# Outcome Based Education (OBE) Curriculum

Bachelor of Science in Civil Engineering (B. Sc. in CE)

Department of Civil Engineering

Faculty of Modern Science



# LEADING UNIVERSITY

Ragibnagar, Kamalbazar, South Surma, Sylhet-3112, Bangladesh PABX: +880 1313 084499, Fax: 88-0821-720307, www.lus.ac.bd Outcome Based Education (OBE) Curriculum for Undergraduate Program-Bachelor of Science in Civil Engineering (B.Sc. in CE)

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(To be effective from the semester Spring-2022)

Department of Civil Engineering Faculty of Modern Science



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## <u>Content</u>

1.Profile of Leading University	1
1.1 History	1
1.2 Objectives and Goals of Leading University:	2
1.3 Admission Requirements:	3
1.4 Registration Regulations	3
1.5 Academic Policies:	4
1.6 Teaching-Learning and Assessment	6
1.7 Template of Course Outline (Outcome-Based Curriculum)	9
1.8 Template for Course File (Outcome-based Curriculum)	11
1.9 Vision of faculty of modern science, Leading University	11
1.10 Mission of faculty of modern science, Leading University	11
2.10verview of the Department	11
2.2 Vision of the Department	12
2.3 Mission of the Department	13
2.4 Program Educational Objectives	13
2.5 Program Learning Outcomes	13
2.6 Graduates Attributes	14
2.7 Mapping of mission statements (MS) with program educational objectives	15
(PEOs)	
2.8 Mapping of Program Educational Objectives (PEOs) with Graduate Attributes (Gas)	15
2.9Mapping of Program Outcomes (Pos) with Program Educational Objectives (PEOs)	15
2.10 Mapping of ProgramOutcomes (Pos) with Graduate Attributes (Gas)	16
2.11 Profile of Duties and Competence of Civil Engineer (entry level)	19
3.1 Academic Policy of CE Department	24
3.2 Degree offreing Department	24
3.3 Course Designation and Numbering System	24
3.4 CLO-PLO Mapping	25
4.1 Course Structure	52

#### 1. Profile of Leading University

#### **1.1 History:**

The establishment of Leading University in Sylhet, a holy place of the country, was, indeed, a noble idea of a distinguished personality Danobir Dr. Syed Ragib Ali, who is well-known for his philanthropic contributions to educational institutions all over the country. He established many educational institutions at different levels and of different kinds including a medical college-Jalalabad Ragib-Rabeya Medical College and Hospital in Sylhet. Dr. Ragib Ali is a pioneer in establishing the first private university-North-South University in Bangladesh. He was the founding Vice-Chairman of North-South University and the Chairman of The University of Asia Pacific and later on he was the Chairman of North-South University. He placed a proposal for establishing Leading University to the Ministry of Education on the 24<sup>th</sup> of August 1996 and the Ministry issued permission on the 28th of August 2001. Leading University was inaugurated on the 4th of March 2002 and it commenced its first trimester on that day. The University at first had an enrollment with 106 students at undergraduate programs that was marked a milestone for the university and reasonably a source of inspiration to the persons those are interested in education. Currently, the number of enrolled students of this university is around 5000 which is larger than other private universities in this region. Leading University is playing a leading role in providing rationalized and quality education with the support of more than 200 distinguished faculty members from home and aboard. Academic activities started in the permanent campus which is located in a very beautiful and green landscape of more than 5 acres of area at Ragibnagar, Kamalbazar which is at the outskirts of Sylhet City. At present, students of all faculties are availing this opportunity to attend classes in two spacious academic buildings of 34,000 square feet and 88,000 square feet respectively along with all

supportive facilities which open the door of a new horizon for providing excellent academic services.

**Vision:** The vision of Leading University is to produce professionally competent and accomplished graduates who will be able to encounter any challenges at home and abroad, to fulfil the national and international requirements of job market and to contribute significantly to the human development.

Mission: The mission of Leading University, Sylhet (LU) is to

- provide internationally comparable higher education at a reasonable cost in a range of subjects that are particularly relevant to current and future societal needs in trade, industry, humanities, science and technology;
- offer opportunities and expertise to the students so that they can achieve their high academic and career oriented goals;
- promote and inculcate ethical standards, values and norms and high ideals;
- gain confidence of all stakeholders through Key Performance Indicators(KPI).

#### 1.2 Objectives and Goals of Leading University:

 i) To boost capacity in generating and sharing knowledge, skills and attitudes nationally and globally, making important contributions to economic development of the country;

ii) To establish network with other institutions and organisations, where such partnerships can lead to age-cutting research and teaching;

iii) To create a congenial academic environment where inspired intellect, high morals and social responsibilities will be focused;

iv) To expedite an endless effort to nurture highly professional fields of

education, nowledge and proven learning centre;

v) To explore the ways of intellectual pursuit, scientific success, massive

technological integration, liberal education, entrepreneurial and managerial

scopes;

vi) To produce skilled graduates who are fit for the purposes.

#### **1.3 Admission Requirements:**

Admission Requirements for Bachelor's Degree: For the program B.A. (Honours) in English, the following admission requirements must be fulfilled:

**Under National Curriculum of Bangladesh:** Minimum Second Division or GPA 2.5 or equivalent grade at each of S.S.C and H.S.C or other equivalent public examinations. But in case of GPA 2.0 in any of the above mentioned examinations, the aggregate GPA must be minimum 6.0. For the children of a Freedom Fighter, the minimum score of GPA \_5.0' must be secured aggregately in S.S.C and H.S.C or any other public examinations.

**Under British Educational Curriculum:** For 'O' level examination 5 subjects and for 'A' level examination 2 subjects must be passed respectively from which at least \_B' grade or GPA \_4' must be obtained in 4 courses and \_C' grade or GPA \_3.5' must be obtained in the remaining three subjects out of total 7 courses in both the levels.

Students are allowed to get admitted into Undergraduate programs within 4 (four) years of passing the H.S.C or equivalent examinations.

#### **1.4 Registration Regulations**

- The following are some regulations for registration:
- Registration for a semester is conducted under an academic calendar. Registration starts immediately preceding the start of classes and late registration continues till the second week of classes.
- Students should complete the registration process before classes begin.
- Late Registration within fortnight is permitted after the first day of classes in a semester on the recommendation of the Head of the Department. Late fees are charged for that.
- Enrolment changes to courses can only be made with official second week of the semester.
- Tuition fees are payable in advance. A student shall not be enrolled until the payment is made.
- Students cannot drop a course merely by stopping attendance.
- Students must register for at least 6 (three) courses in every semester.

#### **Readmission:**

LU students who do not register for two or more consecutive semesters without notice have to submit application for readmission. Fees are charged for readmission.

#### **Fraudulent Application:**

Candidates who furnish fraudulent or misleading information in the application for admission or readmission are liable to immediate dismissal from the university in addition to further liability depending on the nature of fraudulent information.

#### **Provisional Admission:**

LU may provisionally accept applicants for admission who cannot produce official transcripts by the first week of classes. Such admissions are provisional. All provisional students who enter the university without complete credentials for admission will be required to submit the appropriate credentials within the semester as a prerequisite for continuing enrolment. Required credentials must be submitted within the semester of initial enrolment.

#### **Orientation:**

Orientation programme is organized for the new students. Guardians may also attend. The orientation programme acquaints the students with university policies and the educational opportunities, facilities, and services available at the university.

#### **Student Identification Cards:**

All the students will receive photo identification cards with their registration numbers. These cards will be used for purposes of entering campus, attending classes and using the library and computer services.

#### **1.5 Academic Policies:**

#### **Right to Change Rules:**

The university reserves the right to change or revise requirements, rules, and fees. Such regulations shall come into force whenever the proper authorities may determine.

#### **Right to Dismiss Students:**

The university reserves the right to suspend, dismiss or exclude any student from the university, or from any class or classes, whenever, for the interest of the students or the university. The university administration considers disciplines a prior concern.

#### **Responsibility of Students:**

The students are individually responsible to read and know regulations contained in the LU prospectus. Failure to read and comply will not exempt the students from liabilities.

#### **Conduct of Students:**

LU strives to maintain a healthy academic atmosphere in its campus. The students should read and grasp the code of conduct. All the students are expected to actively contribute to achieve a goal by attending classes regularly and making appropriate use of all campus facilities. They shall endeavour to enhance their academic atonements, maintain discipline, keep the campus clean. In short, students are expected to be good citizens. The university does not prescribe any dress requirement, but the students are expected to be dressed decently.

#### Academic Honesty:

Any material plagiarised or otherwise dishonestly prepared that a student submits as an original work is taken to be cheating and constitutes grounds for disciplinary actions. Any student judged to have engaged in cheating might receive a reduced grade for the work in question, a failing grade in the course, or such other lesser penalty, as the teacher deems appropriate. Serious instance of discipline shall be dealt with more severity.

#### Medium of Instruction:

English is the medium of instruction and examination. It is also the campus language. A Remedial English course has been introduced for the students who are deficient in English.

#### **Course Load:**

The normal load of fifteen-hour class lectures per week is generally expected for the students by accepted standard. In addition, there will be assignments, home work in each week. Moreover, a faculty member will hold consultation and/or tutorial and thus raises contact hours to twenty. The students will have to access to the Computer Lab to prepare their papers and other assignments under supervision for up to 30 hours each semester. Preparation of papers and other assignments under supervision will raise workload to 30 hours a week.

#### Semester:

The university offers two semesters in an academic year, namely Spring and Summer Semesters. Each semester lasts for 14 weeks. Spring Semester starts in January and Summer in July.

#### **Class Attendance:**

Regular class attendance is a prerequisite for successful completion of course works. Teacher shall be responsible to inform the students of the consequences of absence from class. The students shall be responsible to inform the teacher of possible absence from classes. Absence does not exempt the students from obligations of class assignments and examinations. The teacher concerned will determine the manner in which missed assignments and examinations may be made up. A student may be dropped from a course for consecutive three absences. Attendance is regarded as a part of the course requirement. A student may be debarred from appearing at the course Final Examinations if his/her attendance falls below 45%. The students are given marks on class attendance.

#### Academic Standing and Probation:

The students with a GPA of less than 2.00 are placed on probation. The students on probation are allowed a maximum of three semesters to raise their GPA to 2.00. The students who fail to achieve a GPA of 2.00 within two semesters are dismissed from the university.

#### **Change of Degree Programme:**

The students who wish to change their degree programme must submit a request to the Head of the Department. Upon recommendation of the Head of the academic department to which the student intends to change, the office of the Admission shall make the necessary changes to a student's record.

#### **Student Dismissal:**

The student are dismissed from the programme for failing to maintain the required

CGPA (2.0) in two consecutive semesters. The students dropped out of the programme may appeal to the Dean/Head of the department for re-admission. Re-admission will not be granted without strong evidence of significant change in student's ability to complete the requirements satisfactorily.

#### 1.6 Teaching-Learning and Assessment

The Department of English ensures effective teaching-learning to provide quality education. Teaching-Learning and Assessment is based on two strategies: Teaching-Learning Strategy and Assessment Strategy.

**Teaching-Learning Strategy**: Diverse methods are used in the department to develop the skills of original thinking and creative faculty of the students, providing course profile, use of lesson plan, technology integration and skill development mechanism. The instruction strategy is direct and teacher –student oriented. Here teachers play vital roles and students are also encouraged to participate actively. It is done in the department in various ways like delivering lectures, multimedia presentation, explicit teaching, drill and practice, didactic questions, guided and shared – reading, listening, viewing, thinking, video, etc.

Assessment Strategy: Students' performances are assessed in different ways in the Department of English like, presentation, viva, assignment, tutorials, midterm examination and final examination. All the assessment strategies are planned before the commencement of the particular course. The strategies are planned to measure students' multiple skills through the achievement of intended learning outcomes of study. Students acquire grade based on their performances.

#### **Examination Schedule:**

An examination schedule of Midterm and Final Examination will be notified to the teachers and students within 3 weeks after starting the classes every semester. Before that a tentative schedule including time frame of 2 Tutorial Examinations, Midterm and Final Examinations will be notified.

#### **Examination Guidelines:**

- Student must put their ID cards properly.
- They must bring their admit cards. A student shall not be allowed to sit for the examination without admit cards.
- The students have to be sure that the Registrar ensures permission before the examination starts.
- The students must keep all things except permitted materials and examination documents in front of the room.
- The students, if found with any act of cheating, shall be debarred from appearing at the said examination or all examinations to be decided by the Discipline Committee.
- Candidates shall not leave the examination hall before one hour is finished.
- They must sign in the attendance sheet before leaving the examination hall.
- All cellular phones must be switched off during the examination.
- Digital diary or programmable calculators are not allowed for use in the examination hall.
- Candidates must observe silence and strict discipline in the examination hall.

For any other matters pertaining to smooth conduct of examination not mentioned above, the decision of the invigilator/hall-in-charge shall be considered final.

#### **Change of Department and Programme:**

The students willing to change the Department and Programme should make a written application to the Head of the Department to which he/she is interested to get in along with the transcripts of the previous courses completed. The department will scrutinize the application and upon the recommendation of the department and faculty to he/she is interested to go, the office of the Registrar will make necessary arrangement to transfer.

#### **Medium of Instruction**

English Proficiency is a prerequisite to excel in the modern competitive world. LU offers several English courses for improvement of the English Language Proficiency of the students to make them competent in the job market. Conducting classes (theory, practical and sessional) in English language is compulsory. English is the medium of instruction and examination at LU. It is also the campus language.

COMPONENTS	% OF MARKS
Class Attendance	10%
Assignment	10%
Tutorial Examination	10%
Midterm Examination	30%
Semester Final Examination	40%
Total	100%

#### **Performance Evaluation and Marks Distribution:**

#### **Grading System**

Leading University follows the grading system approved by the University Grants Commission of Bangladesh. The grading system includes:

NUMERICAL GRADE	LEI	TER GRADE	GRADE POINT
80% and above	A+	(A Plus)	4.00
75% to less than 80%	А	(A Regular)	3.75
70% to less than 75%	A-	(A Minus)	3.50
65% to less than 70%	B+	(B Plus)	3.25
60% to less than 65%	В	(B Regular)	3.00
55% to less than 60%	B-	(B Minus)	2.75
50% to less than 55%	C+	(C Plus)	2.50
45% to less than 50%	С	(C Regular)	2.25
40% to less than 45%	D		2.00
Less than 40%	F		0.00

#### **Grade Point Average (GPA):**

A Grade Point Average (GPA) is the weighted average of the Grade Points obtained in all the courses completed by a student in a semester.

