DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

ACADEMIC PROGRAMS AND CURRICULA

(UPDATED 2020)

NORTH SOUTH UNIVERSITY

Center of Excellence in Higher Education

The First Private University in Bangladesh

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DEPARTMENT OF CIVIL AND ENVIORONMENTAL ENGINEERING

Chapter 1. Introduction

1.1 History

North South University (NSU), the first private university in Bangladesh, was established in 1992 by the then Foundation for Promotion of Education and Research (FPER), a charitable, non-profit, non-commercial and non-political organization. The FPER later was renamed as the NSU Foundation and is presently called The North South Foundation for Education and Research. The Foundation is comprised of a group of eminent industrialists, prominent patrons of education, notable philanthropists, widely experienced academics and senior civil servants of the country.

All along its history, NSU has been considered as the best private university in Bangladesh and probably the only university in the region which strictly adheres to North American academic standards. All faculty members of this university are graduates of globally reputed universities, especially from USA, Canada, UK, Japan and Australia. At present there are seventeen academic departments here under four schools; Business and Economics, Engineering and Physical Sciences, Humanities and Social Sciences, and Health and Life Sciences and seven research institutes and centers. The Department of Civil and Environmental Engineering (DCEE) belongs to the School of Engineering and Physical Sciences (SEPS).

The Bachelor of Science in Civil and Environmental Engineering (BSCEE) degree is the most modern and globally used version of the traditional Civil Engineering degree. Although, DCEE started its journey in 2013, the BSCEE curriculum was proposed in 2003 by a committee headed by the honorable member of the Board of Trustee (BoT) Mr. Benajir Ahmed. The curriculum received approval of the University Grants Commission (UGC) of Bangladesh in 2004. However, the university started enrolling students in the BSCEE program after the Bashundhara campus had been built and standard laboratory facilities had been developed. It was Summer 2013 when the first batch of students started their classes. Professor Dr. Md. Sirajul Islam was the founder Chair of the Department to embark on this endeavor. Professor Dr. Javed Bari became the second chair of the Department serving between 2015 and 2017 and consolidated the academic and extra-curricular activities of the Department. Professor Dr. Mohammad Nazmul Islam is the current chair since July 2017.

DCEE applied for accreditation of its BSCEE program to Board of Accreditation for Engineering and Technical Education (BAETE) of the Institution of Engineers, Bangladesh (IEB) in February 2018 when its first batch was being graduated in 2018 convocation. NSU's BSCEE program is the first of its kind in Bangladesh to be accredited under Outcome Based Accreditation (OBA)

manual of BAETE. It is the shortest period ever in the history of an engineering department of a private university to be awarded BAETE accreditation. The BSCEE program has officially been accredited by IEB with effect from January 2019.

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works such as buildings, roads, bridges, canals, dams, airports, sewerage systems, pipelines, and railways. Historically civil engineering is linked to knowledge of materials science, mechanics, structures, geology, soils, transportation, hydrology, environment, sanitation and other fields. Civil engineering is traditionally broken into a number of sub-disciplines viz., structural engineering, geotechnical engineering, transportation engineering, water resources engineering and environmental engineering. Besides, construction engineering, coastal engineering, earthquake engineering, surveying, material science and engineering, urban (municipal) engineering etc. fall into the broad classification of civil engineering.

The main objective of the Department of Civil and Environmental Engineering (DCEE) at NSU is to provide and equip students with the highest level of technical competencies, social responsibility, leadership and lifelong learning skills for successful careers in civil engineering. The department is equipped with high quality faculty members having academic affiliation from reputed universities in the world and professional bodies of North America. Laboratories are equipped with all the branded instruments and facilities in addition to modern classrooms, IT and library facilities.

The BSCEE graduates of NSU are fully eligible for employment and higher education in all relevant government and private entities at home and abroad as well as for getting professional membership and registration in relevant professional bodies like IEB, ASCE etc.

1.2 Vision of DCEE

The Department of Civil and Environmental Engineering (DCEE) at North South University (NSU) aspires to be a leader in providing engineering solution to sustainable infrastructure and environment. In line with this, it maintains high standard of teaching-learning system and will collaborate with industries and other stakeholders to gain national and global recognition, and will attract quality students, faculty and staff.

1.3 Mission of DCEE

The overall mission of the Department of Civil and Environmental Engineering (DCEE) at North South University (NSU) is to produce world-class engineers with technical competencies, ethical standards and leadership skills, who can have successful careers as professionals and will

contribute to the advancement of knowledge and innovation in civil engineering and similar fields. The specific missions of DCEE are as follows:

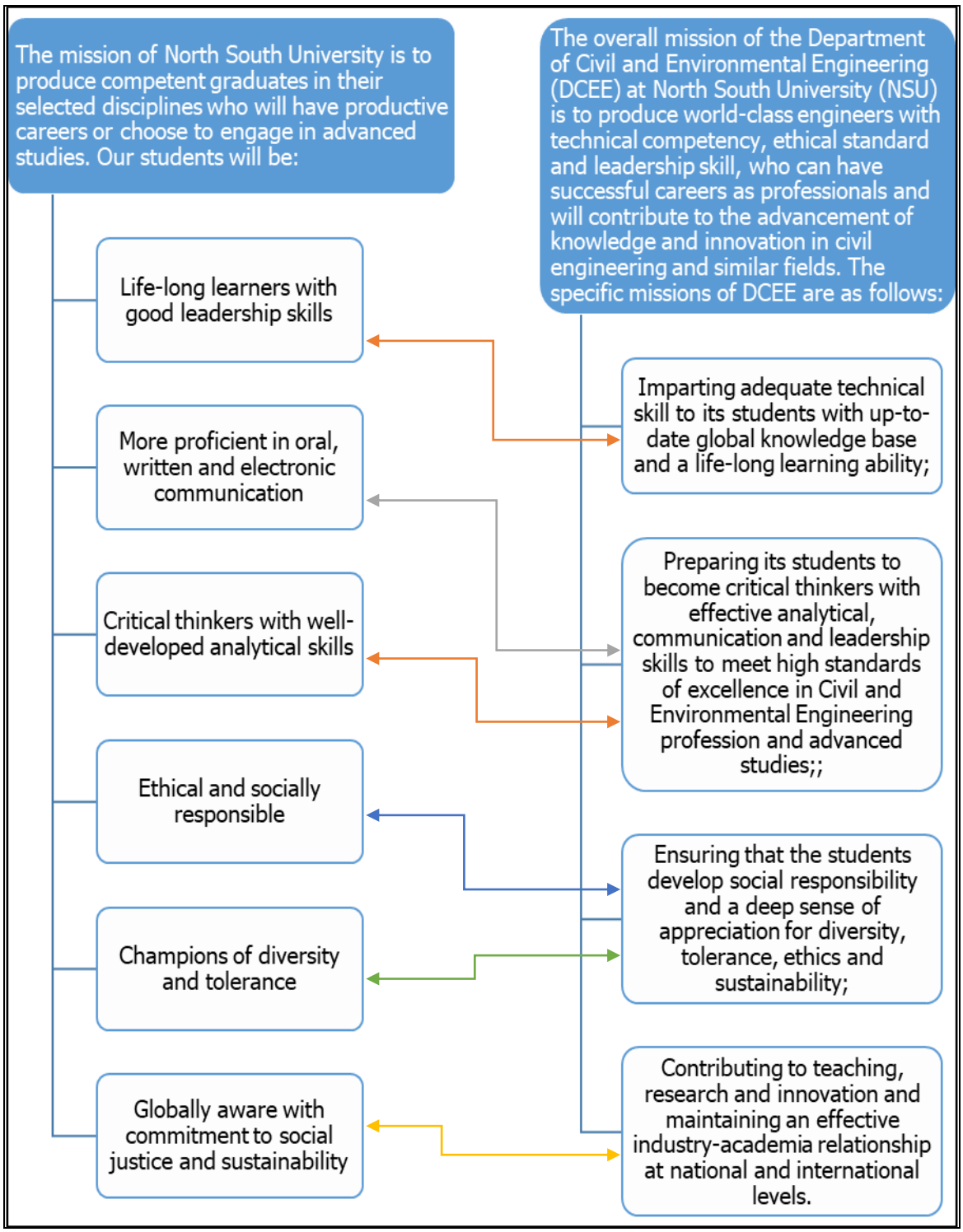
1. Imparting adequate technical skill to its students with up-to-date global knowledge base and life-long learning abilities;
2. Preparing its students to become critical thinkers with effective analytical, communication and leadership skills to meet high standards of excellence in Civil and Environmental Engineering profession and advanced studies;
3. Ensuring that the students develop social responsibility and a deep sense of appreciation for diversity, tolerance, ethics and sustainability;
4. Contributing to teaching, research and innovation and maintaining an effective industry-academia relationship at national and international levels.

1.4 Goals of DCEE

To support its vision and mission, the Department of Civil and Environmental Engineering (DCEE) at North South University has established the following goals:

1. Develop and maintain high quality degree and non-degree programs at undergraduate and graduate levels, and continuously improving its programs;
2. Provide international standard resources and facilities to support its academic programs;
3. Excel in teaching, research, innovation, consultancy and students' performance;
4. Establish and maintain excellent relationships with industry and academia;
5. Prepare students with skills in critical thinking, analysis, communication, teamwork, leadership, social awareness, diversity, tolerance, ethics and sustainability;
6. Obtain accreditation of reputed standards.

