DEPARTMENT OF CIVIL ENGINEERING

The Department of Civil Engineering is dedicated to produce quality professional engineers with abilities to design, manage and operate Civil Engineering based fields. These objectives are achieved through OBE (Outcome Based Education) system as per Washington Accord. The Department of Civil Engineering through outstanding faculty and state of the art lab facilities ensures that the engineers of tomorrow are not only well equipped theoretically but also have hands-on training of modern engineering tools, e.g. European made 2,000 kN Servo-Hydraulic Machine (UTM), European made flow channel, Italian made 50 kN tension/compression tri-axial machine, etc. A highly conducive environment including not only class and lab learning but also co-curricular activities, enables the student to grow professionally as well as personally & ethically.

The department is also offering graduate program in four specializations areas. There are three major research groups where the faculty is actively involved in research activities. The MS/PhD students are associated with these research groups that give them the practical experience and flavor of modern technological research.

BS Civil Engineering

■ Program Educational Objectives (PEOs)

The graduates of BS Civil Engineering program will become professionals who will:

(i) Ensure quality while applying civil engineering practices and will exhibit professional expertise at national and international level.

(ii) Enhance and improve their knowledge and skills through professional growth and development activities.

(iii) Serve the society and engineering profession in an ethical manner, considering social, environmental, national and global concerns.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS(CE) program will possess the following attributes:

(i) **Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

(ii) **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

(iii) **Design/Development of Solutions:** An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

(iv) **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

(v) **Modern Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

(vi) **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

(vii) **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

(viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

(ix) **Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

(x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective

presentations, and give and receive clear instructions.

(xi) **Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

(xii) **Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

Admission Requirements

(i) Higher Secondary School Certificate (FSc Pre-Engineering) or Equivalent with Physics, Chemistry and Mathematics securing at least 60% marks in aggregate. In case of foreign qualification, equivalence from IBCC will be required.

OR

Diploma of Associate Engineer Examination in relevant discipline securing at least 60% marks in aggregate.

(ii) CUST Admission Test/HEC Approved Test

Degree Requirements

Each candidate for the BS Civil Engineering degree is required to complete successfully 136 credit hours (Cr. Hrs.) as per the following details:

	Area	Cr. Hrs.
(a)	Natural Sciences Courses	21
(b)	Humanities Courses	15
(c)	Management Sciences Courses	08
(d)	Computing Courses	09
(e)	Foundation Courses	27
(f)	Breadth Courses	20
(g)	Depth Courses	23
(h)	Interdisciplinary Courses	07
(i)	Design Project (Part-I & II)	06
(j)	Industrial Internship	00
(k)	Survey Camp	00
(l)	Community Service	00
	Total	**136**

Natural Sciences Courses (21 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	MTCE1013	3
Engineering Geology	CE1313	3

Applied Differential Equation	MTCE1043	3
Engineering Mechanics	CE1213	3
Engineering Economics	MTCE1111	1
Probability and Statistics	MTCE3072	2
Numerical and Complex Analysis	MTCE2063	3
Geo Informatics	CE3131	1
Engineering Mechanics Lab	CE1211	1
Geo Informatics Lab	CE3191	1

■ Humanities Courses (15 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Pakistan Studies	HMCE1002	2
Islamic Studies	HMCE2012	2
Functional English	HMCE1113	3
Communication Skills	HMCE2123	3
Technical Report Writing	HMCE2133	3
Professional Ethics	HMCE4032	2

■ Management Science Courses (8 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Construction Management	CE3833	3
Hydrology and Water Resource Management	CE3543	3
Hazards and Disaster Management	CE4831	1
Hydrology and Water Resource Management Lab	CE3541	1

■ Computing Courses (9 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Computer Programming	CSCE1012	2
Civil Engineering Drawing and Graphics	CE2021	1
Quantity Surveying and Estimation	CE3033	3
Computer Programming Lab	CSCE1011	1
Civil Engineering Drawing and Graphics Lab	CE2022	2