#### Cumulative Grade Point Average (CGPA):

A Cumulative Grade Point Average (CGPA) is the weighted average of the Grade Points obtained in all the courses completed by a student in more than one semester.

#### **Incomplete Courses:**

The grade of Incomplete (I) may be used in special circumstances. The Incomplete may be given only at the end of a semester to a student whose work is progressing, but who has left unfinished a small amount of work for completion without further class attendance. The teacher must file with the Controller of Examination an Incomplete Grade form describing the work to be completed, indicating a tentative final Grade to be assigned if the work is completed and the time period in which the work must be completed (no longer than the following semester).

The student is responsible to take the initiative in completing the work and is expected to make up the Incomplete. If action is not taken, the \_I' grade becomes final \_F' grade. In case the teacher from whom a student received an Incomplete Grade is not available, the disposal of the case involving an Incomplete Grade vests in the Head of the Department. The Grade \_l' must be replaced within one semester after it is assigned.

#### **Course Withdrawal:**

The Grade Withdrawal (W) is given when a student officially drops a course during the period between the ends of the third and sixth week. Prior to that time no entry is made on the academic record if a student drops a course. A -W does not affect the student's GPA.

#### **Retake Courses:**

Students may opt to repeat a course. In these situations the original registration showing course, credits and the grade R (Retaken or Repeated) will appear on the academic record. Only the credits and grade of the last attempt will be used to calculate the GPA and to fulfil graduation requirements. Students will not be allowed to repeat a course more than twice. Students with a grade of B or above will not be allowed to repeat the course. The students who wish to repeat a course must register for the course again and will be assessed to tuition and applicable fees.

**Grade Improvement:** Students who obtained below letter grade B in a course, he/she may avail of the opportunity for improving the results by retaking the course(s). Students who want to improve grade, he/she must appear at the next immediate Semester Final Examination. Students who obtained F grade will also be permitted to appear at the said examination twice for improving the F grade. Students may improve maximum 8 (eight) courses for an undergraduate program. For a graduate program (Master's), a student may take two courses as an improvement courses.

#### Adding and Dropping Courses:

The students who seek to add or drop courses should consult their Head of the department. The teacher may drop students from a course if they fail to attend 60 percent of the scheduled class sessions. The students must keep the teacher informed of absence from classes.

#### Residency

The students are required to earn minimum of 70 credits at LU as the degree students. In other words, the students who are allowed to transfer credits earned from other universities may have the benefit of 70 credits to the maximum.

#### Implications of Co-curricular and Extra Curricular Activities of the programme

Apart from academic engagement, the Department of English through this programme inspires the students to take part actively in social activities and community services. Creating awareness among the students and helping the endangered during natural calamities becomes an inseparable part. Sports activities are a vibrant part of the programme. Students have opportunities to sharpen their wisdom through participating in debate competitions at national and international levels. The students organize workshops, seminars, and view exchange programs to develop their skills. The programme is intended to nourish the latent talents in music and songs. Staging dramas, performances and recitation are other focal points as a part of an excellent learning experience for the students.

#### **1.7 Template of Course Outline** (Outcome-Based Curriculum)

#### Part A

- 1. Course No./Course Code :
- 2. Course Title:
- 3. Course Type (GEG/Core Course/Electives/.....)
- 4 . Year /Level/Semester/Term :
- 5. Academic Session:
- 6. Course Teacher/Instructor:
- 7. Pre-requisite (If any) :
- 8. Credit Value:
- 9. Contact Hours:
- 10. Total Marks:
- 11. Rationale of the Course:
- 12. Course Objectives:
- 13. Course Learning Outcomes (CLOs) and Mapping of CLOs with Program

Course Learning	PLO-1	PLO-							
Outcomes(CLOs)		2	3	4	5	6	7	8	9

Learning Outcomes (PLOs)

#### Part B

14. Course plan specifying contents, CLOs, co-curricular activities (if any)

Teaching-learning and assessment strategy mapped with CLOs:

Week	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Part C

- 15. Assessment and Evaluation
  - 1) Assessment Strategy
  - 2) Marks distribution:
    - a) Continuous Assessment:
    - b) Summative:
  - 3) Make-up Procedures

#### Part D

16. Learning Materials

- I) Recommended Readings
- 2) Supplementary Readings
- 3) Others...... (as applicable for the discipline / academic program)

#### **1.8 Template for Course File** (Outcome-based Curriculum)

- 1. Course outline
- 2. Lecture materials/notes
- 3. Attendance sheet
- 4. Assignment --- copies of best, mediocre and poor
- 5. Class test/quiz /mid-term test etc---- copies of best, mediocre and poor
- 6. Copies of question papers/assessment tools
- 7. Rubrics for assessment
- 8. Course evaluation by course teacher considering feedback from the students
- 9. Feedback from the students on the course
- 10.Peer review: Done/Not done
- 11. Evaluation of attainment of CLOs
- 12. Improvement plan for better attainment of CLOs

#### 1.9 Vision of faculty of modern science, Leading University

The vision of the faculty of Modern Science is to become a dynamic center with research, innovation and creative actions, where skilled graduates will be produced having the quality of leadership, professionalism, and lifelong learning aptitude to ensure collaboration with local and global community for the development of society and country.

#### 1.10 Mission of faculty of modern science, Leading University

1	Provide outcome based higher education of international standards on architecture,
	science & engineering subjects, and public health.
2	Engage in value-added activities that address and fulfills the needs of professional
	careers, which in terms advance the socio-economic status of the inhabitants of
	various regions and the country.
3	Foster and inculcate the ability of analytical thinking, logical coordination and
	application possibilities to prepare students to face the world job market and
	become innovators and entrepreneurs.
4	Integrate ethical and human values and social concerns with technical education.
5	Engage in research, innovation and implementation programs with other partner
	academic institutes and industries.

#### 2.1 Overview of the Department

Department of Civil Engineering (CE), one of the engineering departments of LU, was established in 2008 with an objective of keeping pioneer role to mitigate environmental and

structural problems of Bangladesh as well as of the entire human race.CE department offers four years B. Sc. in Civil Engineering degree program. The department follows semester system comprising of two semesters in a year. A student has to complete a minimum of 164 credits to obtain a B. Sc. in in Civil Engineering degree. Currently, there are 450 students studying in 15 batches at different academic sessions and five batches (total 110 students) already obtained their B. Sc. Engineering Degree. There are 18 full-time faculty members dedicated to teaching the students of this department. The teachers are highly professionals in their respective fields. Most of them have higher degree from home and abroad. Besides, highly experienced teachers and professional experts from other universities and institutions are also engaged in teaching the students. There are eight laboratories available in the department namely Water Supply and Sewerage Engineering Laboratory, Environmental Engineering Laboratory, Transportation Engineering Laboratory, Engineering Materials Laboratory, Geotechnical Engineering Laboratory, Fluid Mechanics Laboratory, Solid Mechanics Laboratory and, Computational and Simulation Laboratory. The laboratories of the department are well equipped with sophisticated instruments and dedicated for the betterment of the students. Moreover, the department has its own seminar library where different types of engineering books, research papers, and magazines are available. The students of the CE department are very enthusiastic and active in participating different extra curriculum activities like organizing gaming competition, annual picnic, excursion etc. In addition, they organized different technical seminars, such as a Sustainable solution for concrete, repair and retrofitting, Eco-housing: a sustainable approach to global warming mitigation and adaptation, Application of stone dust as an alternative to sand and so on. Moreover, two groups of students of Civil Engineering department were awarded as champion and runner up team for their prepared projects in the Knowledge Fair -2013, organized by Leading University.

#### 2.2 Vision of the Department

Our vision is to be an outstanding hub in civil engineering education, innovation, and scientific research.

#### 2.3 Mission of the Department

- Our mission is to provide an environment of better learning within which innovative thinking, practical services, and self-development are cultivated and continued to produce qualified civil engineers who will contest the present and enrich the future.
- Educating, inspiring, and mentoring future leaders whose are prepared to meet 21<sup>st</sup>century challenges in a global economy.
- To create and integrate knowledge of engineering, science, and technology that expands the civil and environmental engineering knowledge base, which in turn enables the betterment of human society.
- Performing forward-looking research both applied and theoretical that will positively impact and improve our profession and society.

#### 2.4 Program Educational Objectives

The educational objectives developed by the Department for its undergraduate program reflects our commitment to provide a program that produces engineers who:

PEO 1: Graduates will demonstrate technical competency and leadership to become professional engineers in order to ensure a better life and sound environment to find out engineering solutions for the society.

PEO 2: Graduates will demonstrate commitment towards sustainable development in order to ensure betterment of society.

PEO 3: Graduates will pursue lifelong learning in civil engineering solutions using research and complex problem-solving skills.

PEO 4: Graduates will work in improving the leadership development, membership in the professional careers and creating job opportunities in technical competency to become professional engineers.

#### 2.5 Program Learning Outcomes

After finishing B. Sc. in Civil Engineering degree, the graduates will exhibit.

PLO 1: An ability to apply knowledge of science and engineering.

PLO 2: An ability to design and conduct experiments, as well as to analyze and

interpret data.

PLO 3: An ability to design a system, component, or process to meet desired needs within realistic constraints.

PLO 4: An ability to identify, formulate, and solve engineering problems.

PLO 5: An understanding of professional and ethical responsibility.

PLO 6: An ability to communicate effectively.

PLO 7: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

solutions in a global, economic, environmental, and societal context.

PLO 8: A recognition of the need for, and an ability to engage in life-long learning.

PLO 9: An ability to use the techniques, skills, and modern engineering tools

necessary for engineering practice.

PLO 10: An understanding of critical issues for professional practices.

#### **2.6 Graduates Attributes**

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These attributes are generic and are common to all engineering programs.

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **Project management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

	PEO1	PEO2	PEO3	PEO4
MS1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
MS2		✓	$\checkmark$	
MS3	$\checkmark$		$\checkmark$	$\checkmark$
MS4	✓	✓		

#### 2.7 Mapping of mission statements (MS) with program educational objectives (PEOs)

# **2.8 Mapping of Program Educational Objectives (PEOs) with Graduate Attributes (GAs)**

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
PEO1	~	~	~	✓			~					
PEO2			✓		✓					√	√	~
PEO3						✓		~	~			✓
PEO4						~		~	~			✓

# **2.9 Mapping of Program Outcomes (POs) with Program Educational Objectives (PEOs)**

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
PEO1	✓		✓	✓			✓			
PEO2		$\checkmark$			$\checkmark$	✓				

PEO3			$\checkmark$			$\checkmark$	
PEO4		$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$
PEO5	✓					$\checkmark$	✓

#### 2.10 Mapping of Program Outcomes (POs) with Graduate Attributes (GAs)

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
PLO1	~				✓							
PLO2		✓			~							
PLO3		✓	✓	✓								
PLO4		✓	✓	✓								
PLO5						✓		✓	✓			$\checkmark$
PLO6									✓	✓		
PLO7	✓						✓					
PLO8												$\checkmark$
PLO9					$\checkmark$							
PLO10						$\checkmark$		$\checkmark$			$\checkmark$	

The distribution of marks for a project/ th	hesis work will be as follows:
---	--------------------------------

Evaluation	Beginning (4)	<b>Developing (6)</b>	Proficient (8)	Exemplary (10)
Criteria				
Identification	Insufficient	Partial	Adequate	Clear and
of Problem or	identification	identification of	identification of	complete
<b>Definition of</b>	of problem;	problem; lack of	problem; any	identification of
Project	inadequately	specifics does	lack of specifics	design goals and
-	objectives.	impair solution	does impair	objectives.
		of design.	solution of	
		C	design.	
Complexity of	Below typical	Average typical	Meets typical	Exceeds typical
Design	technical	complexity for	technical	technical
_	complexity for	course level.	complexity for	complexity for
	course level.		course level.	course level.
Research	No evidence of	One research	Two research	Three or more
	use of outside	source cited.	sources are	research sources
	information		cited.	are cited;
				evidence of
				variety
Meeting	Few design	Only basic	Design	All design
Design	requirements	requirements are	requirements are	requirements
Requirements	are met.	met.	met.	are met and
	Design Areas:	Design Areas:	Design Areas:	exceeded.
	Physical	Physical	Physical	Design Areas:
	Features	Features	Features	Physical
	Operation &	Operation &	Operation &	Features
	Use	Use	Use	Operation &