1.5 Mapping between NSU mission and DCEE mission



Chapter 2. Faculty Members

2.1 Core Faculties

Dr. Md. Sirajul Islam, Professor, Water Resources and Environmental Engineering

Ph.D. in Urban Engineering (Environmental Engineering), The University of Tokyo, Japan, 2003
M. Eng. in Civil Engineering, National University of Singapore (NUS), Singapore, 2001
B.Sc. in Civil Engineering, BUET, Dhaka, 1995
Fellow, IEB; Former UNFCCC Fellow, IPCC Expert Reviewer, Consultant ADB.

Dr. Javed Bari, Professor, Transportation Engineering and Dean, SEPS

Ph.D. in Civil Engineering, Arizona State University, USA 2005
MS in Civil Engineering, Arizona State University, USA 2001
B.Sc. in Civil Engineering, BUET, Dhaka.1993
Professional Engineer (PE), USA
Life Fellow of IEB & Member ASCE, Former faculty of Arizona State University, USA
Former Senior Engineering of Arizona Department of Transportation
Former Consultant of the World Bank and USAID

Dr. Mohammad Nazmul Islam, Professor, Structural Engineering & Chair,

Ph.D. in Civil Engineering, The University of Tokyo, Japan 2004.
M.Eng. in Civil Engineering, National University of Singapore (NUS), Singapore 2001.
B.Sc. in Civil Engineering, BUET, Dhaka, 1998.
Fellow, IEB,
Former Consultant, Snowy Mountain Engineering Corporation,
Former Staff Consultant of ADB

Brigadier General (rtd) Habibur Rahman Kamal, ndc, psc., Professor, Structural Engineering

Former Professor & Dean, Department of Civil Engineering, MIST, Mirpur Cantt., Dhaka
PhD, Preston University, California, USA
MS, Naval Post Graduate School, USA 1994
M. Sc in Civil Engineering, Bangladesh University of Engineering and Technology (BUET)
Master of Science in Development Studies, Bangladesh University of Professionals (BUP)
B.Sc. in Civil Engineering, Chittagong University of Engineering and Technology (CUET)
Advisor, Labib group
Founder Registrar, BUP, Former PD, Sajek Road Project

Dr. Nazmun Nahar P.Eng., Professor, Water Resources Engineering

Ph.D. in Civil Engineering, Purdue University, USA, 2003
M.Sc. in Civil Engineering, Purdue University, USA, 1998
B.Sc. in Civil Engineering, BUET, Dhaka, 1995
Professional Engineer (P.Eng), Canada, 2007
Fellow, IEB; Former Engineer at Associate Engineering and Urban Systems (Canada)
Former Faculty at British Columbia Institute of Technology (BCIT), Canada
Former Ad – Hoc Faculty, Idaho State University (2016-2017)

Dr. Md. Shoaib Chowdhury, Professor, Transportation Engineering

Ph.D. in Transportation, New Jersey Institute of Technology (NJIT), USA, 2000
M.E. in Civil Engineering, The City College of New York (CCNY), USA, 1996
B. Sc. in Civil Engineering, BUET, Dhaka, 1991
Professional Engineer (PE), New York, USA
Fellow, ASCE & Member, Sigma-Xi
Former Senior Engineer and Professional Associate, Parsons Brinckerhoff, USA
Former TA (Engineer), SWMC (now IWM), Dhaka
Former Adj. Associate Professor, CCNY, USA
Former Adj. Faculty, NJIT, USA

Dr. Nadim Reza Khandaker, Associate Professor, Environmental Engineering

Ph.D. in Environmental Engineering, Pennsylvania State University, USA 1995
MSc in Environmental Engineering, University of Arkansas, USA 1991
BSE in Chemical Engineering, University of Massachusetts at Lowell, USA 1986
Professional Engineer (P.Eng), Ontario Canada and New Brunswick Canada
Research Engineer Sandia National Lab USA.
Research advisor Ontario Clean Water Agency Canada
Associate Research Professor University of New Mexico USA
Research Scholar University of Arizona, USA and McGill University, Canada

Dr. Shama E. Haque, Associate Professor, Environmental Engineering

Ph.D. in Environmental Science and Engineering, University of Texas at Arlington, USA, 2007
B.S. in Civil Engineering, The University of Texas at Austin, USA, 1995
Postdoctoral Research Fellow, The University of British Columbia, Canada
Postdoctoral Research Fellow, University of Saskatchewan, Canada
Former Env. Scientist/Geochemist in Training, Amec Earth & Environmental Ltd, Canada
Editor: Groundwater for Sustainable Development (Elsevier)

Dr. Minhaz M. Shahriar, Assistant Professor, Geotechnical Engineering

Ph.D. in Engineering (Geotechnical), 2017, Louisiana Tech University, Ruston, LA, USA
MS in Civil Engineering, 2015, Louisiana Tech University, Ruston, LA, USA
BS in Civil Engineering, 2009, Ahsanullah University of Science Technology, Dhaka, Bangladesh

Dr. S.M. Ashfaqul Hoq, Assistant Professor, Structural Engineering

Ph.D., University of Wyoming, USA
MSc in Civil Engineering, The University of Texas at Arlington (UTA), TX, USA
B.Sc. in Civil Engineering, BUET, Dhaka

Bushra Marium Islam, Lecturer
M. Sc. In Civil Engineering, New Jersey Institute of Technology
B.Sc. in Civil Engineering, the University of Asia Pacific, Bangladesh

2.2 Faculty Members on Study Leave

Ms. Sifat Kalam, Lecturer, Environmental Engineering

Ph.D. (ongoing), University of British Columbia (UBC), Canada
M.A.Sc. in Civil Engineering, University of British Columbia (UBC), Canada
B.Sc. in Civil Engineering, BUET, Dhaka

2.3 Part Time Faculty Members

Dr. Asif Mohammed Zaman, Associate Professor, Water Resources Engineering

Managing Director, Esolve International & Environmental Consultant World Bank
Ph.D. in Water Resources Management, University of Melbourne, Australia
M.Eng.,in Environmental & Earth Resource Engineering, Imperial College London, UK

Dr. Shoeb Reaz Alam, Assistant Professor

Additional Deputy Inspector General Bangladesh Police &
Ph. D. in Civil Engineering, Lamar University, Texas, USA
M.Sc.in Civil Engineering, Lamar University, Texas, USA
B.Sc. in Civil Engineering, BUET, Dhaka

2.4 Visiting Faculty Members

Dr. Farhad Reza, P.E., Professor, Structural Engineering

Professor, Department of Mechanical and Civil Engineering, Minnesota State University
Ph.D. in Civil Engineering, Clarkson University, Potsdam, New York.
M.Sc. in Civil Engineering, Clarkson University, Potsdam, New York.
B.Sc. in Civil Engineering, University of Iowa, Iowa City, Iowa
Professional Engineer (P.E.), USA

2.5 Laboratory Staff

Ms. Khadiza Akter, Lab Officer

B.Sc. in Civil Engineering, Dhaka University of Engineering & Technology (DUET)
Diploma in Architecture, Mohila Polytechnic Institute, Dhaka
Member of IEB, RAJUK enlisted Engineer

Khandaker Moniruzzaman, Assistant Officer (Lab)

M.Sc. in Urban and Regional Planning (URP) (Ongoing), BUET, Dhaka
B.Sc. in Civil Engineering, Ahsanullah University of Science & Technology, Dhaka
Member of IEB

Anwar Hossain, Assistant Officer (Lab)

B.Sc. in Civil Engineer, University of Asia Pacific, Dhaka
Diploma in Civil, Feni Polytechnic Institute.

Md. Abdul Jalil, Assistant Officer (Lab)

B.Sc. in Civil Engg., University of Information Technology and Sciences (UITS)

PART TWO: UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE

IN CIVIL AND ENVIRONMENTAL ENGINEERING

Chapter 1. Overview of BSCEE

1.1 Preamble

The Bachelor of Science in Civil and Environmental Engineering (BSCEE) degree is the most modern and globally used version of the traditional Civil Engineering. The BSCEE program of North South University (NSU) strictly follows the Outcome-based Education (OBE) protocol outlines by the Washington Accord, USA's Accreditation Board for Engineering and Technology (ABET) and Board of Accreditation for Engineering and Technical Education (BAETE) of the Institution of Engineers, Bangladesh (IEB). The BSCEE program is approved by the University Grants Commission of Bangladesh and fully accredited by BAETE of IEB following its OBE manual.

The curriculum is a 149 credit hour program, but there are another 9 credit hours of orientation courses, of which 6 credit hours are not counted toward CGPA calculation. The rest 3 credit (ENG102) is counted, but might be waived with a good background in English demonstrated in the Admission Test or SAT exam. All students need to take Internship as a mandatory requirement (effective for Fall 2016 batch onwards) and all students must take Capstone Design course spanning over a period of one year (three semesters). The Undergraduate Research is an optional course to be selected out of a good number of elective courses. The curriculum has been modified six times since 2013 to meet the global trends and market needs.

Adopting Outcome Based Education (OBE) in line with the requirements outlined by BAETE and ABET, DCEE has set its PEO and PO that are consistent with the NSU mission statements. The following sections outline them.