■ Foundation Courses (27 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Civil Engineering Materials	CE1412	2
Engineering Drawing	CE1011	1
Engineering Surveying	CE1112	2
Fluid Mechanics	CE2513	3
Mechanics of Solids	CE2223	3
Construction Engineering	CE2811	1
Soil Mechanics	CE3323	3
Structural Analysis-I	CE2423	3
Civil Engineering Materials Lab	CE1411	1
Engineering Drawing Lab	CE1012	2
Engineering Surveying Lab	CE1182	2
Fluid Mechanics Lab	CE2511	1
Mechanics of Solids Lab	CE2221	1
Construction Engineering Lab	CE2891	1
Soil Mechanics Lab	CE3321	1

■ Breadth Courses (20 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Advanced Engineering Surveying	CE2122	2
Structural Analysis-II	CE3433	3
Advanced Fluid Mechanics	CE2523	3
Transportation Planning & Engineering	CE3613	3
Plain and Reinforced Concrete-I	CE3443	3
Environmental Engineering-I	CE3713	3
Advanced Engineering Surveying Lab	CE2121	1
Advanced Fluid Mechanics Lab	CE2521	1
Plain and Reinforced Concrete-I Lab	CE3441	1

Depth Courses (23 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Earthquake-resistant Design of Concrete Structures	CE4461	1
Geotechnical and Foundation Engineering	CE3333	3
Plain and Reinforced Concrete-II	CE3453	3
Highway and Traffic Engineering	CE4623	3
Environmental Engineering-II	CE4721	1
Steel Structures	CE4473	3
Hydraulics and Irrigation Engineering	CE4533	3
Earthquake-resistant Design of Concrete Structures Lab	CE4491	1
Geotechnical and Foundation Engineering Lab	CE3331	1
Plain and Reinforced Concrete-II Lab	CE3451	1
Highway and Traffic Engineering Lab	CE4621	1
Hydraulics and Irrigation Engineering Lab	CE4531	1
Environmental Engineering-II Lab	CE4791	1

Interdisciplinary Courses (07 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Basic Electrical Engineering	EECE1011	1
Basic Mechanical Engineering	MECE2011	1
Architectural and Town Planning	CE4823	3
Basic Electrical Engineering Lab	EECE1091	1
Basic Mechanical Engineering Lab	MECE2091	1

Design Project (6 Cr. Hrs)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 2 Cr. Hrs. in the 7^{th} semester of their degree program. Design Project (Part-II) of 4 Cr. Hrs. can be taken in next semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	CE4912	2
Design Project (Part-II)	CE4924	4

Industrial Internship (CE4000)

Each student is required to complete 8 weeks industrial internship training usually after 6^{th} semesters or on the completion of 90 Cr. Hrs. The internship shall be graded as pass/fail.

Survey Camp (CE4930)

Students are required to register, attend and successfully complete a minimum of 2 weeks Survey Camp following the fourth semester of their degree program. Course CE2122 is a pre-requisite for Survey Camp. A formal evaluation will be carried out and Pass/Fail grade will be awarded to the students.

Community Service (VIS3000)

Each student is required to complete 65 hours community work, usually after 1^{st} semester which would be a prerequisite for the award of degree.

CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

Program Duration

This is a four year degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Civil Engineering degree is 07 years.

SCHEME OF STUDIES
BS Civil Engineering Program

☐ Semester-I (17 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
HMCE1002	Pakistan Studies	Humanities	2
HMCE1113	Functional English	Humanities	3
MTCE1013	Calculus and Analytical Geometry	Natural Sciences	3
CE1313	Engineering Geology	Natural Sciences	3
CE1412	Civil Engineering Materials	CE Foundation	2
CE1011	Engineering Drawing	CE Foundation	1
CE1411	Civil Engineering Materials Lab	CE Foundation	1
CE1012	Engineering Drawing Lab	CE Foundation	2

☐ Semester-II (17 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
EECE1011	Basic Electrical Engineering	IDEE	1
CSCE1012	Computer Programming	Computing	2
MTCE1043	Applied Differential Equation	Natural Sciences	3
CE1213	Engineering Mechanics	Natural Sciences	3
CE1112	Engineering Surveying	CE Foundation	2
MTCE1111	Engineering Economics	Natural Sciences	1
EECE1091	Basic Electrical Engineering Lab	IDEE	1
CSCE1011	Computer Programming Lab	Computing	1
CE1211	Engineering Mechanics Lab	Natural Sciences	1
CE1182	Engineering Surveying Lab	CE Foundation	2