	Safety	Safety	Safety	Use		
	Cost	Cost	Cost	Safety		
	0050	0000	0050	Cost		
Fngineering	Most analysis	Analyses	Analyses	Analyses		
Analysis	is skipped or	nerformed are	nerformed are	nerformed are		
Analysis	does not	done after the	performed are	performed are		
	contribute to	fact to prove	design	design		
	contribute to	that choices	offoctivonos	offostivonos		
	offective	mada war	and	and		
	design	ffective made were and meeting				
	design.		design	uesign		
	A nolycon one	Analyses	A nalvass	A maluage		
	Analyses are	diagonaria e that	Analyses	Analyses		
	performed as a	discovering that	performed to	performed to		
	separate	trial and error is	prevent trial and	save significant		
	process alter	not working	error when	effort by		
	design choices	well.	prototype is	preventing trial		
	are made.	Analyses are	Duilt.	and error when		
	Analyses are	haphazard and	Analyses are	prototype 1s		
	inkery incorrect	do not follow a	performed			
	difficult to	logical flow.	correctly and	Analyses are		
	unificant to		contain many	performed		
	understand due		elements of a	correctly and		
	to poor setup.		quality	follow steps for		
			engineering	quality.		
			analysis.			
Alternative	No evidence of	One alternative	At least two	Three or more		
Solutions	alternative	presented as the	alternatives	alternatives		
	designs.	project solution.	presented.	presented.		
Optimizing,	3.7					
	No reason	Reasoning for	Reasoning for	Solution		
Testing &	No reason provided for	Reasoning for the solution	Reasoning for the solution is	Solution selected by the		
Testing & Evaluation	No reason provided for the selected	Reasoningforthesolutionbasedon	Reasoning for the solution is supported by	Solution selected by the use of		
Testing & Evaluation	No reason provided for the selected solution.	Reasoningforthesolutionbasedonopinion only.	Reasoning for the solution is supported by facts.	Solution selected by the use of comparative		
Testing & Evaluation	No reason provided for the selected solution.	Reasoning for the solution based on opinion only.	Reasoning for the solution is supported by facts.	Solution selected by the use of comparative data.		
Testing & Evaluation	No reason provided for the selected solution. Project does	Reasoning for the solution based on opinion only. Results	Reasoning for the solution is supported by facts. Results	Solution selected by the use of comparative data.		
Testing & Evaluation	No reason provided for the selected solution. Project does not include	Reasoning for the solution based on opinion only. Results evaluated but	Reasoning for the solution is supported by facts. Results evaluated;	Solution selected by the use of comparative data. Evaluation data		
Testing & Evaluation	No reason provided for the selected solution. Project does not include evaluation of	Reasoning for the solution based on opinion only. Results evaluated but without any	Reasoning for the solution is supported by facts. Results evaluated; reflects the	Solution selected by the use of comparative data. Evaluation data are collected to		
Testing & Evaluation	No reason provided for the selected solution. Project does not include evaluation of results.	Reasoning for the solution based on opinion only. Results evaluated but without any focus.	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need.	Solution selected by the use of comparative data. Evaluation data are collected to support needs.		
Testing & Evaluation Time	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was made	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan,		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning.	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was matebut but not	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning. Missed	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was made but not followed; some	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures followed during	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures followed and		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning. Missed significant	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was made but not followed; some goals	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures followed during the project.	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures followed and documented.		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning. Missed significant milestones or	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was made but not followed; some goals accomplished;	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures followed during the project. Goals	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures followed and documented. Identify plan		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning. Missed significant milestones or project not	Reasoningforthesolutionbasedonopinion only.Resultsevaluatedbutwithoutanyfocus.Plan was madebutnotfollowed;somegoalsaccomplished;inconsistentuse	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures followed during the project. Goals accomplished;	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures followed and documented. Identify plan and timeline;		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning. Missed significant milestones or project not completed	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was made but not followed; some goals accomplished; inconsistent use of time.	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures followed during the project. Goals accomplished; most milestones	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures followed and documented. Identify plan and timeline; consistently met		
Testing & Evaluation Time Management	No reason provided for the selected solution. Project does not include evaluation of results. No evidence of planning. Missed significant milestones or project not completed	Reasoning for the solution based on opinion only. Results evaluated but without any focus. Plan was made but not followed; some goals accomplished; inconsistent use of time.	Reasoning for the solution is supported by facts. Results evaluated; reflects the project's need. Plans and procedures followed during the project. Goals accomplished; most milestones met; misses	Solution selected by the use of comparative data. Evaluation data are collected to support needs. Project plan, procedures followed and documented. Identify plan and timeline; consistently met deadlines.		

Design	Reports may	Reports attempts	Reports used	Reports used		
Documentation	have poor	appropriate	mostly	appropriate		
& Presentation	quality writing	language/format	appropriate	language/format		
	and mix jargon	for the	language/format	format for the		
	with	engineering	for the	engineering		
	engineering	field.	engineering	field.		
	language.		field.			
	Reports miss	Reports are		Reports are		
	many	fairly	Reports are	informative and		
	important	informative and	mostly	easy to read.		
	topics and are	generally easy to	informative and	Information in		
	not easy to	read.	easy to read.	reports is well		
	read.	Information in	Information in	organized so		
	Information in	reports	reports is well	that data or		
	report is not	organized into	organized. All	design features		
	organized.	sections with	data and design	explanations are		
	Data or design	data or design	features can be	easy to found.		
	features	features	found without	Demonstration		
	explanations	explanation	difficulty.	is effectively		
	are very	present.		incorporated		
	difficult to	Demonstration	Demonstration	into		
	locate.	is present but	enhances	presentation.		
	Demonstration	breaks up flow	understanding	Project results		
	may not work	of presentation.	during	shared;		
	and derails the	Project results	presentation.	improvements		
	purpose of the	shared with	Project results	presented.		
	presentation.	others.	shared; both	Avoid		
	Project results		positive and	plagiarism, does		
	are not shared	The team did	negative results	not use		
	with others.	not quote all the	presented.	information		
		source of	The team quoted	without giving		
	Evidence of	information that	nearly all the	credit to the		
	plagiarism.	they used.	source of	appropriate		
		-	information that	source.		
			they used.			
Teamwork	Student builds	Student	Student jokes	Student apathy		
Dynamics	cohesion in	behavior brings	and pranks bring	negatively		
v	group through	sometimes	cohesion in the	affects group		
	verbal and	cohesion in	group but	performance.		
	non-verbal	group. Sporadic	meeting become	Group cohesion		
	behavior.	jokes and pranks	very time	is broken by		
		encourage	consuming.	non-verbal		
		participation of		behavior.		
		team members.				

Attendance	Marks	5
95% and ab	oove	10
90% and ab	oove	09
85% to less	than 90%	08
80% to less	than 85%	07
75% to less	than 80%	06
70% to less	than 75%	05
65% to less	than 70%	04
60% to less	than 65%	03
55% to less	than 60%	02
50% to less	than 55%	01
Less than 5	0%	0

Basic for awarding marks for class participation and attendance will be as follows:

However, no students will be allowed to sit for the final examination if he/she does not have 50% or more attendance in his/her corresponding course. The scheme of continuous assessment that a teacher proposes to follow for a course will be announced on the first day of classes. A student must sit for final examinations for theory courses and final quiz for laboratory/ sessional/ field work courses to pass the course. Moreover, any missed exam/test will earn zero (0). Academic dishonesty, such as Misbehaver in class, copying exam/test or letting another student copy may result -Fl grade in the course.

2.11 PROFILE OF	<b>DUTIES AND</b>	COMPETENCE	<b>OF CIVIL</b>	ENGINEER	(ENTRY
LEVEL)					

DUTIES	SPECIFIC DUTIES	COMPETENCES
1. Understands application of basic computer systems and associated software	<ol> <li>Understanding of computer hardware and systems</li> <li>Ability with basic algorithms and languages</li> <li>Ability in Basic Application Software such as word processing, spreadsheets, presentation, computer aided design and drafting, and construction management</li> <li>Ability with the Internet and online operations</li> </ol>	
General	6. Communicates effectively and efficiently	<ol> <li>Proficiency in English and Pilipino</li> <li>Ability to put down in writing thoughts, ideas, opinions, principles</li> <li>Ability to verbalize thoughts, ideas, opinions, principles whether in individual or group situations</li> <li>Ability to prepare technical papers, documents and reports</li> <li>Ability to present technical papers and reports</li> <li>Ability to create strategies for information dissemination</li> </ol>

	f s m	14. Ability of the principles of mathematics, natural,
	es ge o dts	15 A bility to determine enpropriate engineering
	plie edg nd teel cep	rinciples and techniques to be applied
	Ap will will the al gin on	16 Ability to develop appropriate mathematical or
	3. 2 Kno Ma En C	computer models
		17 Ability to use appropriate principles and models to
		develop solutions
		19. Understanding of the Civil Engineering Law
	on d	20. Understanding of other laws relevant to the
	ent ent ati	practice of civil engineering such as National
	are em frac iffic	Building Code.
	eci npl	21. Understanding the standard contract documents
	Pr de Sp de Dr	such as draft construction and consultancy
	18.	contracts, Instruction to Bidders, Technical
		Specifications, Bid Documents
	, <b>60</b>	22. Ability to know the range of various materials for
	l rin	civil engineering projects
	5. Selects and evaluates materi for civil enginee projects	23. Understanding of relevant properties of identified
		materials
		24. Understanding of applicable Standards
		25. Understanding of measuring and testing and
		26 Ability to measure test and evaluate building and
		construction materials
		27. Awareness of his role as a responsible citizen of
	рг	the nation
	an	28. Understanding of the Code of Ethics for Civil
	tands tts ethictices	Engineers
(j		29. Familiarity with the responsibilities to
nec	ner rac	clients/employer, co-professionals, the profession
ntin	nde pi	and the nation
Col	D. U	30. Familiarity with what constitutes unprofessional
ין (פ		and unethical conducts and their corresponding
ler?		penalties/sanctions
Jen	na re	31. Awareness of the need to continuously upgrade
Ŭ	ong	knowledge and skills throughout his professional
	Pun fe-l arr	life 22 Avvergences of the verieus modes of obtaining
	7. 7 lif le	52. Awareness of the various modes of obtaining
		33 Understanding of methods of research
	icts ind ent s	34 Understanding of research areas/tonics in civil
	ih a in ect	engineering
	Con arc roj:	35. Ability to undertake to basic/elementary research
	3. ( ese pi pi	projects
	σ1 ~	
	lies rin cts	
	asic of vil vil	1. Familiarity with the basic principles
	bî ci jî pre	2. Ability to apply basic principles in various projects
	<u>d</u> 9 9 0	phases

Planning	10. Undertakes technical feasibility studies	<ol> <li>Understanding of the objectives/purpose of a technical feasibility study</li> <li>Understanding of the scope/components of a technical feasibility study</li> </ol>				
	11. Conducts economic and financial feasibility studies	<ul> <li>a. Understanding the objectives/purpose of an economic/financial feasibility study</li> <li>b. Understanding the scope/components of an economic/financial feasibility study</li> <li>c. Awareness of the application of economic/financial principles to an economic/financial feasibility study</li> </ul>				
	12. Undertakes surveys and investigations	<ul> <li>a. Understanding the appropriate surveys and investigations required for various civil engineering projects</li> <li>b. Familiarity with the requirements of the various surveys and investigations</li> <li>c. Familiarity with methodologies of carrying out the more common surveys and investigations such as topographic surveys and geotechnical investigations</li> </ul>				
	13. Undertakes environmenta l studies	<ul> <li>a. Understanding of the general principles and objectives</li> <li>b. Understanding of the applicable laws</li> <li>c. Understanding of the scope and components of environmental studies</li> </ul>				
Design	14. Undertakes and/or supervises structural designs of civil engineering structures	<ol> <li>Ability to use methods of analysis relevant to structural design</li> <li>Ability to formulate mathematical and computer structural models</li> <li>Ability to determine structural loads such as dead load, live load, seismic load, wind load, etc.</li> <li>Ability to apply methods of analysis to the structure</li> <li>Ability to prepare details and plans</li> <li>Ability to prepare relevant documents such as computations, technical specifications, quantity calculations, bills of materials, estimates, etc.</li> <li>Understanding of computer aided design methods</li> </ol>				
	15. Undertakes and/or supervises the hydraulic design of structures	<ul> <li>a. Ability to use design methods relevant to hydraulic structures and systems</li> <li>b. Ability to determine hydraulic loads</li> <li>c. Ability to apply methods of analysis to the hydraulic structure and systems</li> <li>d. Ability to apply design methods to components of hydraulic structures and systems in accordance with appropriate codes</li> </ul>				

	16. Undertakes and/or supervises the design of geotechnical and transportation related engineering structures	<ul> <li>a Ability to use methods of analysis relevant to geotechnical and transportation engineering</li> <li>b. Ability to formulate mathematical and computer geotechnical and transportation engineering models</li> <li>c. Ability to determine relevant loads and material properties/behavior</li> <li>d. Ability to apply methods of analysis to the soil and affected components of the structure</li> <li>e. Ability to prepare geotechnical reports</li> <li>f. Ability to apply design methods to components of transportation structures and systems in accordance with appropriate codes</li> <li>g. Understanding of computer aided design methods</li> <li>h. Ability to apply design methods to components of geotechnical and transportation structures and systems in accordance with appropriate codes</li> </ul>
Construction / Demolition	18. Undertakes and/or supervises project management	<ol> <li>Understanding of government requirements such as permits, clearance, etc.</li> <li>Ability to read and interpret construction plans and working drawings</li> <li>Ability to read, interpret and revise contract documents, estimates and technical specifications</li> <li>Understanding of components of TOR for professional services</li> <li>Understanding of the bidding process</li> <li>Ability to prepare and update construction schedules and programs</li> </ol>
	19. Plans, implements and supervises construction projects	<ol> <li>Understanding of construction methods and alternatives</li> <li>Understanding of quality control methods</li> <li>Understanding of construction schedules and programs</li> <li>Ability to prepare progress report and measure accomplishment for payment</li> </ol>
	20. Evaluates and selects appropriate equipment for construction projects	<ol> <li>Familiarity with common construction equipment such as mixer, bulldozer, loader, etc.</li> <li>Familiarity with usage and performance capacity of common construction equipment</li> <li>Familiarity with equipment schedules</li> </ol>

21. Plans, supervises and implements manpower plans	<ol> <li>Understanding of labor laws and wage scales</li> <li>Understanding of the various manpower requirement in construction projects</li> <li>Understanding of the roles, duties and responsibilities of construction personnel</li> <li>Understanding of roles, manning schedule</li> </ol>
22. Plans, implements and supervises delivery of materials	<ol> <li>Ability to prepare quantities, inventories and delivery schedules</li> <li>Understanding of handling/storage requirements</li> </ol>
23. Implements safety standards and practices	<ol> <li>Understanding of relevant safety requirements and concerns</li> <li>Understanding of mitigation concerns</li> </ol>

#### ACADEMIC POLICY OF CE DEPARTMENT

#### **3.1 Academic Policy of CE Department**

The Department of Civil Engineering offers Bachelor of Science in Civil Engineering. Civil engineering is a specialized engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings. Civil engineering is divided into a number of sub-disciplines. It is one of the oldest engineering disciplines. Since the beginning of the civilization, Civil Engineering has established itself as one of the most important branches of engineering. All the students of Civil Engineering are required to have a balanced knowledge of mechanics, mathematics, physics, structures, transformational engineering, geotechnical and foundation engineering, surveying, building materials, environmental design and engineering etc. Throughout the study programs, considerable emphasis is placed on the development of methodical procedure for analysis and design, and on the responsible use of technology.

#### **3.2 Degree offering Department**

Our degree-offering department is the Department of Civil Engineering, which is under

Faculty of Modern Science.