1.2 Program Educational Objectives (PEO) of BSCEE program

The general objective of the BSCEE degree program administered by DCEE is to prepare graduates to become successful in their chosen career paths. Specifically, the graduates of the program will be able to:

1.2.1 PEO-1:

Successfully apply analytical skills with critical thinking using mathematical, scientific and engineering principles in formulating and solving civil engineering problems;

1.2.2 PEO-2:

Work competently in diverse career choices on engineering decision-making and sustainable design covering one or more core civil engineering disciplines;

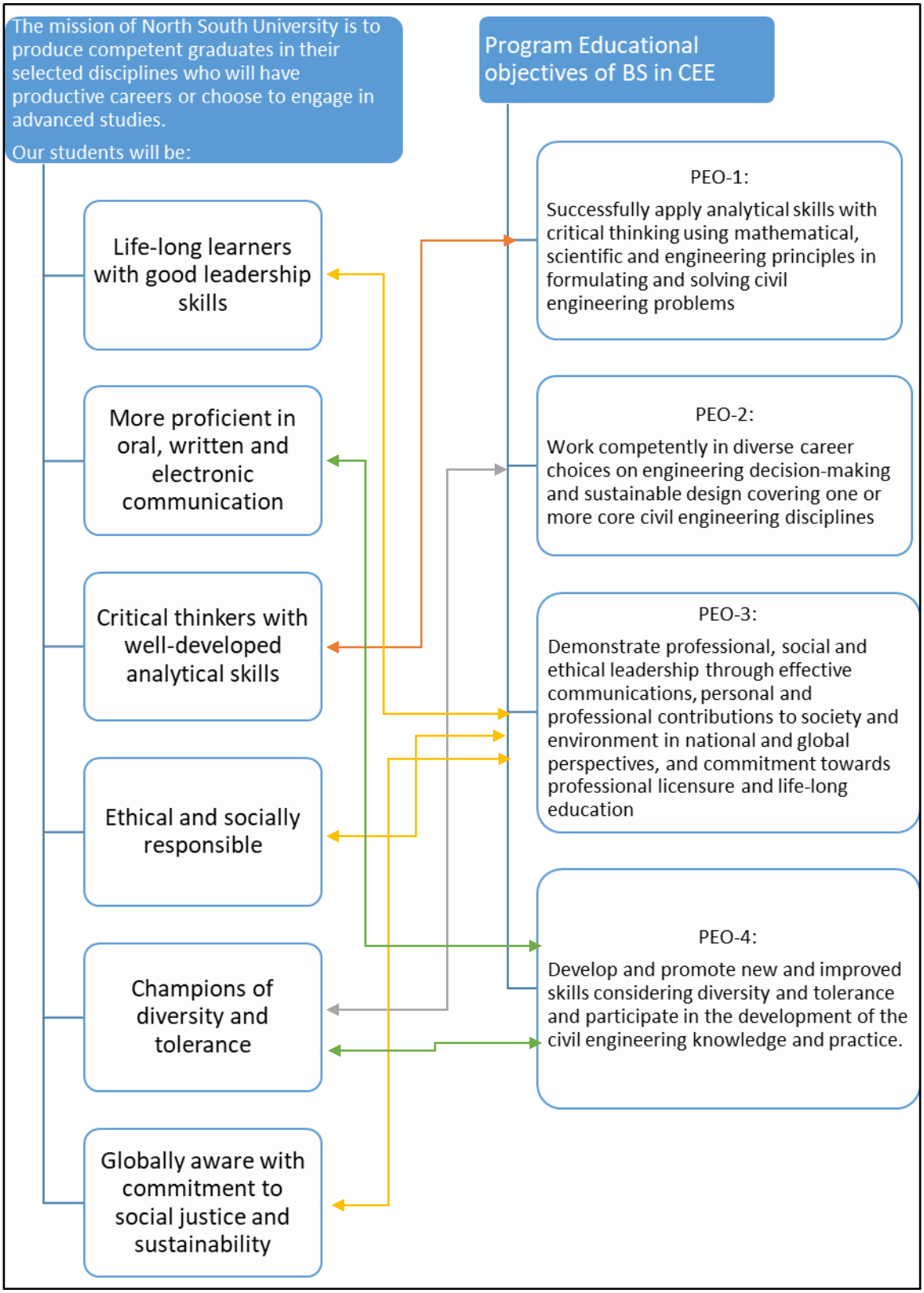
1.2.3 PEO-3:

Demonstrate professional, social and ethical leadership through effective communications, personal and professional contributions to society and environment in national and global perspectives, and commitment towards professional licensure and life-long education;

1.2.4 PEO-4:

Develop and promote new and improved skills considering diversity and tolerance and participate in the development of the civil engineering knowledge and practice.

1.3 Mapping between NSU mission and PEOs of BSCEE



1.4 Relationship between BSCEE Curricular Elements and PEOs

Curricular Elements	Credit hours	PEO 1	PEO 2	PEO 3	PEO 4
Mathematics	18	***	**		*
Basic and applied sciences	24	***	**		*
Arts and Social Science	12	*	*	**	*
Engineering Tools	31	***	***	***	**
Civil Engineering Core	49	***	***	**	**
Civil Engineering Electives	12	**	***	*	***
Capstone Design	3	*	**	*	***
Internship	0	*	**	***	**
Total	149				

Note: *slightly, **moderately, ***highly relevant

1.5 BSCEE Program Outcomes (POs) and related PEOs

1.5.1 (a) Engineering knowledge:

Apply knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialization as specified in K1 to K4 respectively to the solution of **complex engineering problems.**

1.5.2 (b) Problem analysis:

Identify, formulate, research literature and analyse **complex engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (K1 to K4)

1.5.3 (c) Design/development of solutions:

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. (K5).

1.5.4 (d) Investigation:

Conduct investigations of **complex problems** using research-based knowledge (K8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

1.5.5 (e) Modern tool usage:

Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to **complex engineering problems**, with an understanding of the limitations. (K6)

1.5.6 (f) The engineer and society:

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 solutions to **complex engineering problems**. (K7)

1.5.7 (g) Environment and sustainability:

Understand and evaluate the sustainability and impact of professional engineering work in the solution of **complex engineering problems** in societal and environmental contexts. (K7)

1.5.8 (h) Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (K7)

1.5.9 (i) Individual work and teamwork:

Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

1.5.10 (j) Communication:

Communicate effectively 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.

1.5.11 (k) Project management and finance:

Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

1.5.12 (l) Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

1.5.13 (m) Contemporary Issues

Demonstrate sound knowledge on global and local contemporary civil engineering issues.

1.6 Knowledge Profile

	Attribute
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Engagement with selected knowledge in the research literature of the discipline

1.7 Range of Complex Engineering Problem Solving

Attribute	Complex Engineering Problems have characteristic P1, and some or all of P2 to P7:
Depth of knowledge required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting requirements	P2: Involve wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues
Extent of applicable codes	P5: Are outside problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and conflicting requirements	P6: Involve diverse groups of stakeholders with widely varying needs
Interdependence	P7: are high-level problems including many component parts or sub-problems

1.8 Range of Complex Engineering Activities

Attribute	Complex activities mean (engineering) activities or projects that have some or all of the following characteristics:
Range of resources	A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
Level of interaction	A2: Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	A3: Involve creative use of engineering principles and research based knowledge in novel ways
Consequences for society and the environment	A4: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches

1.9 Group-wise Distribution of Courses

Group No.	Course Group	Credit hours	Percent
	University and School Core courses (63 credits, 57 counted)		
1	Orientation (9 credits, 3 counted)	9	6%
2	Mathematics	18	11%
3	Basic and applied sciences	24	15%
4	Arts and Social Sciences	12	8%
	Program Core Courses (83 credits)		
5	Engineering Tools	31	20%

6	Civil Engineering Core	49	31%
7	Capstone Design Project	3	2%
	Elective Courses (12 credits)		
8	Civil and Environmental Engineering Electives	12	8%
9	Internships	0	0%
	Total graduation requirement	158	

1.10 Year-wise Distribution of Courses

	Year	Credits	Number of courses
1	Freshman	42	13 Th. + 3 lab.
2	Sophomore	43	13 Th. + 4 lab.
3	Junior	40	12 Th. + 4 lab.
4	Senior	33	9 Th. + 3 lab.+ Proj. + Int.
	Total graduation requirement	158	

1.11 Course Groups

1.11.1 Orientation courses: (non-credit)

Course Code and Title	Credit hours
CEE100 Introduction to Civil & Environmental Engineering	3
MAT116 Pre-calculus	3
ENG102 Introduction to Composition	3

1.11.2 Mathematics, Credit hours = 18

Course Code and Title	Credit hours
MAT120 Calculus and Analytic Geometry I	3
MAT130 Calculus and Analytic Geometry II	3
MAT 250 Calculus and Analytic Geometry-IV	3
MAT361 Introduction to Probability and Statistics	3
MAT125 Linear Algebra	3
MAT350 Engineering Mathematics	3

1.11.3 Basic & Applied Sciences, Credit hours = 24

Course Code and Title	Credit hours
ENV107 Environmental Science	3
PHY107 Physics I	3
PHY107L Physics Lab. I	1
PHY108 Physics II	3
PHY108L Physics Lab. II	1
CHE120 Inorganic chemistry (or CHE 101 Chemistry I)	3

CHE120L Inorganic chemistry Lab. (CHE 101L Chemistry I Lab.)	1
CEE209 Environmental Chemistry	3
CEE260 Hydrology	3
ENV311 Geology and Geomorphology	3

1.11.4 Arts and Social Sciences, Credit hours=12

Course Code and Title	Credit hours
Mandatory 9 credits	
ENG103 Intermediate Composition	3
BEN205 Bangla Language and Literature	3
HIS103 Emergence of Bangladesh	3
Elective 3 credits; one from the following list	1
ECO101, SOC101, PSY210, POL210, LAW200, MGT210, PHI101, ENG105	3