☐ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
HMCE2123	Communication Skills	Humanities	3
HMCE2012	Islamic Studies	Humanities	2
MECE2011	Basic Mechanical Engineering	IDEE	1

CE2223	Mechanics of Solids	CE Foundation	3
CE2513	Fluid Mechanics	CE Foundation	3
CE2122	Advanced Engineering Surveying	Breadth	2
MECE2091	Basic Mechanical Engineering Lab	IDEE	1
CE2221	Mechanics of Solids Lab	CE Foundation	1
CE2511	Fluid Mechanics Lab	CE Foundation	1
CE2121	Advanced Engineering Surveying Lab	Breadth	1

☐ Semester-IV (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
HMCE2133	Technical Report Writing	Humanities	3
CE2021	Civil Engineering Drawing and Graphics	Computing	1
MTCE2063	Numerical and Complex Analysis	Natural Sciences	3
CE2811	Construction Engineering	CE Foundation	1
CE2423	Structural Analysis-I	CE Foundation	3
CE2523	Advanced Fluid Mechanics	Breadth	3
CE2022	Civil Engineering Drawing & Graphics Lab	Computing	2
CE2891	Construction Engineering Lab	CE Foundation	1
CE2521	Advanced Fluid Mechanics Lab	Breadth	1

☐ Semester-V (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
MTCE3072	Probability and Statistics	Natural Sciences	2
CE3131	Geo Informatics	Natural Sciences	1
CE3713	Environmental Engineering-I	Breadth	3
CE3433	Structural Analysis-II	Breadth	3
CE3323	Soil Mechanics	CE Foundation	3
CE3443	Plain and Reinforced Concrete-I	Breadth	3
CE3321	Soil Mechanics Lab	CE Foundation	1
CE3441	Plain and Reinforced Concrete-I Lab	Breadth	1
CE3191	Geo Informatics Lab	Natural Sciences	1

☐ Semester-VI (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
CE3033	Quantity Surveying and Estimation	Computing	3
CE3543	Hydrology & Water Resources Management	Management	3
CE3613	Transportation Planning and Engineering	Breadth	3
CE3453	Plain and Reinforced Concrete-II	Depth	3
CE3333	Geotechnical and Foundation Engineering	Depth	3
CE3541	Hydrology & Water Resources Management Lab	Management	1
CE3451	Plain & Reinforced Concrete-II Lab	Depth	1
CE3331	Geotechnical & Foundation Engineering Lab	Depth	1

☐ Semester-VII (15 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
CE4823	Architecture and Town Planning	IDEE	3
CE4461	Earthquake-resistant Design of Concrete Structures	Depth	1
CE4623	Highway and Traffic Engineering	Depth	3
CE4831	Hazards and Disaster Management	Management	1
CE4833	Construction Management	Management	3
CE4491	Earthquake-resistant Design of Concrete Structures Lab	Depth	1
CE4621	Highway and Traffic Engineering Lab	Depth	1
CE4912	Civil Engineering Design Project (Part-I)	Design Project	2

☐ Semester-VIII (15 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
HMCE4032	Professional Ethics	Humanities	2
CE4721	Environmental Engineering-II	Depth	1
CE4473	Steel Structures	Depth	3
CE4533	Hydraulics and Irrigation Engineering	Depth	3
CE4531	Hydraulics & Irrigation Engineering Lab	Depth	1
CE4791	Environmental Engineering-II Lab	Depth	1
CE4924	Civil Engineering Design Project (Part-II)	Design Project	4

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MS Civil Engineering

■ Program Educational Objectives (PEOs)

The graduate of MS Civil Engineering will become professional, who will:

(i) Ensure quality while applying advanced civil engineering practices and will excel in professional expertise at national and international level.

(ii) Enhance and improve their in-depth analysis and investigate skills through excellence in applied research.

(iii) Serve the society and engineering profession following rules of ethics and considering social, environmental, national and global concerns.

■ Program Learning Outcomes (PLOs)

(i) **Design/Development of Solutions:** An ability to design appropriate solutions for engineering problems and design systems, components or processes that meet specified needs with the use of the modern tools.

(ii) **Investigation and Research:** An ability to investigate engineering problems at advanced levels in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

(iii) **Societal Impact and Lifelong Learning:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, cultural and environmental issues for sustainable development and solution to complex engineering problems leading to innovation and technological development.