#### 3.3 Course Designation and Numbering System

- The first part of a course code having three letters indicate the course offering department followed by a four-digit number with the following criteria:
  - a. The first digit will correspond to the year in which the course is normally taken by the students.
  - b. The second digit will correspond to the semester in which the course is normally taken by the students.
  - c. The third digit will be reserved for departmental use. The 3rd digit represents ...
    - 0- for Civil Engineering Practices
    - 1- for Structural Courses
    - 2- for Environmental Engineering Courses
    - 3- for Water Resources Engineering Courses
    - 4- for Geotechnical Engineering Courses
    - 5- for Transportation Engineering Courses
  - d. The fourth digit will be odd for theoretical and even for sessional/laboratory courses.
  - e. In case of GED courses, third digit represents the course-offering department.
- The course designation system is illustrated by the following example:

# CE 1213: ENGINEERING MECHANICS II Course title odd digit designates a theoretical course (similarly even for a sessional course) 3<sup>rd</sup> digit reserved for departmental use 2<sup>nd</sup> digit indicates semester/level 1<sup>st</sup> digit indicates year/level Department identification code

• Project/thesis courses shall be designated by the department identification code followed by 4102 (Example: CE 4102) applicable in both odd and even Terms.

### First Year: Semester I

CE 1111: Engineering Mechanics I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	~	$\checkmark$		~					~	

MAT 1151: Calculus and Linear Algebra

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	
CLO 2	~	~		~					~	
CLO 3	~	~		~					~	

GED 1131: Basic English

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1						~			$\checkmark$	~
CLO 2						~			~	~
CLO 3						~			~	~
CLO 4						~			~	~
CLO 5						~			~	~

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~			$\checkmark$		$\checkmark$	
CLO 2	~	~		~			~		~	
CLO 3	✓	✓		✓			✓		✓	
CLO 4	✓	✓		✓			✓		✓	
CLO 5	✓	✓		✓			✓		✓	
CLO 6	✓	✓		✓			✓		✓	
CLO 7	$\checkmark$	$\checkmark$		✓			$\checkmark$		$\checkmark$	

GED 1171: Physics: Heat, Light and Sound

GED 2181: Introduction to Economics

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1		~		~			~		~	~
CLO 2		~		~			~		~	~
CLO 3				~			~		~	~
CLO 4		~		~			~		~	~
CLO 5		~		~			~		~	~
CLO 6		~		~			~		~	~

PHY 1272: Physics Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		✓			$\checkmark$		$\checkmark$	
CLO 2	~	~		~			~		$\checkmark$	

CE 1112: Civil Engineering Drawing

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	$\checkmark$		~					$\checkmark$	
CLO 2	~	~		~					✓	

GED 1161: Chemistry

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	$\checkmark$		~					$\checkmark$	
CLO 2	~	~		✓					✓	

### First Year: Semester II

CE 1213: Engineering Mechanics II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$					$\checkmark$	
CLO 2	~	$\checkmark$		~					$\checkmark$	

#### CE 1211: Surveying

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$								$\checkmark$	~
CLO 2	~								~	~

#### GED 1231:Functional English

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1						~			~	~
CLO 2						~			~	~
CLO 3						~			~	~
CLO 4						~			~	~
CLO 5						~			~	~

MAT 1251: Differential Equation, Laplace Transform and Fourier Analysis

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~						
CLO 2	~	~		~						
CLO 3	~	~		~						

GED 1291: Principles of Accounting

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1		$\checkmark$		$\checkmark$			$\checkmark$		✓	~
CLO 2		~		~			~		$\checkmark$	~
CLO 3				~			~		✓	~
CLO 4		✓		✓			~		✓	✓
CLO 5		~		~			~		~	✓

CE 1212: AutoCAD for Civil Engineers

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$					$\checkmark$	
CLO 2	~	✓		✓					~	

GED 1261: Sustainable Development

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~						~		~	$\checkmark$
CLO 2	~						~		~	~
CLO 3	~						~		~	~

#### CE 1214: Practical Surveying

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$	~	$\checkmark$		$\checkmark$	~	$\checkmark$
CLO 2	~	~		~	~	~		~	~	~

GED 1162: Chemistry Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 2	~	~		~					$\checkmark$	~

## Second Year: Semester I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	
CLO 2	$\checkmark$	~		~					~	
CLO 3	✓	✓		✓					✓	
CLO 4	✓	~		✓					✓	
CLO 5	✓	✓		✓					✓	

CE 2111: Engineering Materials

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		$\checkmark$			$\checkmark$		$\checkmark$	
CLO 2	~	~		~			~		~	

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		$\checkmark$			$\checkmark$		~	
CLO 2	~	~		✓			~		~	

CE 2141: Engineering Geology and Geomorphology

#### CE 2113: Mechanics of Solids I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		~	~					$\checkmark$	
CLO 2	~		~	~					✓	

MAT 2151: Coordinate Geometry and Vector Analysis

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		$\checkmark$	~						
CLO 2	✓		✓	✓						
CLO 3	~		✓	✓						
CLO 4	~		✓	✓						
CLO 5	~		✓	✓						

CE 2112: Details of Construction

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$		~	~					~	
CLO 2	~		~	~					~	

CE 2114: Engineering Materials Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					~	
CLO 2	~	✓		~					~	

CE 2116: Mechanics of Solids Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~			~				$\checkmark$	

EEE 2172: Electrical Technology Lab

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		$\checkmark$	~					$\checkmark$	
CLO 2	~		~	~					~	

GED 2121: Computer Programming

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$		~	$\checkmark$					~	
CLO 2	~		~	~					~	

## Second Year: Semester II

CE 2211: Numerical Methods

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		$\checkmark$					✓	
CLO 2	~	~		~					$\checkmark$	
CE 2215: Mechanics of Solids II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		$\checkmark$	$\checkmark$					$\checkmark$	
CLO 2	~		✓	~					~	

CE 2231: Fluid Mechanics

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					~	
CLO 2	~	~		~			~		~	
CLO 3	~	~		~					~	
CLO 4	~	~		~			~		~	

GED 1145: Bangladesh Studies

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1						~	$\checkmark$			~
CLO 2						✓	~			~
CLO 3						~	~			~
CLO 4						✓	~			~
CLO 5						~	~			~

#### STA 2261: Statistics

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$						
CLO 2	~	$\checkmark$		~						

CE 2221: Environmental Engineering I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	$\checkmark$		~			~		$\checkmark$	
CLO 2	✓	✓		✓			✓		✓	
CLO 3	$\checkmark$	~		~			$\checkmark$		~	

CE 2222: Environmental Engineering Sessional I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~			$\checkmark$		~	
CLO 2	~	~		~			~		~	
CLO 3	✓	~		~			~		~	
CLO 4	✓	~		~			~		~	
CLO 5	~	~		~			~		~	

GED 2222: Computer Programming Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		$\checkmark$					✓	$\checkmark$
CLO 2	~	~		✓					$\checkmark$	✓

CE 2212: Quantity Surveying

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	$\checkmark$		~					$\checkmark$	
CLO 2	~	✓		~					✓	
CLO 3	~	$\checkmark$		~					~	

CE 2232: Fluid Mechanics Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~			$\checkmark$		$\checkmark$	
CLO 2	~	~		~			~		~	

# **Third Year: Semester I**

CE 3111: Structural Analysis I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$		$\checkmark$	~					~	
CLO 2	~		~	~					~	
CLO 3			✓	✓					✓	

PLO PLO 1 PLO 2 PLO 3 PLO 4 PLO 5 PLO 8 PLO 9 PLO 6 PLO 7 CLO ✓ ✓ ✓  $\checkmark$ CLO 1 ✓ ✓ CLO 2 ✓ ✓ ✓ CLO 3  $\checkmark$ ✓  $\checkmark$ ✓ ✓ CLO 4  $\checkmark$ ✓

PLO 10

CE 3113: Design of Concrete Structures I

GED 3211: Smart Village Studies

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
CLO 2	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
CLO 3	~	~		✓			~	✓	✓	✓
CLO 4	$\checkmark$	~		$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	~
CLO 5	✓	~		✓			✓	$\checkmark$	$\checkmark$	~
CLO 6	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$

CE 3141: Geotechnical Engineering I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~			~						
CLO 2	~			~						
CLO 3	~	~		~					~	
CLO 4	~	~		~					~	
CLO 5	~	~		~					~	

CE 3133: Open Channel Flow

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$		$\checkmark$	
CLO 2	~	~		~			~		~	
CLO 3	~	~		~					~	
CLO 4	~	✓		✓			~		✓	
CLO 5	~	✓		✓			~		✓	

# CE 3135: Hydrology

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$						$\checkmark$			
CLO 2	~			~			~		~	
CLO 3					✓			✓	✓	~

CE 3142: Geotechnical Engineering Sessional I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	~	~		~					~	

CE 3116: Engineering Computation Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	✓	~		~					✓	

CE 3132: Open Channel Flow Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		~			~		$\checkmark$	

# **Third Year: Semester II**

CE 3213: Structural Analysis II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		~							
CLO 2	~		~	✓				~	✓	✓
CLO 3	~		~	~				✓	✓	

CE 3215: Design of Concrete Structures II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	✓	~	✓	✓					✓	
CLO 3	~	~	~	~					~	

CE 3243: Geotechnical Engineering II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	
CLO 2	~	~	✓	~					✓	
CLO 3	$\checkmark$	~		~					~	

CE 3251: Transportation Engineering I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1							$\checkmark$			
CLO 2	~		~							
CLO 3	~		~							
CLO 4	~									

CE 3211: Design of Steel Structures

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		$\checkmark$					~	$\checkmark$
CLO 2	~	~		~					~	~
CLO 3	~	~		~					~	~
CLO 4	~	~		~					~	~

CE 3214: Concrete Structures Sessional I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	
CLO 2	✓	✓		~					✓	
CLO 3	$\checkmark$	$\checkmark$		~					✓	

CE 3212: Structural Analysis and Design Sessional I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$								~	
CLO 2	~		~	~					~	~
CLO 3	~		~	~				~	~	

CE 3252: Transportation Engineering Sessional I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	✓	~		~					$\checkmark$	
CLO 3	~	~		~					✓	
CLO 4	~	~		~					✓	

# Fourth Year: Semester I

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~			~		$\checkmark$	
CLO 2	~	✓		✓			~		✓	
CLO 3	$\checkmark$	$\checkmark$		$\checkmark$			~		$\checkmark$	

CE 4123: Environmental Engineering II

### CE 4153: Transportation Engineering II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	~	~		~			~		✓	
CLO 3	~	~		✓			~		✓	
CLO 4	~	~		~					~	

CE 4101: Project Planning and Management

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$				
CLO 2	~			✓						~
CLO 3	~		$\checkmark$							

CE 4115: Structural Analysis III

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$					$\checkmark$	
CLO 2	~	$\checkmark$		~					$\checkmark$	

CE 4137: Irrigation and Flood Control

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		~			~		$\checkmark$	~
CLO 2	~	~		~			~		$\checkmark$	~
CLO 3	~	~		~			~		✓	
	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$		$\checkmark$	$\checkmark$

CE 4116: Concrete Structures Sessional II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		~	~					$\checkmark$	
CLO 2	~		~	~					~	

CE 4118: Structural Analysis and Design Sessional II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		~	~			~	$\checkmark$	~	
CLO 2	✓		~	~			~	✓	~	
CLO 3	$\checkmark$		~	~			~	~	~	

CE 4102: Capstone Project

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~			$\checkmark$		✓	$\checkmark$
CLO 2	~	~		~			~		~	~

CE 4104: Project / Thesis (will be completed in 4th year 2nd semester)

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~		~	~		~	$\checkmark$
CLO 2	~	~		~		~	~		~	✓

# Fourth Year: Semester II

# **Compulsory Courses**

CE 4201: Professional Practices and Ethics

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	$\checkmark$		~	$\checkmark$	~	$\checkmark$		$\checkmark$	~
CLO 2	~	$\checkmark$		~	✓	✓	~		✓	~
CLO 3	~	$\checkmark$		✓	$\checkmark$	✓	✓		✓	~

CE 4203: Research Methodology

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~			$\checkmark$		$\checkmark$	~
CLO 2	~	~		~			~		✓	✓

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~			$\checkmark$		$\checkmark$	~
CLO 2	✓	~		~			✓		✓	~
CLO 3	~	~		~			~		✓	~

CE 4204: Remote Sensing and GIS Sessional

CE 4104: Project / Thesis

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~		~	~	~	~	~
CLO 2	~	~		~		~	~	~	~	~
CLO 3	~	~		~		~	~	~	~	~
CLO 4	~	~		~		~	~	~	~	~

# **Specialized Courses: Structure**

CE 4211: Theory of Elasticity & Elastic Instability of Structures

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$					$\checkmark$	
CLO 2	~	$\checkmark$		~						

CE 4213: Earthquake Resistant Design and retrofitting

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$			$\checkmark$				$\checkmark$	$\checkmark$	$\checkmark$
CLO 2	$\checkmark$			~				~	~	~

CE 4215: Pre-stressed Concrete

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	~
CLO 2	✓	~		~					✓	✓
CLO 3	~	~		~					✓	~
CLO 4	✓	✓		~					✓	✓

CE 4217: Introduction of Finite Element Method

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					~	~
CLO 2	~	~		~					~	~
CLO 3	~	~		~					~	~
CLO 4	~	~		~					~	~

CE 4219: Dynamics of Structures and Earthquake Engineering

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					$\checkmark$	
CLO 2	~			~						
CLO 3	~			~					✓	

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$	~						~	
CLO 2	~	$\checkmark$	~							

## CE 4212: Structural Analysis and Design Sessional III

# **Specialized Courses: Environment**

CE 4221: Solid Waste Management

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~			~			~		~	
CLO 2	~			~			~		~	~
CLO 3	~			~			~		~	~
CLO 4	$\checkmark$			~			$\checkmark$		✓	

#### CE 4223: Environmental Pollution and its Control

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$			~			$\checkmark$		$\checkmark$	
CLO 2	~			✓			~		✓	

CE 4225: EIA and Development projects

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1		~			$\checkmark$	$\checkmark$	$\checkmark$			✓
CLO 2		~			~	~	~			✓
CLO 3		~			~	~	~			~
CLO 4		~			~	~	$\checkmark$			✓

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~			~	~	~			~
CLO 2	~	~			~	~	~			~
CLO 3	~	~			~	~	~			~
CLO 4	~	~			~	~	~			~

CE 4227: Introduction to Environmental Modelling

CE 4222: Environmental Engineering Sessional II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~					~			✓
CLO 2	~	~					~			~

# **Specialized Courses: Geotechnical**

CE 4241: Earth Retaining Structures

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		$\checkmark$					$\checkmark$	
CLO 2	✓	~		✓					~	
CLO 3	✓	~		✓					✓	

CE 4243: Elementary Soil Dynamics

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	
CLO 2	~	~		~					✓	
CLO 3	~	~		~					✓	
CLO 4	$\checkmark$	$\checkmark$		~					$\checkmark$	

#### CE 4245: Soil- water interaction

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~						
CLO 2	~	~		✓						
CLO 3	~	~		~						
CLO 4	~	$\checkmark$		~						

## CE 4242: Geotechnical Engineering Sessional II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					<	

# **Specialized Courses: Transportation**

### CE 4251: Traffic Planning and Management

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~								
CLO 2			~							~
CLO 3				~	~					

### CE 4253: Highway Drainage and Airports

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~		~	~						

### CE 4255: Transport Projects and Operations

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~						$\checkmark$		~	
CLO 2	~	~					~		~	
CLO 3	~	~					~		~	
CLO 4	~	~					~		~	

CE 4252: Transportation EngineeringSessional II

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~								
CLO 2	~	~								

## **Specialized Courses: Water Resources**

CE 4231: Groundwater Engineering

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~	~		~					~	
CLO 2	~	~		~					~	
CLO 3	~	~		~					~	

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		~					$\checkmark$	~
CLO 2	~	~		~					✓	~
CLO 3	~	✓		~					✓	✓

CE 4233: River Engineering and Basin Management

# CE 4235: Hydraulic Structures

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$			~					✓	~
CLO 2	~			~					✓	~
CLO 3	~			~					$\checkmark$	~

# CE 4237: Coastal Engineering

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	$\checkmark$		$\checkmark$					✓	~
CLO 2	~			✓					$\checkmark$	~

# CE 4232: Irrigation and Flood Control Sessional

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	~			~					~	~
CLO 2	~	~		~					~	~

PLO CLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10
CLO 1	$\checkmark$	~		✓					$\checkmark$	
CLO 2	~	~		~					$\checkmark$	

CE 4234: Water Resources Engineering Sessional

# 4.1 Course Distribution according to different multidisciplinary area

# Language

Туре	Course Code	Course Name	Credit	Credit Hour
Languaga	GED 1131	Basic English	2	2
Language	GED 1231	Functional English	2	2
		Total Credit	4	4
		Requirement	6	

# **General Education**

Туре	Course Code	Course Name	Credit	Credit Hour
	GED 2181	Introduction to Economics	2	2
	GED 1291	Principles of Accounting	2	2
Social Sciences	GED 1261	Sustainable Development	2	2
	GED 3211	Smart Village Studies	3	3
Arts and Humanities	GED 1145	Bangladesh Studies: History, Society and Culture of Bangladesh	2	2
		Total Credit	11	11
		Requirement	15	

# **Basic Sciences**

Туре	Course Code	Course Name	Credit	Credit Hour
Dhysics	GED 1171	Physics: Heat , Light and Sound	2	2
Physics	PHY 1272	Physics Sessional	1.5	3
Chamistry	GED 1161	Chemistry	3	3
Chemistry	GED 1162	Chemistry Sessional	1.5	3
		Total Credit	8	11
		Requirement	11	

# Mathematics

Туре	Course Code	Course Name	Credit	Credit Hour
	MAT 1151	Calculus and Linear Algebra	3	3
	MAT 1251	Differential Equation, Laplace Transform and Fourier Analysis	3	3
Mathematics	MAT 2151	Coordinate Geometry and Vector Analysis	3	3
	STA 2261	Statistics	2	2
	CE 3116	Engineering Computation Sessional	1.5	3
	CE 2211	Numerical Methods	2	2
		Total Credit	14.5	16
		Requirement	12	

# **Other Engineering**

Туре	Course Code	Course Name	Credit	Credit Hour
	GED 3271	Electrical Technology in Buildings	2	2
	EEE 2172	Electrical Technology Lab	1.5	3
	GED 2222	Computer Programming Sessional	1.5	3
Other	GED 2121	Computer Programming	2	2
Engineering	CE 1112	Civil Engineering Drawing	1.5	3
		Total Credit	8.5	13
		Requirement	9	
*** Total credit on GED courses				
*** Re	*** Requirements as per BNQF 25% (Out of 164 credits)			

# **Civil Engineering Core:**

# Basic

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 1111	Engineering Mechanics I	3	3
	CE 1213	Engineering Mechanics II	3	3
	CE 1211	Surveying	4	4
	CE 2111	Engineering Materials	3	3
Basic	CE 2141	Engineering Geology and Geomorphology	3	3
	CE 2113	Mechanics of Solids I	3	3
	CE 2114	Engineering Materials Sessional	1.5	3
	CE 1212	AutoCAD for Civil Engineers	1.5	3
	CE 2215	Mechanics of Solids II	3	3
		Total Credit	25	28
		Requirement	22	

# Structural Engineering

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 3111	Structural Analysis I	3	3
	CE 3213	Structural Analysis II	3	3
	CE 4115	Structural Analysis III	3	3
	CE 3113	Design of Concrete Structures I	3	3
Structural	CE 3215	Design of Concrete Structures II	3	3
Engineering	CE 3211	Design of Steel Structure	2	2
	CE 3212	Structural Analysis & Design Sessional 1	1.5	3
	CE 4118	Structural Analysis & Design Sessional II	1.5	3
		Total Credit	20	23
		Requirement	12	

# **Environmental Engineering**

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 2221	Environmental Engineering I	3	3
Environmental Engineering	CE 2222	Environmental Engineering Sessional I	1.5	3
	CE 4123	Environmental Engineering II	3	3
		Total Credit	7.5	9
		Requirement	7	

# **Geotechnical Engineering**

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 3141	Geotechnical Engineering I	3	3
Geotechnical	CE 3243	Geotechnical Engineering II	3	3
Engineering	CE 3142	Geotechnical Engineering Sessional I	1.5	3
		Total Credit	7.5	9
		Requirement	7	

# Transportation Engineering

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 3251	Transportation Engineering I	3	3
Transportation Engineering	CE 3252	Transportation Engineering Sessional I	1.5	3
	CE 4153	Transportation Engineering II	3	3
		Total Credit	7.5	9
		Requirement	7	

# Water Resources Engineering

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 2231	Fluid Mechanics	3	3
	CE 3133	Open Channel Flow	3	3
Water	CE 3135	Hydrology	3	3
Engineering	CE 4137	Irrigation and Flood Control	3	3
	CE 3132	Open Channel Flow Sessional	1.5	3
		Total Credit	13.5	15
		Requirement	7	

# **Civil Engineering Practices**

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 4101	Project Planning and Management	3	3
CIVII	CE 4201	Professional Practices and Ethics	2	2
Practices	CE 4204	GIS and Remote Sensing Sessional	1.5	3
	CE 4203	Research Methodology	2	2
		Total Credit	8.5	10
		Requirement	6	

# Others

Туре	Course Code	Course Name	Credit	Credit Hour
	CE 1214	Practical Surveying	1.5	3
	CE 2116	Mechanics of Solids Sessional	1.5	3
	CE 2112	Details of Construction	1.5	3
Others	CE 2212	Quantity Surveying	1.5	3
	CE 2232	Fluid Mechanics Sessional	1.5	3
	CE 4116	Concrete Structures Sessional II	1.5	3
	CE 3214	Concrete Structures Sessional I	1.5	3
	CE 4102	Capstone Project	3	6
Project / mesis	CE 4104	Project / Thesis	3	6
		Total Credit	16.5	33
		Requirement	11	

# Technical Electives (12 credits will be offered from the following courses)

Туре	Course Code	Course Name	Credit	Credit Hour
	GED 1262	Computer Aided Engineering Drawing	1.5	3
	CE 4211	Theory of Elasticity& Elastic Instability of Structures	2	2
	CE 4213	Earthquake Resistant Design and retrofitting	2	2
	CE 4215	Pre-stressed Concrete	2	2
	CE 4217	Introduction of Finite Element Method	2	2
	CE 4219	Dynamics of Structures and Earthquake Engineering	2	2
	CE 4212	Structural Analysis and Design Sessional III	1.5	3
	CE 4221	Solid Waste Management	2	2
	CE 4223	Environmental Pollution and its	2	2

	Control		
CE 4225	EIA and Development projects	2	2
CE 4227	Introduction to Environmental Modelling	2	2
CE 4222	Environmental Engineering Sessional II	1.5	3
CE 4241	Earth Retaining Structures	2	2
CE 4243	Elementary Soil Dynamics	2	2
CE 4245	Soil- water interaction	2	2
CE 4242	Geotechnical Engineering Sessional II	1.5	3
CE 4251	Traffic Planning and Management	2	2
CE 4253	Highway Drainage and Airports	2	2
CE 4255	Transport Projects and Operations	2	2
CE 4252	Transportation Engineering Sessional II	1.5	3
CE 4231	Groundwater Engineering	2	2
CE 4233	River Engineering &Basin Management	2	2
CE 4235	Hydraulic Structures	2	2
CE 4237	Coastal Engineering	2	2
CE 4232	Irrigation &Flood Control Sessional	1.5	3
CE 4234	Water Resources Engineering Sessional	1.5	3
	Total Credit	12	30
	Requirement	11	
	*** Total credit	164	221

# 4.2 Course Structure

First Year: Semester I				
Course Code	Course Title	Credit	Contact Hour	
CE 1111	Engineering Mechanics I	3	3	
MAT 1151	Calculus and Linear Algebra	3	3	
GED 1131	Basic English	2	2	
GED 1171	Physics: Heat, Light and Sound	2	2	
GED 2181	Introduction to Economics	2	2	
PHY 1272	Physics Sessional	1.5	3	
CE 1112	Civil Engineering Drawing	1.5	3	
GED 1161	Chemistry	3	3	
	Total	18	21	
	First Year: Semester II			
Course Code	Course Title	Credit	Contact Hour	
CE 1213	Engineering Mechanics II	3	3	
CE 1211	Surveying	4	4	
GED 1231	Functional English	2	2	
MAT 1251	Differential Equation, Laplace Transform and Fourier Analysis	3	3	
GED 1291	Principles of Accounting	2	2	
CE 1212	AutoCAD for Civil Engineers	1.5	3	
GED 1261	Sustainable Development	2	2	
CE 1214	Practical Surveying	1.5	3	
GED 1162	Chemistry Sessional	1.5	3	
	Total	20.5	25	

Second Year: Semester I					
Course Code	Course Title	Credit	<b>Contact Hour</b>		
GED 3271	Electrical Technology in Buildings	2	2		
CE 2111	Engineering Materials	3	3		
CE 2141	Engineering Geology and Geomorphology	3	3		
CE 2113	Mechanics of Solids I	3	3		
MAT 2151	Coordinate Geometry and Vector Analysis	3	3		
CE 2112	Details of Construction	1.5	3		
CE 2114	Engineering Materials Sessional	1.5	3		
CE 2116	Mechanics of Solids Sessional	1.5	3		
EEE 2172	Electrical Technology Lab	1.5	3		
GED 2121	Computer Programming	2	2		
	Total	22	28		

Second Year: Semester II				
Course Code	Course Title	Credit	<b>Contact Hour</b>	
CE 2211	Numerical Methods	2	2	
CE 2215	Mechanics of Solids II	3	3	
CE 2231	Fluid Mechanics	3	3	
GED 1145	Bangladesh Studies	2	2	
STA 2261	Statistics	2	2	
CE 2221	Environmental Engineering I	3	3	
CE 2222	Environmental Engineering Sessional I	1.5	3	
GED 2222	Computer Programming Sessional	1.5	3	
CE 2212	Quantity Surveying	1.5	3	
CE 2232	Fluid Mechanics Sessional	1.5	3	
	Total	21	27	

Third Year: Semester I					
Course Code	Course Title	Credit	<b>Contact Hour</b>		
CE 3111	Structural Analysis I	3	3		
CE 3113	Design of Concrete Structures I	3	3		
GED 3211	Smart Village Studies	3	3		
CE 3141	Geotechnical Engineering I	3	3		
CE 3133	Open Channel Flow	3	3		
CE 3135	Hydrology	3	3		
CE 3142	Geotechnical Engineering Sessional I	1.5	3		
CE 3116	Engineering Computation Sessional	1.5	3		
CE 3132	Open Channel Flow Sessional	1.5	3		
	Total	22.5	27		
	Third Year: Semester II				
Course Code	Course Title	Credit	Contact Hour		
CE 3213	Structural Analysis II	3	3		
CE 3215	Design of Concrete Structures II	3	3		
CE 3243	Geotechnical Engineering II	3	3		
CE 3251	Transportation Engineering I	3	3		
CE 3211	Design of Steel Structures	2	2		
CE 3214	Concrete Structures Sessional I	1.5	3		
CE 3212	Structural Analysis and Design Sessional I	1.5	3		
CE 3252	Transportation Engineering Sessional I	1.5	3		
	Total	18.5	23		

Fourth Year: Semester I				
Course Code	Course Title	Credit	Contact Hour	
CE 4123	Environmental Engineering II	3	3	
CE 4153	Transportation Engineering II	3	3	
CE 4101	Project Planning and Management	3	3	
CE 4115	Structural Analysis III	3	3	
CE 4137	Irrigation and Flood Control	3	3	
CE 4116	Concrete Structures Sessional II	1.5	3	
CE 4118	Structural Analysis and Design Sessional II	1.5	3	
CE 4102	Capstone Project	3	6	
CE 4104	Project / Thesis (will be completed in 4 <sup>th</sup> year 2 <sup>nd</sup> semester)	1.5	3	
	Total	22.5	30	

Fourth Year: Semester II			
	Compulsory Courses		
Course Code	Course Title	Credit	Contact Hour
CE 4201	Professional Practices and Ethics	2	2
CE 4203	Research Methodology	2	2
CE 4204	Remote Sensing and GIS Sessional	1.5	3
CE 4104	Project / Thesis	1.5	3
	Total	7	10
Specialized Co	ourses: Structure		
CE 4211	Theory of Elasticity and Elastic Instability of Structures	2	2
CE 4213	Earthquake Resistant Design and retrofitting	2	2
CE 4215	Pre-stressed Concrete	2	2
CE 4217	Introduction of Finite Element Method	2	2
CE 4219	Dynamics of Structures and Earthquake Engineering	2	2
CE 4212	Structural Analysis and Design Sessional III	1.5	3

Specialized Co	ourses: Environment		
CE 4221	Solid Waste Management	2	2
CE 4223	Environmental Pollution and its Control	2	2
CE 4225	EIA and Development projects	2	2
CE 4227	Introduction to Environmental Modelling	2	2
CE 4222	Environmental Engineering Sessional II	1.5	3
Specialized Co	ourses: Geotechnical		
Course Code	Course Title	Credit	Contact Hour
CE 4241	Earth Retaining Structures	2	2
CE 4243	Elementary Soil Dynamics	2	2
CE 4245	Soil- water interaction	2	2
CE 4242	Geotechnical Engineering Sessional II	1.5	3
Specialized Co			
CE 4251	Traffic Planning and Management	2	2
CE 4253	Highway Drainage and Airports	2	2
CE 4255	Transport Projects and Operations	2	2
CE 4252	Transportation Engineering Sessional II	1.5	3
Specialized Co	urses: Water Resources		
CE 4231	Groundwater Engineering	2	2
CE 4233	River Engineering and Basin Management	2	2
CE 4235	Hydraulic Structures	2	2
CE 4237	Coastal Engineering	2	2
CE 4232	Irrigation and Flood Control Sessional	1.5	3
CE 4234	Water Resources Engineering Sessional	1.5	3
	Total	12	30
	Total Credit	164	221

# First Year: Semester I

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 1111	<b>Engineering Mecha</b>	nics I		Theory	3.0	3.0
Course Rationa	le						
Engineering mec	hanics Iprovid	es the basic understand	dings, cor	ncept and p	ractice of Engi	ineering me	chanics to the
civil engineering	students.			-			
Course Objectiv	ves		Course	Outcomes			
> To mak	e the students	knowledgeable with		The know	vledge gained	on Coplan	ar concurrent
the basi	cs of Engineer	ing mechanics.		Non conc	loments and p	barallel cop	lanar forces,
> To dev	elop a proble	m-solving power on		Non-conl	anar forces	Centroids	Moment of
Coplana	ar concurrent f	forces, Moments and		inertia of	f areas and	Moment o	of inertia of
parallel	coplanar for	ces, Non-concurrent	masseswill provide a strong dais to understand				
and no	n-parallel cop	olanar forces, Non-	analyses of Structures.				
coplana	r forces, Cei	troids, Moment of	$\succ$ The students will apply the fundamentals of				
inertia of areas and Moment of inertia of		mechanics to solve practical problems related to					
masses.				structures.			
<b>Course Content</b>	s						
Part A:							
Introduction to u	nits, Composit	ion and Resolution of	forces, M	loments and	d their applicat	tions, Paral	lel forces and
couples,							
Part B:							
Equilibrium of forces, Centroids, moment of inertia of areas and moment of inertia of masses.							
1 ext books and/or Keterence Materials							
1. Analytical Mechanics by Virgil Moring Faires, Sherman Daniel Chambers.							
2. Engineering Mechanics by R. S. Khurmi							
3. Engineering Mechanics by Ferdinand L. Singer.							

Course Code: MAT 1151	Credits: 03	Semester: 1 <sup>st</sup>	Year: 1 <sup>st</sup>			
Course Title: Calculus and Linear Algebra						
<b>Rationale of the Course:</b> This course is designed to provide engineering undergraduates with the problem-solving capacity on differential, integral calculus and matrices.						
Course Objectives:						
This course has been assigned • To make the stude	<ul> <li>This course has been assigned for the students</li> <li>To make the students conversant with basics of Differential Calculus</li> </ul>					
• To make the stude	nt sound on Integral Calculus					
• To acquaint the stu	ident with Matrices					
• To develop a prob Matrices.	lem-solving power on Differe	ntial Calculus, Integral Calcu	ulus and			
Intended Learning Outcome	5:					
At the end of the course, stude	nts are expected to:					
<ul> <li>ILO-1 define and understand basic topics of calculus related to Engineering studies</li> <li>ILO-2 selects and apply appropriate methods to solve structural problems.</li> <li>ILO-3 be able to make interpretation of the findings for engineering analysis, research and planning purposes</li> </ul>						
Course Contents:						
<ul> <li>Part-A</li> <li>Differential Calculus: Functions of one variable &amp; their plots, Limit, Continuity, Differentiability, Successive differentiation, Leibnitz's theorem, Rolle's, Mean-value, Taylors, Maclaurin's Theorem, Langrange's&amp; Cauchy's forms of Remainder, Expansion of functions in Taylor's &amp;Maclaurin's series, Maxima and Minima of a function, Points of inflexion, Tangent, Normal, Curvature &amp; radius of curvature, Functions of several variables, Partial derivatives, Euler's theorem, Jacobians, Directional derivatives.</li> <li>Integral Calculus: Physical meaning of a integration of function, different techniques of integrations, Integration by parts, Definite integration, Integration by summation of series, Fundamental theorem of</li> </ul>						
integral calculus. <b>Part-B</b> <b>Matrices</b> : Definition of diffe	rent kinds of matrices; algeb	ora of matrices; inverse of	matrix; rank and			
elementary transformation of matrices; solution of system of linear equations; Eigen values and Eigen vectors; Cayley-Hamilton theorem.						
Recommended Text Books: 1. Calculus: Thomas and Finney						
<ol> <li>Differential Calcu</li> <li>Integral Calculus:</li> </ol>	lus: Das &Mukharjee Das &Mukharjee					

4. Linear Algebra: AbdurRahman

Course Code: GED 1131	Credits: 02	Semester: 1	st Ye	ar: First
Course Title: Basic English				
Rationale: The course intends to familiari	se the students	with the basic ru	les/patterns o	of English

language and fundamental principles of grammar and notions to communicate effectively.

Course Objectives: This course has been offered for the students

- to develop an understanding about the basic patterns of English sentence construction,
- to introduce to them the techniques of how to apply conversational materials in day to day life communications,
- to enable them to write correct sentences,
- to enable them to express their regular notions, feelings and intentions in English,
- to make them know how to enrich vocabulary and to develop skills to use English.

#### **Intended Learning Outcomes (ILOs):**

At the end of this course, students should be able to

ILO-1: improve essential concepts of English grammar,

- ILO-2: develop an understanding of different sentence structures and patterns,
- ILO-3: be familiar with strategies and techniques of expressions used in English,
- ILO-4: write grammatically correct sentences on given topics,
- ILO-5: interact with teachers and professionals with a sense of confidence in English.

#### **Course Contents:**

#### Part-A

Reading fiction texts: fractions of various modern fictions written in easy language, short stories etc.; Skills: making inference, understanding how impressions are created, examining impact of words, examining points of view and reaching a conclusion etc. Reading non-fiction texts: newspapers, prose relating to history, geography, science and technology; Skills: summarizing a text, understanding use of words and their effects, comparing the style of fiction and non-fiction texts etc. Comprehension Practice, Parts of Speech/ Modals/Notions/Functions, Discussion on Tense and Practice, Number/Gender, Causative Verbs & Subjunctive/ Infinitive, Use of Articles, Voice and Speech Change, Phrases and Structures ,Adjectives and its Various Usage, Conditional Sentences, Subject-verb Agreement, Transformation of Sentences, etc.

#### Part-B

Writing practice on particular topics, Prepositions and adverbs, Use of Punctuations ,Sentence Construction, Uses of English Expressions, Dialogues/Monologues, problem Solving Tasks, Simulations, Games, Pair Discussions,Open-ended Writing on Specific Topics. **Unit-1:Skills;** Making requests, Giving commands, Inviting people, Giving advice, Giving suggestions, Agreeing and disagreeing, Asking questions, Giving opinion, Making comments, Presenting a paper, Addressing an audience, etc.

#### **Recommended Books:**

- Raymond Murphy: Intermediate English Grammar
- Barron's TOEFL
- E. L. Tibbitts: *Exercises in Reading Comprehension*
- Michael Swan: *Practical English Usage*
- A J Glover: Build up Your English
- Cambridge Practice Test for IELTS (1-12) complied by Cambridge University Press.

Course Code:GED 1171	Credits: 02	Semester: 1	Year: 1		
Course Title: Physics- Heat, Light and Sound					
Rationale: To introduce the fur	ndamentals knowled	ge application of waves	and oscillations. heat		
and thermodynamics, and optics	s.				
Course Objectives: The objective	e of this course is to	educate the students with	the followings:		
• the fundamental knowle	dge laws of oscil	lation and wave motio	on, optics, heat and		
thermodynamics.					
• the skills and techniques of	f applying fundament	al laws of physics in engir	eering technology.		
Intended Learning Outcomes()	ILOs):				
After successful completion of t	this course a student v	vill be able to –			
ILO-1: distinguish simple harm	nonic oscillation, dam	ped oscillation, forced osc	cillation,		
ILO-2: Understand the importa	nce of resonance in e	ngineering,			
ILO-3: identify the types of wa	ves and understand th	ne architectural use of mec	chanical wave,		
ILO-4: know the concept and to	echniques of tempera	ture measurement and hea	t transfer		
ILO-5: use the concepts and lav	ws of thermodynamic	s in engineering and techr	nology,		
ILO-6: be familiar with the fun	damental processes o	of light,			
ILO-7: learn the techniques for	engineering applicati	on of various optical phen	omena and theorem.		
Course Contents:					
<b>Part-A:</b> <i>Waves and Oscillations</i> simple harmonic oscillator, spin oscillation, resonance, waves are intensity of wave motion, statarchitectural acoustics, reverber thermodynamics, principle of the specific heat, heat transfer,	s: differential equatio ring-mass system, to nd its types, different ationary wave, beat ation and Sabine's for temperature measure	n of a simple harmonic o orsional pendulum, damp ial equation of a progress s, intensity level of so ormula. <i>Heat</i> : Temperature ements, thermal expansion	scillation, energy of a ed oscillation, forced sive wave, power and und, Doppler effect, re and Zeroth Law of on, heat capacity and		
<b>Part-B:</b> <i>Thermodynamics:</i> first l processes, Carnot cycle; efficie <i>Optics</i> : Illumination and photom refraction of light, interference of Newton's rings; diffraction of lig resolving power of optical inst	aw of thermodynamic ncy of heat engines, hetry, luminous intens of light, Young's doul tht; Fresnel and Frau- truments, diffraction	cs and its application, reve , entropy and second law ity and its units, theories ole slit experiment, interfe nhofer type diffraction, dif at double slit and n-sli	ersible and irreversible v of thermodynamics. of light, reflection and rence from thin films, ffraction by single slit, its-diffraction grating;		

polarization; polarization of light, different method of polarization, intensity of polarized light, optical activity.

#### **Recommended Books:**

- 1. Fundamentals of physics, by Haliday, Resnick& Walker
- 2. University Physics, by Young & Freedman
- 3. Physics for Engineers Vol-1 &2, by GiasUddin Ahmed

Course Code: GED 2181	Credits: 02	Semester:	Year:			
Course Title: Introduction to Economic	Course Title: Introduction to Economics					
<b>Rationale:</b> The ideas, theories, and analytical methods of economics are explored in detail in this course. This course design to examine both microeconomics and macroeconomics, with a particular emphasis on the analysis of individual decision-making units in both cases (households and businesses)						
<ul> <li>Course Objectives: This course has been offered for the students</li> <li>to develop an understanding about the basic principles of Economics,</li> <li>to acquire knowledge about different micro &amp; macroeconomics concepts,</li> <li>to enable them to focus on the function of individual decision making, nature and functions of product markets ,</li> <li>to make them know how to work the theory of the firm under different types of market as well as savings, investment, unemployment, national income analysis, inflation, monetary &amp; fiscal policy.</li> </ul>						
Intended Learning Outcomes (ILOs):	1 11 .					
<ul> <li>At the end of this course, students should be able to</li> <li>ILO-1: develop an understanding about the principles of micro &amp; macroeconomics.</li> <li>ILO-2: apply cost-benefit analysis to take any marginal decision ,</li> <li>ILO-3: measures of economic activity, focusing on variables and data at the national level within a specific period of time,</li> <li>ILO-4: demonstrate basic skills to solve critical problems in Economics ,</li> <li>ILO-5: analyse the market structures, specific economic issues, and policy alternatives.</li> <li>ILO-6: know the role of government policy to address microeconomic market failures and to achieve macroeconomic goals</li> </ul>						
Course Contents:						
Part-A						
<ul> <li>Introductory lessons related to basic bad, Scarcity, Choice, Opportune Macroeconomics</li> <li>Utility Theory analysis</li> <li>Total utility and Marginal Utility, Theory of Demand and Supply</li> <li>Law of Demand, Determinants of dem</li> <li>Theory of Cost and Production</li> <li>Euplicit acet Implicit Cost Accounting</li> </ul>	concepts such as denity cost, Different e law of Diminishing nand, Law of Supply	efinition of Economics, ence between Micro marginal Utility , Determinants of Supp	y utility, good vs. beconomics and ly			
• Explicit cost, Implicit Cost, Accountin Scale, Three stages of Production, Th	e law of Diminishing	profit, Short Run, Long g Returns.	g Run, Returns to			
<ul> <li>Market Structure of Perfect competitie</li> <li>Overview of Macroeconomics</li> <li>Aggregate Supply and Aggregate dem</li> <li>Macroeconomic Measurements: Price</li> <li>CPI, Types of Inflation, Labour force,</li> <li>Macroeconomic Measurements: GDP</li> </ul>	on, Monopolistic Co nand, Macroeconomi es and Unemploymen , Types of Unemploy 2 and Real GDP	mpetition, Monopoly an c Equilibrium at ment, Business Cycle	nd Oligopoly.			
<ul> <li>Policy application to boost up Econor Recommended Books:</li> </ul>	nic Growth					
• Roger A. Arnold: Economics, West P	ublishing Company,	1989				

• Samuelson, Paul A. and Nordhaus, William D. (2008). Economics. 18th Edition. Boston, McGraw

#### Hill

Campbell R. McConnell and Stanley L. Brue .Economics. Latest Edition McGraw-Hill Irwin

# **Course Code: PHY 1272** Credits: 1.5 Semester: 2 Year: 1 **Course Title: Physics Sessional** Rationale: The aim of this course is to facilitate the physics related practical skills to the engineering students. **Course Objectives:** The objective of this course is to familiar the students with the followings: the discipline in laboratory usage and the necessity of scientific measurement, • tools and techniques used in fundamental scientific measurement, hands on skill in physical phenomena. Intended Learning Outcomes(ILOs): After successful completion of this course a student will be able to -ILO-1: use the laboratory equipment efficiently for scientific measurement, ILO-2: testify the physical laws with their hands on experimental skill, **Course Contents:** Perform 50% of the experiments listed below:

Weighing by the method of oscillation.

- 1. Determination of the spring constant and effective mass of a spiral spring.
- 2. Determination of moment of inertia of a flywheel.
- 3. Determination of "g" by and moment of inertia of a compound pendulum
- 4. Determination of the specific heat of a liquid by the method of cooling.
- 5. Determination of the thermal conductivity of a bad conductor by Lee's method.
- 6. Determination of the pressure co-efficient of air by constant volume air thermometer.
- 7. Determination of the frequency of a tuning fork by Melde's apparatus.
- 8. Determination of the focal length of concave lens by auxiliary lens method.
- 9. Determination of the resistance of a galvanometer by half deflection method.
- 10. Determination of the Mechanical equivalent of heat by electrical method.
- 11. Determination of the dielectric constant of the materials of a parallel plate capacitor.
- 12. Determination of the refractive index of the materials of a prism with the help of a spectrometer.

- 13. Determination of the radius of curvature of a plano-convex lens by Newton's ring method.
- 14. To plot thermo-electromotive force-temperature (calibration) curve for a given thermocouple.
- 15. Determination of the melting point of a solid using the calibration curve.
- 16. Determination of the temperature co-efficient of the resistance of the material of a wire.
- 17. Determination of the refractive index of the material of a prism using spectrometer.
- 18. Determination of the specific rotation of sugar solution by a polarimeter.
- 19. Determination of wavelength of light by Newton's ring.

#### **Recommended Books:**

- 4. Lab Manual of Physics Sessional.
- 5. Practical Physics by GiasUddin Ahmed
- 6. Fundamentals of physics, by Haliday, Resnick& Walker

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 1112	<b>Civil Engineering</b>	Drawing	Sessional	1.5	3.0	
<b>Course Ration</b>	ale						
This course is of the theory and j	lesigned to p practice of en	rovide civil engineer gineering drawings.	ing undergraduate	es with the ba	sic underst	andings of	
Course Object	ive		<b>Course Outcome</b>	es			
<ul> <li>To develop basic ideas on engineering drawings.</li> <li>To learn Lines and lettering, Plane geometry, Solid geometry, Plan, elevations and sections of one storied buildings and bridges and sections of isolated footing, column, beam, and slab.</li> <li>To develop basic ideas on engineering drawing sessional course will engineering drawing skills in practical life.</li> <li>The students will understand and implementation of isolated footing, column, beam, and slab.</li> </ul>				ngineering 11 enrich al life. implement			
<b>Course Conten</b>	Course Content						
Introduction - Lines and lettering, Plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola. Solid geometry: Projections of cube, prism, cone, cylinder, developments, true shapes and sections of cube, pyramid, cone, prism, isometric and oblique drawings of cube, pyramid, cone. Plan, elevations and sections of one storied buildings and bridges, Plan and sections of isolated footing, column, beam, and slab.							
Text Books and/or Reference Materials							
<ul> <li>Latifee, E.R.</li> <li>Singh, G., an ISBN-13: 97</li> </ul>	<ul> <li>Latifee, E.R. (2005),Beginner's guide to Engineering Drawing. E.R. Latifee. ISBN: 984-32-2711-5</li> <li>Singh, G., and Sharma, S. C. (2002), Civil Engineering drawing. Standard Publishers Distributors. ISBN-13: 978-81-8014-004-4</li> </ul>						
Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
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Chemistry	GED 1161	Chemistry		Theory	30	3.0	
Course Rational	le						
To introduce the	e fundamentals	s of atomic structur	re, chemical bond,	reactions and	thermoch	emistry.	
Course Objectiv	/e		Course Outcomes				
<ul> <li>To know t chemistry a various st Technology</li> <li>To apply re to various and Techno</li> </ul>	he fundament and its applica reams of H r. elevant knowle streams of C logy.	tal knowledge in ations relevant to Engineering and edge of chemistry Civil Engineering	<ul> <li>The students the basics of reactions.</li> <li>The student principles of problems r engineering a</li> </ul>	will have ac of chemistry as will app of chemistry elated to applications.	cquired kn bonds an oly the t to solv materials	owledge on nd chemical fundamental re practical used for	

**Part A:**Atomic Structure: Fundamental particles, Rutherford's atom model, Bohr's atom model, origin of spectral line, Quantum numbers, Pauli Exclusion Principle, Electron distribution, Heisenberg uncertain principle, Atomic orbital; Chemicals Bonds: Concept of chemical bonds, Ionic bonds, Properties of ionic bond. Theory and limitation of covalent band, coordination bonds, hydrogen bonds, metallic bond, hybridization; sp, sp2, sp3, Resonance; Periodic Table: Classification of elements, Modern periodic table, variation of physical properties in the periodic table, limitation of periodic table;

**Part B:**Oxidation reduction: Concepts of oxidation reduction, Oxidation States and oxidation Number, assignment of oxidation number; Acid-Base: Concepts of acid- base, acid base conjugatepair, Self–Ionization of water, pH, Buffer solution; Properties of water: Physical properties; Hard and soft water, Structure of water, Chemical properties; Cement: Types of Portland cement, raw materials, Manufacture; dry process, wet process, Setting of cement; Dilute solution; Different kinds of solutions, Concentration units; molarity, molality, mole fraction, ppm, etc; Chemical Equilibrium: Law of mass action, equilibrium constant, Relation between Kp and Kc, Le-chaltelier principle, effect of temperature, pressure, concentration and inert gas on equilibrium constant; Thermochemistry: Enthalpy of a reaction, Heat of reaction at constant pressure and at constant volume Laws of thermochemistry, Effect of temperature on heat of reaction, Heat of solution, heat of neutralization, heat of formation, Laws of thermochemistry.

Text Books and/or Reference Materials

- 1. Physical chemistry: a modern introduction / Clifford E. Dykstra.
- 2. Polymer chemistry: an introduction / Malcolm P. Stevens.
- 3. Introduction to organic chemistry / by Applequist, Dauglas.

# First Year: Semester II

Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 1213	Engineering Mecha	nnics II	Theory	3	3	
<b>Course Ration</b>	ale						
Engineering module dynamics. The	echanics II d outcome of	eals with the princip the course has subst	bles of friction, fle antial impact in er	xible cords, a ngineering co	and conce	pts	
Course Object	ives		<b>Course Outcome</b>	es			
<ul> <li>To make the students aware about the behavior of force on various body.</li> <li>To develop a problem-solving power on Friction, Flexible cords, Plane motion, Relative motion, Force systems that produce rectilinear motion; Work, power and energy, Impulse and momentum.</li> </ul>			<ul> <li>The knowled cords, perference cords</li></ul>	edge gained ect frame an otion, Force motion; Worl d momentum o understan ation gained strong stand Structures.	on Frictic alysis, Pla systems the k, power will prove d the b on this l to unde	on, Flexible ane motion, hat produce and energy, ide a strong ehavior of course will erstand the	
Course Conter	nts						
<ul> <li>Part A:</li> <li>Friction, Support reactions with different loading conditions, Flexible cords, Analysis of perfect frames.</li> <li>Part B:</li> <li>Plane motion, Relative motion, Work, power and energy, Impulse and momentum.</li> </ul>							
Text Books and/or Reference Materials							
1. Analytical Mechanics by Virgil Moring Faires, Sherman Daniel Chambers.							
2. Engineering Mechanics by R. S. Khurmi							
3. Engine	ering Mechan	nics by Ferdinand L.	Singer.				

Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours
CE	CE 1211	Surve	ying	Theory	4	4
Course Rationa	le					
To introduce th Civil Engineeri	To introduce the students with the principles of various surveying methods and their applications to Civil Engineering fields and projects.					
Course Objecti	ve		Course Outcomes	S		
<ul> <li>To provide knowledge on working principles of survey instruments.</li> <li>To learn the measurement of the horizontal and vertical distances, difference in elevations, draw and utilize contour maps.</li> <li>To develop skills on surveying related practical problems.</li> </ul>			<ul> <li>This concepter problems</li> <li>The known help the practical</li> </ul>	ourse will nt on survey s. wledge gaine students to and theoretic	make th ving relate ed on this solve sur al issues.	he student ed practical course will vey related
Course Conten	t					
<ul> <li>Part A: Reconnaissance survey, linear measurements, Traverse survey, Levelling and contouring, Calculation of areas and volumes, Problems on heights and distances, Curves and curve ranging: problems on different types of curves, transition curve, vertical curves.</li> <li>Part B: Tacheometry, Astronomical surveying: definition, instruments, astronomical corrections, systems of time. Photogrammetry: introduction of terrestrial photography, aerial photography, reading of photo mossaic, scale. Project surveying, Errors in surveying, Agricultural and Forest Meteorology, Intercheating to total station on distances.</li> </ul>						
Text Books and	l/or Reference	e Materials				
1. Surveying / ]	B C. Punmia;	Ashok Kumar Jain:	Arun Kumar jain.			

2. A text book of surveying / M.Shahajahan, M.A. Aziz.

Department	Course No	Cou	rse Title	Course Type	Credit Hours	Total Contact Hours
CE	CE 1212	AutoCAD for Engineers	r Civil	Sessional	1.5	3.0
Course Rationale	;					
To make the stud	ents skillful in d	rafting.				
Course Objective	;		Course Outcome	s		
<ul> <li>To develop skills on drafting by computer.</li> <li>To establish knowledge on drawing structural plan (2D and 3D) for practical purposes.</li> </ul>			<ul> <li>This course will make the students knowledgeable on engineering drawings.</li> <li>The knowledge gained on this course will support the students to prepare engineering drafting.</li> </ul>			
Course Content						
Introduction to co	omputer usage. I	introduction to	CAD packages and	d computer a	ided drafti	ng: drawing
editing and dime	nsioning of sim	ple objects. Pla	in, elevations and	sections of m	nulti-storie	d buildings;
reinforcement de	tails of beams, s	labs, stairs etc.	Plan and section of	of septic tank	, Detailed	drawings of
roof trusses, Plans, elevations and sections of culverts, bridges and other hydraulic structures, Buildi					es, Building	
services drawings.						
Text Books and/o	or Reference Mat	terials				
1. AutoCAD ma	anual from CE, I	LU.				

2. The AutoCAD tutor for engineering graphics release 14 / by Alan J. Kalameja

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 1214	Practical Surveying		Sessional	1.5	3.0
Course Rationa	le					
To introduce th	e field works	and applications of	survey methods to	Civil Engine	ering proje	ects.
Course Objecti	ve		Course Outcome	S		
<ul> <li>To offer field works related to various practical surveying topics.</li> <li>To develop survey related engineering skills.</li> </ul>		<ul> <li>This course will make the student competent on survey works.</li> <li>The knowledge gained on this course will help the students to solve survey related practical problems.</li> </ul>				
Course Content	ţ					
Chain Survey, Plain Table Surveying, Traverse Survey, House Setting, Leveling and Contouring, Curve Setting and Route project, Height and Distance Problems, Stadia and Tachometry and Use of Total station and GPS.						
Text Books and/or Reference Materials						
1. Surveying / 1 2. A text book	B C. Punmia; of surveying	Ashok Kumar jain; / M.SHahajahan, M.	Arun Kumar jain. A. Aziz.			

Course Code: GED 1231	Credits: 02	Semester: Second	Year: First						
Course Title: Functional English									
Rationale: The course broadens scopes	for developing skills	s of fundamental writing	g and critical						
approaches for effective communication	n.								
Course Objectives: This course has be	een projected for the	students							
<ul> <li>to improve skills in writing to ι</li> </ul>	use practical life,								
• to help enhance techniques of v	writing in everyday li	ife,							
• to enable them to write insight	ful approaches in wri	ting.							
C C		0							
Intended Learning Outcomes (ILOs):									
At the end of this course, students shou	ld be able to								
ILO-1: demonstrate styles of writing,									
ILO-2: learn and disseminate technique	es of functional Engli	sh,							
ILO-3: be familiar with types of writing	g for academic, non-a	academic and need-base	ed						
effective functions of English la	nguage,								
ILO-4: write compositions and essays of	on various topics and	issues,							
ILO-5: communicate professionally and	d obtain ethics of wri	ting.							
Course Contents:									
Part-A									
understanding academic writing: featur	understanding academic writing: features of academic writing; elements of academic writing;								
approaches to writing: product and prod	cess; generating idea	s for a writing task; log	ically						

approaches to writing: product and process; generating ideas for a writing task; logically synthesizing and organizing diverse information; developing focus in academic writing; drafting and supporting ideas with evidence; integrating data and graphics in texts; maintaining academic style; revising, critiquing and evaluating texts, modes of writing: descriptive writing, argumentative writing, narrative writing, comparative and contrastive writing.

# Part-B

Writing tasks: paragraph, essay, summary, précis, abstract, letter of application, assignments, writing the thesis statement, writing the outline, writing contents, examination paper writing and writing & designing presentation slide, writing essays on theme, character, plot, structure, etc.; article and book review; sequencing of information into a thematic pattern; documentation: MLA and APA style-sheets; ethics in writing, email etiquettes , business writing, IELTS writing and writing for communication, levels of Usage, wordiness, clichés, jargon, slang, abusage, mechanics. Skills: Listening to individual phoneme and word pronunciation, listening to monologue, listening to dialogue and conversation. Listening for specific information, listening for an overall idea etc.