1.11.5 Engineering Tools, credit hours = 31

Course Code and Title	Credit hours
CEE110 Computer Aided Drawing (CAD) for Engineers	3
CEE215 Numerical Analysis & Computer Programming	3
CEE210 Engineering Mechanics	3
CEE211 Fluid Mechanics	3
CEE211L Fluid Mechanics Lab.	1
CEE212 Solid Mechanics	3
CEE212L Solid Mechanics Lab.	1
CEE213 Surveying & Introduction to GIS	3
CEE213L Surveying & Introduction to GIS Lab	1
CEE214 Engineering Materials	3
CEE214L Engineering Materials Lab.	1
CEE310 Quantity Survey and Cost Estimates	3
CEE415 Socioeconomic Aspects of Development Projects	3

1.11.6 Civil Engineering Core, credit hours = 49

1.11.6.1 Structural Engineering, credit hours =14

Course Code and Title	Credit hours
CEE330 Structural Analysis and Design - I	3
CEE330L Structural Analysis and Design Lab	1
CEE331 Structural Analysis and Design – II	3
CEE335 Reinforced Concrete Design - I	3
CEE335L Reinforced Concrete Design Lab.	1
CEE430 Reinforced Concrete Design - II	3

1.11.6.2 Geotechnical Engineering, credit hours =7

Course Code and Title	Credit hours
CEE240 Introduction to Soil Mechanics & Foundation Engineering	3
CEE240L Soil Mechanics Lab	1
CEE340 Advanced Foundation Engineering	3

1.11.6.3 Transportation Engineering, credit hours =7

Course Code and Title	Credit hours
CEE250 Introduction to Transportation Engineering	3
CEE250L Transportation Engineering Lab	1
CEE350 Traffic Analysis and Design	3

1.11.6.4 Water resources Engineering, credit hours =7

Course Code and Title	Credit hours
CEE360 Open-Channel Hydraulics	3
CEE360L Open-Channel Hydraulics Lab	1
CEE460 Groundwater Hydraulics	3

1.11.6.5 Environmental Engineering, credit hours = 14

Course Code and Title	Credit hours
CEE 271L Environmental Engineering Lab. I	1
CEE370 Water Supply and Treatment	3
CEE 371L Environmental Engineering Lab. II	1
CEE373 Sanitation and Wastewater Engineering	3
ENV373 Environmental Impact Assessment	3
CEE470 Solid and Hazardous Waste Engineering	3

1.11.7 Capstone Design Project, credit hours=3

Course Code and Title	Credit hours
CEE499A Engineering Project I	1
CEE499B Engineering Project II	1
CEE499C Engineering Project III	1

1.11.8 Civil and Environmental Engineering Elective courses: credit hours=12

1.11.8.1 GROUP A: Structural Engineering

Course Code and Title	Credit hours
CEE431 Introduction to Structural Dynamics	3
CEE432 Composite Structures	3
CEE433 Finite Element Methods	3
CEE434 Advanced Reinforced Concrete Design	3
CEE435 Prestressed Concrete	3
CEE437 Behavior and Design of Metal Structures	3
CEE439 Earthquake-resistant Design	3

1.11.8.2 GROUP B: Geotechnical Engineering

Course Code and Title	Credit hours
CEE441 Advanced Geotechnical Engineering	3
CEE442 Earthen Dam and Slope Stability	3
CEE443 Earth Retaining Structures	3
CEE444 Advanced Soil Mechanics	3

1.11.8.3 GROUP C: Transportation Engineering

Course Code and Title	Credit hours
CEE450 Road and Traffic Safety Engineering	3
CEE452 Pavement Analysis, Design and Construction	3
CEE454 Advanced Traffic Engineering	3
CEE458 Transportation Systems Engineering and Planning	3
CEE459 Geometric Analysis and Design of Roads	3

1.11.8.4 GROUP D: Water Resources Engineering

Course Code and Title	Credit hours
CEE463 Integrated Water Resources Planning and Management	3
CEE465 River Engineering	3
CEE467 Irrigation and Drainage Engineering	3
CEE473 Coastal and Estuarine Analysis	3
CEE475 Water Resources and Environmental Modelling	3

1.11.8.5 GROUP E: Environmental Engineering

Course Code and Title	Credit hours

CEE477 Ecological Engineering	3
CEE479 Air Quality Engineering	3
CEE471 Pollution Control	3
CEE472 Climate Change and Disaster management	3
CEE474 Green Building and Infrastructure	3

1.11.8.6 GROUP F: Special Topic

Course Code and Title	Credit hours
CEE410 Construction Engineering	3
CEE425 GIS and Remote Sensing	3
CEE426 Urban Planning	3
CEE427 Advance Procurement Systems	3
CEE490 Special Topic	3
CEE492 Undergraduate Research	3

1.11.9 Internship: credit hours=0

Course Code and Title	Credit hours
CEE498 Internship	0

1.12 Course Mapping

Year	Semester	Courses to be taken									Semester credits	Total credits: semesters*	Year Credits	Total credits: Years*
Freshman Year	Semester one	CEE 110	CEE 100						ENG 102	MAT 116	12	12	38	38
	Semester two			CHE 120	CHE 120L			ENV 107	ENG 103	MAT 120	13	25		
	Semester Three			CEE 210			PHY 107	PHY 107L	BEN 205	MAT 130	13	38		
Sophomore year	Semester one	CEE 213	CEE 213L	CEE 214			PHY 108	PHY 108L		MAT 250	14	52	44	87
	Semester two		CEE 214L	CEE 212		CEE 211	CEE 211L		HIS 103	MAT 125	14	66		
	Semester Three			CEE 212L		CEE 260	CEE 209	ENV 311	CEE 215	MAT 361(or MAT 140)	16	82		
Junior Year	Semester one	CEE 310		CEE 240L	CEE 240	CEE 250	CEE 250L			MAT 350(or MAT 260)	14	96	43	125
	Semester two			CEE 330	CEE 340	CEE 350		CEE 370	SOC101/ POL210/		15	111		
	Semester Three			CEE 335	CEE 360L	CEE 360	ENV 373	CEE 373	CEE 271L		14	125		
Senior Year	Semester one	CEE 415	CEE 330L		CEE 430	CEE 335L		CEE 470	CEE 371L	CEE 499 A	13	138	33	158
	Semester two			CEE 331		CEE 460		Elective 1		CEE 499 B	10	148		
	Semester Three		Elective 2		Elective 3		Elective 4		CEE 498	CEE 499 C	10	158		
											158	158	158	158

* Total credits to be finished at the end of a certain semester/year

Chapter 2. Course Descriptions

2.1 Orientation courses

CEE100 Introduction to Civil and Environmental Engineering

History and development of Civil and Environmental Engineering, Five major divisions under Civil and Environmental Engineering and activities under each division, discussion about the Scope & Pattern of Job as a Civil and Environmental Engineer. Civil and Environmental Engineering, codes, ethics and professional responsibilities and issues related to sustainable development.

ENG102 Introduction to Composition

Continued work on analytic reading and on fluency and control of the writing process. Development of expressive, persuasive and referential writing with emphasis on planning, organization, cohesion and coherence. 3 credits (if taken, 3-credits counted, or may we waived based on Admission Test score)

MAT116 Pre-Calculus

Topics includes sets. real numbers system, algebraic expressions, systems of equations, functions and relations, quadratic functions, synthetic division, the zeros of a polynomial function, exponential and logarithmic functions, trigonometric functions, graphs of trigonometric functions, analytic trigonometry, additional applications of trigonometry, mathematical induction, the binomial theorem, sequences. 3 credits (Non-credit)

2.2 Mathematics

MAT120 Calculus and Analytic Geometry-I

A first course in calculus and analytic geometry. Coordinates, Graphs and Lines; Functions and Limits; Differentiations; Application of Differentiation; Integration; Logarithmic and Exponential Functions. Pre-requisite: MAT116/ECO101/ENV107 3 credits

MAT130 Calculus and Analytic Geometry-II

Second course in calculus and analytic geometry. Applications of Definite Integral; Hyperbolic Functions, Inverse Trigonometric and Hyperbolic Functions; Techniques of Integration;

Improper Integrals: L'Hospitals Rule; Topics of Analytical Geometry; Polar Coordinates ad Parametric Equations. Pre-requisite: MAT120. 3 credits

MAT250 Calculus and Analytic Geometry IV

Partial Derivatives: Functions of two variables, limits and continuity, partial derivatives, differentiability and chain rule, directional derivatives and gradients, tangent planes and normal vectors, maxima and minima of functions of two variables. Multiple Integrals: Double integrals, double integrals over non-rectangular regions, double integrals in polar coordinates, triple integrals, centroid, center of gravity, triple integrals in cylindrical and spherical coordinates, change of variables in multiple. Topic in vector calculus: Vector fields, line integrals, Green's theorem, surface integrals, the divergence theorem, stokes theorem. Pre-requisite MAT130. 3 credits

MAT361 Probability and Statistics

Introduction to Statistics, Descriptive Statistics, summarizing data sets, Markov, Chebyshev's inequality, the sample correlation coefficient. Elements of Probability, Types of random variables, jointly distributed random variables, expectation, conditional distributions, computing probability and expectation by conditioning, variance, covariance, moment generating functions. Special Random Variables- Bernoulli, binomial, Poisson, hypergeometric, uniform, normal exponential, gamma distribution, distributions arising from the normal-the chi square distribution, the t-distribution, the F-distribution. Distributions of Sampling Statistics, Parameter Estimation, Hypothesis Testing, Regression analysis and distribution of its parameters. Pre-requisite: MAT250. 3 credits