(iv) **Communication, Ethics and Project Management:** An ability to demonstrate effective communication and management skills by applying engineering principles and rules of ethics to one's own work, as a member and / or leader in a team.

■ Admission Requirements

(i) A minimum of 16 years of education leading to BS/BE/BSc in Civil Engineering or equivalent in a relevant area.

(ii) Minimum 2.00/4.00 CGPA or 50% marks

(iii) Admission Test/HEC Approved Test

** Applicants with undergraduate degree from non-civil engineering areas may be required to take some undergraduate courses to fulfill pre-requisite deficiencies as determined by the Graduate Admission Committee. The deficiency Cr. Hrs. will not be counted towards the minimum Cr. Hrs. requirement for the award of the MS degree.*

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

(i) 24 Cr. Hrs course work with 6 Cr. Hrs Thesis

(ii) Course work only (10 Courses)

The students are required to register courses offered by the department from the list appended below:

Water Resource Engineering and Management

Course Title	Code	Cr. Hrs.
Advanced Open Channel Hydraulics	CE5103	3
Advanced Hydrology	CE5113	3
River Engineering	CE6123	3
Design of Hydraulic Structures	CE6133	3
Advanced Hydraulics	CE5143	3
Drainage and Irrigation Engineering	CE5153	3
Flood Risk Assessment	CE6203	3

Structural Engineering

Course Title	Code	Cr. Hrs.
Dynamics of Structures	CE5303	3
Fiber Reinforced Composites	CE5313	3
Computer Aided Analysis and Design of Structures	CE6323	3
Earthquake Engineering	CE6333	3
Matrix Analysis of Structures	CE5353	3
Pre-stressed Concrete theory and Practice	CE6373	3
Advanced Steel Structures	CE6403	3
Structural Fire Engineering	CE6423	3
Performance Based Seismic Design	CE6453	3
Design of Tall Structures	CE6463	3

Construction Engineering and Management

Course Title	Code	Cr. Hrs.
Advanced Construction Management	CE5803	3
Project Planning and Control	CE5813	3
Advanced Project Management for Construction Projects	CE5823	3
Construction and Safety Management	CE5833	3
Construction Contracts for Civil Engineers	CE6863	3
Sustainability in Construction Projects	CE6873	3

Environmental Engineering

Course Title	Code	Cr. Hrs.
Solid Waste Management	CE5703	3
Environmental Impact Assessment (EIA)	CE6723	3
Water Supply & Wastewater Engineering	CE6733	3
Water Quality Management	CE6743	3

Elective Courses

Course Title	Code	Cr. Hrs.
Advanced Topics in Civil Engineering	CE5003	3
Research Methods in Civil Engineering	CE6053	3
Disaster Risk Assessment and Evaluation	CE6063	3
Advanced Geotechnical Engineering	CE6503	3
Foundation Engineering	CE6523	3
Infrastructure Design and Development	CE6603	3
Pavement Evaluation and Rehabilitation	CE6613	3
Traffic Engineering	CE6623	3
Principles of Pavement Engineering	CE6633	3
Highway Planning and Design	CE6643	3
Transportation Planning and Policy Making	CE6653	3

Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	CE6916	6

CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his/her degree requirements.

Program Duration

This is normally a two years program comprising of 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Civil Engineering is 4 years.

PhD Civil Engineering

Civil Engineering is the profession that dates back with the old civilizations. It always kept on growing and developed exciting outcomes all over the world. The new trends in Civil Engineering have played a pivotal role in the new era of construction, intelligent building systems, urban development, irrigation systems, highway construction, infrastructure planning etc. All these technological advancements would not have been possible without the research in several offshoots of the Civil Engineering.

The PhD program of Civil Engineering Department, through a close liaison with industry and R&D organizations, is designed to provide excellent research environment to its PhD Scholars.

Admission Requirements

(i) MS degree in relevant discipline

(ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)

(iii) Admission Test/HEC Approved Test

(iv) Interview

Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

(i) 18 Cr. Hrs. Course Work with minimum CGPA 3.00/4.00

(ii) Comprehensive Examination (written and oral)

(iii) 30 Cr. Hrs. Research Work

(iv) Synopsis Defense

(v) Dissertation Foreign Reviews

(vi) Publication/Acceptance of at least one research paper in HEC approved journal.

(vii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters