
 - Psychological Perspective
 - Social-Psychological Perspectives
- Structure and Control in Organization
 - Introduction
 - Bureaucracy
 - Managerial Work
 - Contingency theory
 - Organizational Design
- Individual and Work Learning
 - Learning Theories
 - Learning and Work
- Stress
 - Types of Stress and Work
 - Occupational Stress Management
- Individual Differences
 - Personality and its factors
 - Personality dimensions and social learning
 - Intelligence

- Motivation and Job Satisfaction
 - Needs at Work
 - Theories of Motivation and job satisfaction
 - Correlates of Job satisfaction
 - Correlates of Job satisfaction

- Group and Work
 - Social Interaction
 - Dramaturgy and impression Management
 - Social Skill

- Group and Inter group Behaviour
 - Group Structure & Norms
 - Group Processes
 - How throne Studies

- Leadership
 - Leadership as an attribute
 - Leadership Style

- Patterns of Work
 - Work-the classical approach
 - Marx, Weber, & The critique of labour
 - Foucault & Disciplinary Power

- Conflict and Consent in Work
 - The labor Process debate
 - Work place control and resistance
 - Industrial conflict and industrial relations

- Organizational culture
 - Organizational culture and strategic management
 - Exploring organizational culture
 - Evaluating concept of culture

Recommended Books:

1. Fincham, R., & Rhodes, P. (2003), Principles of Organizational Behaviour, 3rd Oxford.
2. Noe, R., Hollenbeck, J. Gerhart, B., & Wright, P. (2006), Human Resource Management, 5th Ed., McGraw Hill.
3. Newstrom John W. (2007), Organizational Behaviour, (12th Ed), McGraw Hill.
4. Luthan Fred, (2005), Organizational Behaviour, McGraw-Hill Inc.
5. Robins, Stephen, (2005), Organizational Behaviour, McGraw-Hill Inc.

MANAGEMENT COURSES

ENTREPRENEURSHIP

Objective:

Entrepreneurship is an important component in the process of economic development. The purpose of this course is to analyse the theories of entrepreneurship and to go for case studies of successful entrepreneurs.

Course Contents:

Introduction: The concept of entrepreneurship, the economist view of entrepreneurship, The sociologist view, Behavioural approach, Entrepreneurship and Management

The Practice of Entrepreneurship: The process of entrepreneurship, Entrepreneurial Management, The entrepreneurial business, Entrepreneurship in service institutions, The new venture

Entrepreneurship and Innovation: The innovation concepts, Importance of innovation for entrepreneurship, Sources of innovative opportunities, The innovation process, Risks involved in innovation

Developing Entrepreneur: Entrepreneurial profile, Trait approach to understanding entrepreneurship, Factors influencing entrepreneurship, The environment, Socio cultural factors, Support systems

Entrepreneurship Organization: Team work, Networking organization, Motivation and compensation, Value system

Entrepreneurship and SMES: Defining SMEs, Scope of SMEs, Entrepreneurial managers of SME, Financial and marketing problems of SMEs

Entrepreneurial Marketing: Framework for developing entrepreneurial marketing, Devising entrepreneurial marketing plan, Entrepreneurial marketing strategies, Product quality and design

Entrepreneurship and Economic Development: Role of entrepreneur in the economic development generation of services, Employment creation and training, Ideas, knowledge and skill development, The Japanese experience

Case Studies of Successful Entrepreneurs

Text Books:

1. Paul Burns and Jim Dew Hurst: Small Business and Entrepreneurship
2. P. N. Singh: Entrepreneurship for Economic Growth
3. Peter F. Drucker: Innovation and Entrepreneurship Peter F. Drucker
4. John B. Miner: Entrepreneurial Success.