MAT125 Introduction to Linear Algebra

Basic concepts and techniques of linear algebra; includes system of linear equations, matrices and inverses, determinants and a glimpse at vector spaces, eigenvalues and eigenvectors, Markov processes. Pre-requisite: MAT116. 3 credits

MAT350 Engineering Mathematics

First order ordinary differential equations, linear differential equations with constant coefficients, Laplace transformations, power- series solutions of differential equations, Bessel functions. Pre-requisite: MAT250. 3 credits

2.3 Basic & Applied Sciences

ENV107 Environmental Science

Man and environment. Major components of the environment. Brief history of earth; bio-geo-chemical cycles. Population and the environment: basic population dynamics. Biosphere: ecological concepts and ecosystems; flow of matter and energy through an ecosystem; biodiversity. Lithosphere: agriculture and environment: urbanization; solid and hazardous waste management. Atmosphere: chemistry of air; urban air pollution; acid rain; global warming; ozone layer depletion. Hydrosphere: water chemistry; water pollution and treatment; wetland and coastal management. Alternative energy sources. Environmental health and toxicology. Sustainable development. 3 credits

PHY107 General Physics I

Vectors, equations of motions, Newton's laws, conservation laws of energy, linear momentum, Work-Energy theorem, extension of linear into rotational motion including the conservation laws, gravitation, simple harmonic motion, travelling waves, calorimetry, thermal equilibrium, 1st and 2nd laws of thermodynamics. Pre-requisite: MAT120. 3 credits

PHY107L Physics Lab. I

Introduction to Measurements and Statistical Error, Force table, Atwood machine, Hook's law, Mass-spring oscillation, Simple pendulum, Compound pendulum and Static equilibrium. Pre-requisite: MAT120. 1 credit

PHY108 General Physics II

Electricity and Magnetism: Coulomb's Law, Electric field and Gauss's Law, Potential, Capacitance field, Magnetic forces, Induced Electromotive force, AC circuit. Electric Field and Potential:- Conceptually, Electric Field and Potential Discrete System , Electric Field and Potential:- Continuous System, Electric Field and Potential:- Gauss's Law, Capacitors and Capacitance, Dielectric, Ohm's Law, Circuit Theory, Magnetic Force I, Magnetic Force II, Biot-Severt Law, Ampere's Law, Inductance I, Inductance II, Alternating Fields and Current I, Alternating Fields and Current II, Maxwell's Equation, Magnetic Properties of Matter. Prerequisite PHY107 and MAT130. 3 credits

PHY108L Physics Lab. II

Introduction to electric equipment, Verification of Ohm's law, Charging and Discharging of capacitor, Time constant of a Circuit with resistor and capacitor in series and Magnetic induction. Prerequisite PHY107. 1 credit

CHE120 Inorganic Chemistry

Atomic Structure, Periodic Table, Chemical Bonds, Physical and Chemical Properties of Water, Different types of solution, Concentration Unit, Chemical Equilibrium and Thermo-Chemistry, Reaction Kinetics, Colloid and Colloidal Solution, Chemical Corrosion, Chemical of Environmental Pollution, Polymer Paint and Varnishes. 3 credits, Prerequisites: MAT 116

CHE120L Inorganic Chemistry Lab

Laboratory safety practices; basic laboratory techniques; pH measurements; acid base titration, precipitation reactions; solution, colloids and suspensions; limiting reagents; introduction to analytical chemistry (sprectrophotometer analysis) and acquisition / interpretation of data; determination of the weight of acetaminophen tablets. 1 credit. Prerequisites: MAT 116

CHE 101: Chemistry I

This course covers fundamental principles of chemistry. Topics include measurement, atomic and molecular structure, periodicity, chemical reactions, chemical bonding, stoichiometry, thermochemistry, Chemical equilibrium and kinetics, gas laws and solutions. This course is appropriate as a basic chemistry course or as a science elective for students who have science, engineering, or mathematics majors. Upon completion, students will be able to- define chemistry as the study of matter, can apply the basic concepts in their future studies and apply safe laboratory skills to solve problems in a cooperative environment. 3 credits.

CHE 101L: Chemistry Lab. I

Introducing analytical balance, proving the law of definite proportions, estimation of Avogadro's number, standardization of HCl, acid-base titration, determination of density. 1 credit.

CEE209 Environmental Chemistry

A fundamental application of chemical principles to the study of the environment; Key themes are the interaction between life and the environment, air and air pollution, water and water pollution, soil and soil pollution, radioactivity, and how this knowledge is used by the regulatory

agencies; A group project focusing on a selected contemporary environmental issue and training in oral presentation. Pre-requisite: ENV 107, CHE 101/ CHE 120. 3 credits.

CEE209L Environmental Chemistry Lab.

Laboratory methods and instrumental techniques in environmental chemical analysis; Sampling of pollutants in air, water and land; Measurements of biogeochemical parameters of various environmental samples following standard protocols; Interpretation of results with regard to environmental engineering applications. Pre-requisite: ENV 107, CHE 101/ CHE 120

CEE260 Hydrology

Introduction to the global water and energy cycles and the earth system including the atmosphere, oceans, land, and biosphere. Fundamentals of hydrologic science and its applications. Covers basics of the hydrologic processes such as precipitation, evaporation, transpiration, infiltration, and storm runoff, hydrograph & unit hydrograph. Understanding of groundwater flow, hydraulics of wells, Probabilistic analysis and risk estimation for hydrologic variables. Prerequisite CEE211. 3 credits.

ENV311 Geology & Geomorphology

Rocks and minerals: identification of rocks and minerals; common rock forming mineral; physical properties of minerals; mineraloid rocks; types of rocks; cycle of rock change. Structural geology: faults; type of faults; fold and fold type; domes; basin, erosion process; analysis of erosion land forms; earthquake and seismic map of Bangladesh; geology of Bangladesh. Fluvial processes in geomorphology: channel development, channel widening, valley shape, stream terraces; alluvial flood plains; deltas and alluvial fans; fluvial deposits, coastal deposits, glacial deposits, lacustrine deposits and Aeolian deposits, river basin; geomorphologic characteristics of rivers of Bangladesh. 3 credits.

2.4 Arts and Social Sciences

2.4.1 Mandatory courses: 9 credits

ENG103 Intermediate Composition

Continued work on analysis reading and on fluency and control of the writing process. Development of expressive, persuasive and referential writing with emphasis on planning, organization, cohesion and coherence. Prerequisite ENG102. 3 credits.

BEN205 Bangla Language and Literature

Styles of prose, standard, colloquial and dialect are taught. Review and practice of basic and syntax and introduction to language skills; and development of integrated language skills with special focus on the mechanics of the language, important aspects of grammar and vocabulary. This course will aim to show the trend of Bengali literature in the last 100 years by exposing the students to the popular work of major Bengali poets, short story writers, novelists and essayists. 3 credits.

HIS103 Emergence of Bangladesh

Bengal to Bangladesh, Geographical Features, Land and People; Map, Political Background of Partition of India 1947, Language Movement (1948 and 1952), Background, Role of Students, 21st February 1952, Foundation of the Awami League, Election of 1954 and the United Front (Jukto Front), 21 Points Movement, Constitution of 1956, Nature, Difficulties in implementation, Military Rule in 1958 and the Basic Democracy of Ayub Khan, Failure of Democracy and the Rise of, Authoritarian Government, Principle of Controlled Democracy, Constitution of 1962, Principal Features, Provincial Autonomy Question, Struggle for Autonomy, East Pakistan's Movement for provincial Autonomy and Political and Economic Rights. 3 credits

2.4.2 Electives: 3 credits

SOC101 Introduction to Sociology

Examination of how societies grow and change; reciprocal effects of economic, political, familial and scientific institutions on each other and on individual life; changes and social conflict, problems of bureaucratic growth and planned and unplanned social change. 3 credits.

LAW 200 Legal Environment of Business

Examines the nature, formation and application of legal principles in business. Topics include the roles of law in society; the legal environment in which business operates, particularly government taxation; the regulation of commerce competition and labour-management relations and the concepts of property: its creation, transfer and importance to our business society. 3 credits

POL210 Human Rights & Politics

History and development of ideas concerning human rights; analysis of fundamental or basic rights; comparative perspectives on human rights. This course will also include attention to many of the following topics; rights of woman and children; human rights from the perspectives

of national and international law; the variety of rights; political, economic, social and cultural; individual and collective rights; the right to national self- determination and the right to secede; cases in which human rights conflict with economic development or protection of the natural environment; recent work on human rights in political theory and philosophy. 3 credits

MGT210 Principles of Management

Provides a basic discussion of the environments, approaches, principles and process of management. Topics include environmental forces, planning, organizing and control processes, motivation, teamwork, group dynamics and leadership in business and non- business organization. 3 credits

ECO101 Introduction to Microeconomics

An introduction to the methods and principles of microeconomics. Topics include: markets; theory of consumer behaviour; production theory; costs of production, and market structure; efficiency in allocation and production. 3 credits.

2.5 Engineering Tools

CEE110 Computer Aided Drawing (CAD) for Engineers

Introduction – lettering, numbering and heading; plane geometry. Projection (Solid Geometry). Development and true shape – cube, pyramid, cone, prism; section and true shape. Isometric drawing, oblique drawing. Plan, elevation and section of engineering structures; reinforcement details of beams, columns, slabs, stairs etc. Introduction to Computer Aided Design (CAD). 3 credits.

CEE215 Numerical Analysis & Computer Programming

Numerical solution of algebraic and transcendental equations; solutions of systems of linear equations; curve-fitting by least squares; finite difference; interpolation; numerical differentiation and integration; numerical solution of differential equations; Basic components of computer system; introduction to programming languages; Structured and object oriented Programming Languages (MATLAB). Prerequisite MAT130. 3 credits.

CEE210 Engineering Mechanics

Statics: Force vectors and their units; addition of coplanar forces, equilibrium of a particle; moments and equilibrium of rigid bodies; structural analysis of trusses; friction; Center of gravity and centroids; distributed loadings; moments of inertia of areas; moments of inertia of

masses; Dynamics: review of concepts of velocity and acceleration; dynamics of particles and rigid bodies; concepts of work, energy, momentum; introduction to vibrations. Prerequisite MAT130. 3 credits.

CEE211 Fluid Mechanics

Fundamental concepts in fluid mechanics; fluid properties, Hydrostatics, Conservation of mass and momentum using differential and integral balances; fluid kinematics, fluid flow concepts: continuity equations, energy and momentum equations, Shear stresses and velocity profiles in laminar and turbulent flows; incompressible flow, similitude and dimensional analysis, viscous flow in pipes, drag and lift; fluid measurement in orifices, nozzles, venturimeter, weirs and pitot tubes. Civil engineering applications. Prerequisite CEE210, MAT130. 3 credits

CEE211L Fluid Mechanics Lab.

Laboratory experiments on determination of center of pressure in fluid, investigation of Bernoulli's theorem, fluid flow measurement in orifices, external mouthpiece, venturimeter, v-notch weir, sharp crested weir, head loss due to sudden contraction and sudden expansion in a pipe, measurement of fluid friction in pipes. Prerequisite CEE210, MAT130. 1 credit

CEE212 Solid Mechanics

Methods of structural analysis of beams and frames; Internal forces; axial force, shear force and bending moment diagrams of statically determinate beams; deflection of beams; stresses and strains in solid bodies, constitutive relationships; states of stress (axial, bending, shear, and torsion); Transformation of stresses and strains, instability of columns. Prerequisite CEE210, MAT130. 3 credits.

CEE212L Solid Mechanics Lab.

Tension test of mild steel specimen, Compression test of timber specimen, Impact test of metal specimen, Test of helical spring, Direct shear test of metal specimens, Static bending test of beam, Hardness test of metal specimen and Buckling Test of Slender Column. Prerequisite CEE212. 1 credit

CEE213 Surveying & Introduction to GIS

Types of surveying; chain surveying; traverse surveying; leveling and contouring; calculation of areas and volumes; problems of heights and distances; curves and curve ranging; uses of modern surveying equipment. Tachometry: theory, field procedure, errors in tachometry. Astronomical surveying: astronomical terms, co-ordinate systems, astronomical corrections and

systems of time. Photogrammetry: definitions related to photogrammetry, terrestrial photogrammetry, aerial photogrammetry, Remote sensing: introduction to global positioning system (GPS). Hydrographic surveying: elements of hydrograph; acoustic measurements and investigations; hydrographic operations. Introduction to Geographical Information Systems (GIS). Prerequisite CEE110. 3 credits.

CEE213L Surveying & Introduction to GIS Lab

GIS software in the GIS lab and field survey. Prerequisite CEE110. 1 credit

CEE214 Engineering Materials

Mechanical behavior of materials; Variability; Atomic structures and properties of materials; Properties, selection criteria, applications and uses of steel, aluminum, mineral aggregates, cement, cement concrete, asphalt, asphalt concrete, masonry, wood, protective coating materials, and composites; Design of concrete mix; Laboratory experiments on measuring devices, steel, course and fine aggregates, cement, concrete, brick and wood. Prerequisite CHE120/CHE101 and CEE210. 3 credits

CEE214L Engineering Materials Lab

Laboratory experiments and characterization of common civil engineering materials. Experiments will include (but not limited to) Sieve analysis of aggregates, Specific gravity and absorption of aggregates, Normal consistency of cement, Setting time of cement, Slump of freshly mixed Portland cement concrete, Making and curing concrete cylinders, Compressive strength of cylindrical concrete specimens, Non-destructive strength test of concrete. Prerequisite: CEE214

CEE310 Quantity Survey and Cost Analysis

Analysis of Rates; Detailed Estimate of all Items of Work of a Building. Septic tank. Specifications of Materials for the Above Constructions. Prerequisite CEE213, CEE214. 3 credits.

ENV373 Environmental Impact Assignment

Concepts of environmental and social impact assessment; project cycle, scoping, initial environmental examination (IEE) and environmental impact assessment (EIA); methods of impact identification- matrix, network and checklist methods, modeling and simulation; environmental indices and indicators for air, water and land and biota; prediction and assessment of impacts on different environmental media; assessment of visual impacts, social impacts and cultural impacts; decision methods for evaluation of alternatives- weighting,

scaling, rating and ranking of alternatives, decision matrix; people's participation; mitigation measures; environmental monitoring. Preparation of TOR for an EIA, EIA Report. 3 credits.

CEE 415 Socio- economic Aspects of Development Projects

Paradigms of Development and sustainable development. Society - development - environmental linkage. Socio–economic Indicators of development. Participatory planning of development Projects. Seeking societal feedback: rapid rural appraisal (RRA), participatory rural appraisal (PRA), focus group discussion (FGD), key person interview etc. Involving the community: community based operation and maintenance of projects. Gender and institutional issues. Pre-requisite CEE350, ENV373, CEE310. 3 credits.

2.6 Civil Engineering Core

2.6.1 Structural Engineering

CEE330 Structural Analysis and Design-I

Stability and determinacy of structures; wind and earthquake loads; arch, analysis of three hinged arch; analyses of cable structures; influence lines, moving loads; approximate analysis of statically indeterminate structures; elastic strain energy and external work, Virtual work principle, deflection of beams, trusses and frames by virtual work method. Prerequisite CEE212, CEE212L. 3 credits.

CEE330L Structural Analysis and Design Lab.

Algorithms for implementing direct stiffness method in computer; hands-in practice on truss (roof and bridge) and frame analyses by professional software. Prerequisite CEE330. 1 credit

CEE331 Structural Analysis and Design- II

Analysis of statically indeterminate beams and frames by and Moment Distribution Method; Flexibility method; Stiffness method, stiffness matrix, member stiffness, stiffness transformations, assembly of stiffness matrices and solution for beams, frames and trusses. Prerequisite CEE330L. 3 credits.

CEE335 Reinforced Concrete Design-I

Materials and fundamental behavior of reinforced concrete; loads and design philosophies; analysis of beam section under various stages of loading; design of singly reinforced, doubly reinforced and T-beams according to USD methods; shear and diagonal tension; bond and

anchorage; reinforced concrete floor and roof systems, design of one way slabs; two way slab design by ACI coefficients, column supported slab design by direct design and equivalent frame methods; strip method for slabs. Prerequisite CEE212. 3 credits.

CEE335L Reinforced Concrete Design Lab

Analysis of concrete building frame by professional software; design of slab bridge, deck girder bridge and balanced cantilever bridge; Design of concrete building components (stair, water tanks etc.); BNBC, ACI and AASHTO codes. Prerequisite CEE335. 1 credit

CEE430 Reinforced Concrete Design-II

Design of columns; strength interaction diagrams for uniaxial bending and reciprocal load method under biaxial bending; foundations, individual and combined footings, rafts and pile caps; retaining walls; concrete building systems; seismic detailing; structural forms; shear walls; introduction to prestressed concrete. Prerequisite CEE330, CEE335L. 3 credits.

2.6.2 Geotechnical Engineering

CEE240 Introduction to Soil Mechanics and Foundation Engineering

Introduction to Geotechnical Engineering & Soil Mechanics; Soil formation and deposits; Index properties of soil; Classifications of soil; Phase relationship; Soil compaction; Permeability & seepage; Total & effective Stresses; Stress distribution; One-dimensional consolidation; Shear strength of soil; Lateral earth pressure. Prerequisite CEE212, CEE214. 3 credits.

CEE240L Soil Mechanics Lab.

Laboratory Tests of Soil on: Field identification; Specific gravity of soil solids; Sieve analysis; Hydrometer analysis; Atterberg Limits; Compaction; Maximum density and minimum density of sandy soil; Unconfined compression; Direct shear; Permeability by constant head and falling head methods; Consolidation. Prerequisite CEE240. 1 credit

CEE340 Advanced Foundation Engineering

Subsoil investigation; Types of foundations; Bearing capacity settlement of shallow foundations; Bearing capacity and settlement of pile foundations; Slope stability; Earth retaining structures. Prerequisite CEE240L. 3 credits.

2.6.3 Transportation Engineering

CEE250 Introduction to Transportation Engineering

Transportation systems; Transportation economics; Land-use, vehicle and human characteristics in transportation; Geometric design of roadways and railways; Roadway and railways materials; Bituminous mix design; Traffic loading and volume; Design of flexible and rigid pavements; Pavement construction, distresses and maintenance; Introduction to railway and waterways. Design labs on bituminous mix design and pavement design are embedded in the course to reinforce the theories discussed in the lectures. Prerequisite CEE212. 3 credits

CEE250L Transportation Engineering Lab

Laboratory experiments on highway materials (soil, aggregates and asphalt), asphalt concrete mix design, and characterization of highway materials. Prerequisite CEE250. 1 credit

CEE350 Traffic Analysis and Design

Fundamentals of traffic engineering; Traffic flow characteristics; Travel demand forecasting; Analysis and design of the capacity of urban and rural roadway segments and intersections; Traffic control devices, systems and warrants; Transportation planning; Public transportation systems; Transportation safety. Prerequisite CEE250. 3 credits

2.6.4 Water Resources Engineering

CEE360 Open-Channel Hydraulics

Advanced hydraulics of free surface flow in rivers and open channels; discussion of theory, analytical and numerical solution techniques, and their applications to gradually and rapidly varied non uniform flows, unsteady flow, and flow in open channel networks. Design of channel and flow through hydraulic structures will be discussed. Prerequisite CEE260. 3 credits.

CEE360L Open-Channel Hydraulics Lab

Open channel hydraulics lab includes laboratory experiments on hydraulic jump, and flow over broad and sharp crested weirs, computation of GVF using numerical methods, regression analysis, use of HEC-RAS modeling software for river flow analysis, channel flow analysis with bridges and culverts, channel design and modification and floodplain modeling. Prerequisite CEE360. 1 credit

CEE460 Groundwater Hydraulics

Physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass trans port, well hydraulics and pumping test analysis, role of groundwater in the hydrologic cycle, groundwater quality and contamination. Prerequisite CEE360. 3 credits.

2.6.5 Environmental Engineering

CEE271L Environmental Engineering Lab. I

Application of basic chemistry and chemical calculations to measure physical, chemical, and biological parameters of water (e.g., pH, conductivity, turbidity, color, chloride, total dissolved solids, dissolved oxygen, biological oxygen demand, chemical oxygen demand, fecal coliform). Laboratory methods and interpretation of results with regard to environmental engineering applications and control of the quality of natural water. Pre-requisite: CEE209, CEE209L; 1 credit.

CEE370 Water Supply & Treatment

Human need of water; potable water source and their development and protection; applied hydraulics of pipelines and pumps; potable water needs; water quality regulatory requirements; physical and chemical water treatment process design and operation; rural water supply options; Design and operation of urban municipal water distribution systems. Prerequisite CEE209, CEE209L, CEE211. 3 credits.

CEE373 Sanitation and Wastewater Engineering

Wastewater characteristics and treatment systems; sanitary sewer and storm drainage systems; wastewater characteristics; primary treatment systems; secondary treatment systems; sludge: processing systems and disposal options; analysis and design of sewer systems. Prerequisite CEE370. 3 credits.

CEE371L Environmental Engineering Lab. II

Introduction to Wastewater Engineering; Estimation of wastewater; Wastewater collection systems; Hydraulics of sewer; Design, construction and maintenance of sanitary sewer and storm drainage system; Sewer appurtenances; Plumbing system; Wastewater characteristics; Wastewater treatment and disposal; Sludge treatment and disposal; Sanitation and health; Low cost sanitation technology; Septic tank system; Sustainability of water and sanitation services; Community management of water and sanitation services; Introduction to solid and hazardous waste management; Environmental management and environmental impact assessment. CEE271L, CEE370, CEE373. 1 credit.

CEE470 Solid & Hazardous Waste Management

Sources and Types of Solid Wastes; Physical and Chemical Properties of Solid Wastes; Solid Wastes Generation; On Site Handling; Storage and Processing; Collection of Solid Wastes; Transfer Stations and Transport; Ultimate Disposal Methods; Resources and Energy Recovery; Soil Pollution; Industrial Solid Waste Collection and Disposal; Hazardous Waste Management. Prerequisite CEE373. 3 credits.

2.7 Capstone Design Project

Design projects selected from problems submitted by the students, faculty and local industry; Industry projects are given preference as they are best suited for meeting the course objectives; Instructional phase includes (not limited to): communications, report writing, visual aids, design process (requirements/specifications/objections, synthesis/analysis, design evaluation, implementation, maintainability, manufacturability, economic and social influences etc.), proposal preparation, estimating, project management and scheduling, contracts etc.; Performance phase includes (not limited to): design team formation and organization, design proposals, implementation of design process, project scheduling and management, design reviews, design simulation and testing, preparation of documentation, drawings, specifications, etc., written and oral presentation of completed projects.

Pre-requisite: All 300-level core courses completed; 3 credits

The course is offered in three consecutive semesters for a period of one year as given below

CEE499A Engineering Project I

A detailed analysis and design of a civil/environmental engineering project. Prerequisite: 90 credits completed. 1 credit.

CEE499B Engineering Project II

A detailed analysis and design of a civil/environmental engineering project. Prerequisite CEE499A. 1 credit.

CEE499C Engineering Project III

A detailed analysis and design of a civil/environmental engineering project. Prerequisite CEE499B. 1 credit.

2.8 Civil and Environmental Engineering Elective Courses

Students must take two elective courses (6 credits) from one group (Group A to Group E) and take another two elective courses (6 credits) from any remaining group(s).

2.8.1 Group A: Structural Engineering

CEE 431 Introduction to Structural Dynamics

General principles of dynamics. Single-degree-of-freedom systems, free vibrations, response to harmonic and periodic excitations, earthquake response of linear systems; Multi-degree-of – freedom systems; earthquake response of linearly elastic buildings. Pre-requisite CEE331. 3 credits.

CEE432 Composite Structures

Introduction to steel-concrete composite structures; Advantages of composite construction; Interaction between steel and concrete; Shear connectors, elastic analysis of composite beams; Beam-column connections; Behavior of different types of composite columns; Axial load capacity and interaction diagrams for composite columns. Pre-requisites: CEE 331, CEE430; 3 credits.

CEE433 Finite Element Methods

Introduction to Computational Mechanics; mathematical models and numerical simulations; variational methods, weak form and the Ritz method; Second order differential equations in one dimension, Structural mechanics applications, Truss elements, beam elements and frame elements; single variable problems in two dimensions, Triangular and rectangular elements: FEM for plates and shells. Pre-requisite CEE331. 3 credits.

CEE434 Advanced Reinforced Concrete Design

Apply Strut and Tie Model (STM) in the design of disturbed (D) regions of reinforced concrete structures, such as corbels, brackets and beams with openings. Analyse and design of slab using two collapse load methods – Yield Line Method and Strip Method. Evaluate the function structural walls and design of shear walls in buildings. Analyse and design framed structures. Calculate deflections at serviceability limit state and understand methods of deflection control. Calculate crack widths at serviceability limit state and understand methods of crack control. Interpret the design requirements for water-retaining structures, and conduct preliminary design. Pre-requisite CEE331, CEE430. 3 credits.

CEE435 Pre Stressed Concrete

Pre-Stressed Concrete: Materials; Prestressing System; Loss of Prestress Analysis of Sections for Flexure, Shear, Bond and Bearing; Beam Deflections and Cable Layout, Partial Prestress. Design of Pre-stressed Sections for Flexure, Shear, Bond and Bearing. Pre-requisite CEE430. 3 credits.

CEE437 Behavior and Design of Metal Structures

Fundamentals of steel design philosophies by AISC; steel and its properties; tension members and connections by bolts and welds; compression members, stability of plates; torsion and torsional buckling; beams, lateral-torsional buckling, plate girders. Pre-requisite CEE331. 3 credits.

CEE439 Earthquake Resistant Design

Theory and application of structural dynamics for single and multiple degree-of-freedom models of buildings subjected to earthquake ground motion. Characteristics of earthquake ground motion and design spectra. Concepts of overall seismic design of buildings, load paths, and proportioning and ductile detailing of members to achieve satisfactory seismic response. Pre-requisite CEE331, CEE340. 3 credits.

2.8.2 Group B: Geotechnical Engineering

CEE441 Advanced Geotechnical Engineering

Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments and waterfront structure. Seismic hazard analysis, cyclic response of soils and rock; wave propagation through soil and local site effects; liquefaction and post liquefaction behavior, seismic soil-structure of foundations and underground structures, seismic design of retaining walls, underground structures and tunnels. Construction and machine vibrations. Blasting. The lab component will cover design labs and experiments related to the topics covered in the theory part. Pre-requisite: CEE340; 3 credits.

CEE442 Earthen Dam and Slope Stability

Methods of stability analysis: Taylor's method, Felleneous method, Bishop's methods, Morgenstern and Price's method; stability of natural and human made slope; use of geo-textile; flow net diagram; soil-water energy; seepage through earthen dam, sheet pile, cofferdam, caissons and composite section; uplifting pressure on dam; stability analysis for static and dynamic load; piping; design of filter material. Pre-requisite: CEE 340; 3 credits.

CEE423 Earth Retaining Structures

Foundation of structures subjected to lateral loads; rigid and flexible earth retaining structures; mechanically stabilized retaining wall; sheet pile walls; braced cuts; cofferdams; caissons; dewatering and slurry-wall construction. Pre-requisite: CEE340; 3 credits

CEE424 Advanced Soil Mechanics

Unsaturated soil mechanics; behavior of soil on fully and partially saturated conditions; consolidation of soil; shear strength of soil for fully and partially saturated conditions; shear strength of soil for earthquake loading; soil dynamics and earthquake geotechnics; liquefaction problems. Pre-requisite: CEE340; 3 credits

2.8.3 Group C: Transportation Engineering

CEE450 Road and Traffic Safety Engineering

This course has been designed to teach and train senior-level engineering students the needs, policies, methods and procedures required for enhancing road safety measures. The major topics include: Road safety policies; Governmental and local arrangements; Road safety audit; Accident data collection, reporting, database maintenance and data analysis; Identification of hazardous locations (Black Spots); Pedestrian and bi-cycle safety; Road safety manuals; Engineering solutions for road safety enhancement (geometric design, signs & marking, traffic calming devices/measures, traffic signal system, etc); Special cases (bridge approach, rail crossing, business center, etc.); Community awareness and training on road safety; and case study. Prerequisite: CEE350. Total credits: 3.

CEE452 Pavement Analysis, Design and Construction

Stress, strain and deflections of pavements; traffic volume analysis; pavement materials characterization; pavement distresses and performance; pavement maintenance; design of flexible and rigid pavements (Empirical, Mechanistic-Empirical and Mechanistic methods); drainage design; overlay design; road construction methods and practices; practice and use of various pavement design software. The lab component will cover design labs/experiments related to the topics covered in the theory part. Pre-requisite: CEE 350; 3 credits.

CEE454 Advanced Traffic Engineering

This course will cover the fundamental principles and practices of traffic engineering. Specifically, the course will introduce the characteristics of road user, vehicle and roadway as they affect the traffic engineering function; the concepts of highway capacity and traffic flow

theory; traffic control devices; the concepts of intersection control, intersection signal design and capacity analysis; traffic engineering studies involving volume, speed, and travel time; and the techniques and methodologies applied to traffic data collection as well as scientific and statistical techniques used to analyze such data. Prerequisite: CEE350. 3 Credits.

CEE458 Transportation Systems Engineering and Planning

Overview of transportation systems; transportation systems modeling; travel characteristics analysis; traffic predictions; transportation systems management; public passenger transportation; transit planning; urban transportation planning; transportation safety; case studies; transportation systems planning and management in Bangladesh. Pre-requisite: CEE 350; 3 credits.

CEE459 Geometric Analysis and Design of Roads

Analysis and design of visible elements of roadway, design controls, at-grade intersections, freeways, and interchanges; use of design software. The lab component will cover design labs/experiments related to the topics covered in the theory part. Pre-requisite: CEE 350; 3 credits.

2.8.4 Group D: Water Resources Engineering

CEE463 Integrated Water Resources Planning and Management

Basic concepts in integrated water resources management. Economic, environmental and institutional aspects. Participation of beneficiaries. Formation of users group. Fisheries management. Strategic planning. System analysis approach. Conceptual framework and models. Analytical techniques. Operation and maintenance of water resources systems. Pre-requisite: CEE 360; 3 credits.

CEE465 River Engineering

Behavior of alluvial rivers; river pattern and morphological processes; river training and bank protection works; navigation and dredging; sediment movement in river channels, bed forms and flow regimes; flood and its causes; methods of flood management; structural and nonstructural measures such as reservoirs, levees and flood zoning, flood hazard mapping, flood forecasting and warning; flood damage in urban and rural areas. Prerequisite CEE360. 3 credits.

CEE467 Irrigation and Drainage Engineering

Importance of irrigation; sources and quality of irrigation water; soil-water relationship; consumptive use and estimation of water requirements; methods of irrigation; design of irrigation canal systems; irrigation structures; irrigation pumps; problems of irrigated land; irrigation water management; importance of land drainage; drainage systems and theft design. Prerequisite CEE460. 3 credits.

CEE473 Coastal and Estuarine Analysis

Definition, systems view of the coast. Abiotic subsystems; classification of coasts, wave, current sediment transport, two dimensional flow analysis. Biotic subsystem: coastal and estuarine ecosystems, fate and transport of pollutants in marine environment, bio-accumulation, risk form multiple stressors. Bangladesh coast its hydrodynamic and ecological features, Bangladesh Coastal Zone policy. Prerequisite CEE360. 3 credits

CEE475 Water Resources and Environmental Modeling

Definition and classification of Model, Concept of scale and discretization Basic concepts of modeling: conceptualization, data collection, calibration, validation and prediction. Mathematical description and software implementation of mass/energy balance in water, soil and atmospheric systems; reactor processes; fate and transport of chemicals in environmental media. Prerequisite CEE215, CEE360. 3 credits

2.8.5 Group E: Environmental Engineering

CEE477 Ecological Engineering

Ecological concepts and their applications in the assessment, conservation, and management of ecological systems. Description of important attributes and processes at the individual, community and system levels. Ecological implications of engineering structures and projects. Ecological restoration and engineering. Prerequisite CEE215, CEE373, CEE360. 3 credits.

CEE479 Air Quality Engineering

Solving air pollution problems requires a multi-disciplinary approach. Effects of air pollutants on human health and the environment. Origins of atmosphere pollutants and methods to estimate emissions from anthropogenic sources. Atmospheric chemistry and pollutant removal processes. Meteorological phenomena and pollutant dispersion modeling. Laws and regulation to control air pollution. Technological and methods used to control air pollution. Regional and global issues such as acid rain, ozone depletion, and global climate change. Prerequisite CEE209, CEE370. 3 credits.

CEE471 Pollution Control

Important environmental pollutants, their sources and impacts on surrounding ecosystem, infrastructures and planet; Concepts and engineering principles of preventing and controlling air, water and soil, noise and radioactive and other hazardous waste pollution; Control methods and technologies for air, water and land pollution and their use in dealing with short and long term pollution problems; Basics of relevant environmental laws and regulations. Pre-requisite: CEE470; 3 credits.

CEE472 Climate Change and Disaster management

Earth's climate and biosphere; Causes of climate change; Global warming and Green house effects; Carbon footprint; CO2 sequestration; Tomorrows World; IPCC Mitigation of climate change report; Economics of climate change; Environmental legislations; Hazards: Natural, Human-induced, and Industrial; Distinction between hazard and disaster; Vulnerability, Resilience, and Risk; Conceptual framework of disaster risk management; Disaster preparedness planning; Emergency rescue and relief needs; Long-term recovery, rehabilitation and reconstruction; Community based disaster management; Community mobilization; Indigenous knowledge; Social and environmental impact assessment; Damage assessment. Pre-requisite: CEE 470; 3 credits.

CEE474 Green Building and Infrastructure

Green building movement; Principles and Scope of sustainable design; Importance of Place: Site, Transportation and Land Use Issues; Sustainable site design, analysis, and assessment; Sustainable transportation patterns and site development strategies; Energy efficient design; "Green" Materials Selection; Determining materials appropriateness; Material considerations during green home design; Water and Site Design; Sustainable site development patterns; Outdoor water conservation strategies and practices; On-site management methods for storm water and wastewater; Indoor water conservation; Indoor environmental quality and health; Common indoor air pollutants; Achieving good indoor air: barrier, solutions, and implementation issues; Ventilation system design strategies; Benefits of daylight and view; Construction specifications; Construction waste management; Building Durability; and Climate Adaptation. Pre-requisite: CEE 335, CEE350, CEE470; 3 credits.

2.8.6 Group F: Special Topic

CEE410 Construction Engineering

Introduction to the construction processes: contracting and bonding, Project definition; scheduling and control models; material, labor and equipment allocation; optimal schedules; project organization; documentation and reporting systems; management and control. Prerequisite CEE310, CEE430. 3 credits

CEE465 GIS and Remote Sensing

Introduction to the Geographic Information Systems and GIS applications; data structures and basic functions; methods of data capture and sources of data, and the nature and characteristics of spatial data and objects. Introduction to the basics of remote sensing, characteristics of remote sensors, and remote sensing applications in academic disciplines and professional industries.

The lab component will cover design labs/experiments related to the topics covered in the theory part. Pre-requisite: CEE213 and CEE 350; 3 credits.

CEE466 Urban Planning

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning; the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program; identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation. The lab component will cover design labs/experiments related to the topics covered in the theory part. Pre-requisite: CEE335, CEE350, CEE415. 3 credits.

CEE467 Advanced Procurement Systems

Different procurement methods used within the local and international construction industries: LS, DBB, DB, CM, BOT, Milestone-based; Public Procurement Rules; National public procurement methods: open, limited, two-stage, direct, request for quotation, etc.; International procurement methods; e-GP; Emerging concepts such as Sustainable Procurement and Strategic Procurement. The lab component will cover design labs/experiments related to the topics covered in the theory part. Pre-requisite: CEE 310, CEE430; 3 credits.

CEE490 Special Topic

As decided by the faculty and the department based on student needs. 3 credits

CEE492 Undergraduate Research

A research-based thesis course that offers students the opportunity to work on a comprehensive research work that demonstrates mastery of design and/or study of a civil engineering or closely related work. The topic has to be agreed upon in consultation with a CEE department-approved supervisor. The thesis work will be of suitable complexity for results to be published and/or presented for an expert audience. Length: Maximum 12 months (3 semesters in a trimester system). Prerequisite all BSCEE Core CEE courses. 3 credits.

2.9 Internship

CEE498 Internship 0 credit

The undergraduate internship (CEE 498) is a non-credit mandatory course where students get an experiential learning opportunity with an external organization. It can be a government or non-government organization or industry. The duration of the internship is four to six weeks. The internship opportunity links classroom learning and student interest of acquiring practical knowledge in a realistic work environment. Students will produce a critical reflection on their internship experience indicating how they achieve the specific learning outcomes. Students and employers will be required to abide by a "Confidentiality and Professional Conduct" agreement and maintain a work log of activities. There will be a designated industry supervisor and an academic supervisor. The course involves regular meetings with the both the supervisors for guidance and to discuss overall progress. At the end of the internship, the student will submit a report and the course grade will be based on the evaluation by the industry supervisor and the academic supervisor. Prerequisite all BSCEE Core CEE courses. 0 credits.