# **Recommended Books:**

James A. W. Heffernon& John E. Lincoln : *Writings: A College Handbook* Bazerman Weiner : *Writing Skills Handbook*, Fourth Edition, Houghton Mifflin 1998 Maurice Imphoof& Herman Hudson : *From Paragraph to Essay, Longman 1975* Sheridan Baker: *The Practical Stylist* Sarah Norton and Brain Green: *The Bare Essentials* E Whitten and J C Hodges: *Harbrace College Handbook* Barnet and Stubbs : *Practical Guide to Writing* Schwegler: *Patterns in Action* 

Course Code: MAT 1251	Credits: 03	Semester: 2 <sup>nd</sup>	Year: 1 <sup>st</sup>
Course Title: Differential Eq	uation, Laplace Tra	ansform and Fourier Analysis	\$
Rationale of the Course: The	nis course will enab	ble the students to acquire know	owledge about ordinary
differential equation, Laplace	transform and Four	er Analysis. This course will a	also help to enhance the
Course Objectives:	sequent related coul		
	6 .1 . 1 .		
This course has been assigned	for the students	alequations	
• to maximize their	ability of analyzing	and evaluating critical problems	Y
<ul> <li>to have a proper up</li> </ul>	nderstanding of L and	ace transform in engineering sec	' cto <b>r</b>
	iderstanding of Eup		
Intended Learning Outcome	S:		
At the end of the course, stude	nts are expected to:		
• select and apply appro	priate methods to sol	ve differential equations	
• be able to make inter	pretation of the find	dings for engineering analysis,	, research and planning
purposes,			
• apply the Fourier trans	form in their researc	h field especially in spectral ana	ılysis.
Course Contents:			
	Р	art-A	
<b>Differential equation:</b> Ordinal order of DE, Solutions of 1st & Homogeneous linear equations Undermined coefficients & op	ry differential equati 2 2nd order ordinary 3 with constant coeff erator method, Solut P	on, Formation of Differential e DE, Separable equations, Line icients, Solution by variation of ion by series. Part-B	quation (DE), Degree & ar equations, parameters,
Laplace Transformation: De theorem, Inverse transform, Li derivative, Transform of an int Convolutions, Solution of ordi Fourier Analysis: Fourier seri boundary value problem. RecommendedText Books:	finition of Laplace to nearity, Use of first egral, Heaviside uni nary differential equ les & convergence of	ransform (LT), LT of different f shift theorem & Partial function t function, The 2nd shift theorem ation by Laplace transform. f Fourier series, Fourier transform	Tunctions, First Shift is, Transform of m, Periodic functions, rm& uses in solving
1. Introduction to Ordina	ry Differential Equa	tion: Shepley L. Ross	
2. Laplace Transforms, N	/urray R, Spigel		

Course	Code: GED 1291	Credits: 02	Semester: 2 <sup>nd</sup>	Year: 1 <sup>st</sup>				
Course	Course Title: Principles of Accounting							
Rationa	ale of the Course:							
This co	urse is concerned wit	h financial or extern	al accounting theory and p	ractice. This involves a				
sound u	nderstanding of the co	oncepts and choices t	hat underlie how financial	information is measured				
and disc	losed in the financial s	tatements.						
Course	Objectives: The object	tives of this course an	re:					
1.	Fo know the accounting	g for action in busines	SS.					
2.	To know the basic know	vledge about the final	ncial statements and account	ing standards.				
3.	Fo know the disclosure	of the financial repor	·t.	-				
4.	To understand the inter	national financial rep	orting standards.					
Intende	d Learning Outcome	s (ILOs):						
On succ	essful completion of th	nis course, students w	ill be able to:					
ILO-	l: Explain and apply se	everal theoretical appr	coaches to principles of accord	unting.				
ILO-2	<b>2:</b> Recall the features,	tools and methods us	sed to enhance and improve	accounting systems and				
process	es.		*					
ILO-	<b>3:</b> Prepare the basic ele	ments under the finar	icial statement, and it's appli	ied.				
ILO-4	<b>ILO-4:</b> Describe the accounting standards framework and critically evaluate IFRS and							
ILO-	<b>ILO-5:</b> Other matters relating to financial accounting.							
Course	Course Contents:							
Part A:								

- 1. Accounting in Action: Accounting concepts, core accounting principles, GAAP, IAS, BAS, the language of business disciplines of accounting, basic accounting equation and using the accounting equation. Key concepts of financial statements model, building blocks of accounting in financial reporting and generally accepted accounting principles.
- 2. Cost Estimation and Recording Process: System design accounts debits, accounts credits and transaction analysis. Steps in the recording process and charts of accounts, source of data. Special journal and subsidiary ledger, Thinking about the critical thinking of debits and credits and trial balance.
- **3.** Adjusting the Accounts: Basic of adjusting entries, adjusted trial balance and financial statements, emphasizing transactions measurements and events the periodicity, assumption revenue and expense recognition, adjusting entries for revenues recognition.
- **4. Completion of the Accounting Cycle:** The accounting cycle reporting periods using worksheets for financial statements, closing the books, summary of the accounting cycle, and classification of financial positions.
- **5.** Accounting for Merchandising: Operating of merchandising recording and completing the accounting cycle. Forms of financial statements of multiple-step and single step of profit and loss, financial position, and others relevant.

## Part B:

- **6. Inventories:** Concepts of inventories and determining inventory quantities and assigned the problem solved. Perpetual systems and comparing methods, the importance of accurate physical inventory and effects of cost flow methods.
- 7. **Property, plant and equipment:** Determining the cost of PPE and depreciation and its mathematical problem-solving. Costs special rules of depreciation and the straight-line method of depreciation the double declining-balance method of depreciation revisions in depreciation asset-related costs subsequent to acquisition.
- **8.** Current Liabilities and payroll accounting: Accounts payable, notes payable, accruals prepayments, deposits, and collections for other estimated liabilities. Being better borrower concepts in payroll, accounting calculating gross and net pay payroll journal entries.
- **9.** Accounting for Receivables: Basic concept of accounts receivable, notes receivable and statement presentation and analysis.
- **10. Corporate and Partnership Accounting:** The corporation initial public offering the partnership, the sole proprietorship, accounting for sole proprietorships and partnerships. Considerations corporate equity and transactions corrections of errors change in an accounting method and financial statement formation.

# Recommended Book:

Textbook (required): Accounting Principles by Donald E. Kieso (16th Edition).

## **Reference Book:**

Accounting Principles. By Jack L. Smith. McGraw-Hill Education (10th Edition).

Course Code: GED 1261	Credits: 02	Semester:2 <sup>nd</sup>	Year:1 <sup>st</sup>				
Course Title: Sustainable D	evelopment	<u> </u>					
Rationale: The course aims or	n diverse understanding of su	stainability and developme	nt and interactions				
between human development a	and environmental life suppor	t systems.					
Course Objectives:							
<ul> <li>Diverse understanding</li> <li>Changing planetary co</li> <li>What the future might</li> </ul>	<ul> <li>Diverse understandings of sustainability and development,</li> <li>Changing planetary conditions and the growing human population,</li> <li>What the future might look like, and the potential for technology to save us.</li> </ul>						
<ul> <li>Intended Learning Outcom</li> <li>Critically review diverse p</li> <li>Investigate how interaction are/have been managed in</li> <li>Identify the characteristic sustainable development</li> </ul>	<ul> <li>Intended Learning Outcomes:</li> <li>Critically review diverse perspectives of sustainable development</li> <li>Investigate how interactions between human development and environmental life support systems are/have been managed in real world cases</li> <li>Identify the characteristics and be able to differentiate between development, sustainability and sustainable development</li> </ul>						
<b>Course Contents:</b>							
Part-A							
Sustainable Development-exp Environmental degradation an ideas about sustainability, stra and some alternative approach to sustainable development. I innovation strategies.	plains and critically evaluated ad poverty Sustainable develo ategies for promoting sustaina les. Examine some important innovation for sustainable de	es the concept of sustaination opment: its main principles able development, resistand current issues and areas of evelopment- Environmental	able development, s, the evolution of ces to the concept, debate in relation management and				

# Part-B

Societal transformations. Institutional theory. Governance for sustainable development. Policy responses to environmental degradation. Capacity development for innovation. Social aspects of engineering construction and development, social structure and social system, the user community, types of community, stages of development, community involvement, community management, examples of community management, involvement in water supply and sanitation sector.

# **Text/Reference Books:**

1. Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and EnvironmentInstitute, working paper 00-04. Available at: http://ase.tufts.edu/gdae/publications/Working\_Papers/Sustainable% 20Development.PDF

2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics 48(4): 369-384.

3. Hjorth, P. and A. Bagheri (2006) Navigating towards Sustainable Development: A System Dynamics Approach, Futures 38: 74-92.

4. Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding and fostering innovation, London, Zed Books.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CHE	GED 1162	Chemistry Session	onal	Sessional	1.5	3.0
<b>Course Ration</b>	ale			• •		
This course is a	considered to p	rovide chemistry re	elated practical wor	rks to the stud	lents.	
Course Object	tive		<b>Course Outcom</b>	es		
<ul> <li>To develop practical knowledge of chemistry.</li> <li>To enrich problem-solving power on various chemistry related sessional tasks</li> <li>To enrich problem-solving power on various chemistry related sessional</li> <li>The knowledge gaine sessional course will understanding of env</li> <li>The students will abl knowledge on theore</li> </ul>			wledge gained course will f nding of envir ents will able ge on theoreti	d on chemi acilitate th ronmental to merge to cal and pr	stry le science. their actical task.	
Course	e Content					
• Volumetric analysis: acid-base titration, oxidation-reduction titrations, determination of Fe, Cu and Ca volumetrically.						on of Fe,
Text Books and/or Reference Materials						
Lab M	anual of Chem	istry Sessional of C	CE of LU.			

# Second Year: Semester I

Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 2111	<b>Engineering Mate</b>	rials	Theory	3.0	3.0	
<b>Course Ration</b>	ale						
Thecoursewille standard using parameters, mix after completing	Thecoursewillenablethe studentstoacquireknowledge on engineering materials quality and their standard using in different construction work. Also, one can learn the manufacturing process, quality parameters, mix design to desired strength, suitable materials selection for different casting work etc. after completing this course work.						
<b>Course Object</b>	ives		<b>Course Outcome</b>	es			
<ul> <li>To make the students familiar with engineering materials and their characteristics.</li> <li>To develop knowledge on cement, sand, steel and stone with mix design.</li> <li>The students will use the knowledge gained this course in concrete design.</li> <li>The students can apply their knowledge in job responsibilities to check the quality of building materials.</li> </ul>					e gained on edge in the ality of the		
<b>Course Conten</b>	its						
<b>Part A:</b> Properties and u	uses of aggre	gates, brick, cement;	sand, lime, mortar	rs; concrete; c	oncrete mi	ix design.	
<b>Part B:</b> Wood structures and properties; shrinkage and seasoning; treatment and durability; mechanical properties; wood products; advanced fiber reinforced polymer (FRP) composites and its application to civil engineering; reinforcement types, basic property of FRP composites and available FRP composite products; definition of stress and strain; plane stress and strain condition; identification of strain components of elastic, elasto-plastic and elasto-visco-plastic materials; time dependent strain response of these materials due to different types of loadings; mathematical and simple rheological modeling for prediction of creep behavior; ferrocement: advantages and uses; corrosion and prevention of steel in RC structures, offshore structures and ground applications							
Text Books and	d/or Referen	ce Materials					
<ol> <li>A textb</li> <li>Engined</li> <li>Engined</li> </ol>	ook of engin ering Materia eringmaterial	eering materials by M Ils by R. K. Rajput sby K.P. Roy Chowl	M. A. Aziz. ndury.				

Dept.	Course No	Course Title	Course Type	Credit Hours	Total Contact Hours			
CE	CE 2141	Engineering Geology and Geomorphology	Theory	3.0	3.0			
Course Ratio	Course Rationale							

This course is designed to provide fundamental concepts of the earth related information, internal structures of earth, dynamic movement of earth and its effects and affects.

Course Objectives	Course Outcomes
<ul> <li>To develop knowledge on minerals, structural geology and geology with geomorphology of Bangladesh.</li> <li>To make student conversant with faults and rivers.</li> </ul>	<ul> <li>The students will utilize their knowledge on geotechnical engineering courses.</li> <li>This course will help the students to understand on the rocks and soil properties.</li> </ul>

### **Course Contents**

#### Part A:

Introduction to earth structures, earth layers information; Minerals: Identification of minerals, common rock forming minerals, physical properties of minerals, mineraloids rocks, types of rocks, cycle of rock change, introduction to earthquake and seismic map of Bangladesh.

# Part B:

Structural geology: Faults, types of faults, fold and fold type, domes, basins, erosional process, and quantitative analysis of erosional land forms. Geology and Geomorphology of Bangladesh: General description, hilly areas in north-eastern zone and eastern part of Bangladesh; Rivers and river basin of Bangladesh.

#### Text Books and/or Reference Materials

- 1. EngineeringGeology for Civil Engineers / D. VenkatReeey.
- 2. Foundations of Engineering Geology by Tony Waltham.
- 3. Principles of engineeringgeology / Robert B. Johnson, Jerome V. DeGraff.

Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours
СЕ	CE 2113	Mechanics of Sol	lids I	Theory	3.0	3.0
<b>Course Ratio</b>	nale					
It provides a	complete t	reatment of the fu	indamental princ	ciples of m	echanical	behavior,
analysis and p	erformance	of deformable solid	ds.			
Course Obje	ctive		<b>Course Outcon</b>	nes		
<ul> <li>To provide a clear view on structure and material properties.</li> <li>To understand BMD and SFD.</li> <li>To familiarize with stress and strain considering various force condition.</li> <li>To acquainted with joints.</li> <li>To provide a clear view on structure on structure on structure on structure.</li> <li>The students will able to ut knowledge in structural problems.</li> <li>The students can use their designing a structure.</li> </ul>				lize their ideas in		
<b>Course Conte</b>	ent					
<ul> <li>Part A:Concepts of stress and strain, generalized Hooke's law; deformations due to tensio compression and temperature change; frame statics: reactions, axial force, shear force ar bending moments; axial force, shear force and bending moment diagrams of beams usin method of section and summation approach;</li> <li>Part B: Elastic analysis of circular shafts in torsion, solid noncircular and thin walled tubular members subjected to torsion, flexural and shear stresses in beams; shear center closely coiled helical springs.</li> </ul>					to tension, force and ams using hin walled ear center;	
	Text Books and/or Reference Materials					
1. E.P.Pc 2. Beer a 1995.	pov, Engine and Johnsto	eering Mechanics on Mechanics of	f Solids, Prentice Materials, McGr	e Hall of Ind raw Hill Int	ia Pvt. Lto ternationa	1., 1998. 1 Edition,

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 2112	<b>Details of Constr</b>	ruction	Sessional	1.5	3.0
<b>Course Ratio</b>	nale					
To introduce t	the supervisi	on of field works a	and applications of	of theoretical	l knowled	ge to Civil
Engineering p	rojects.		Γ			
Course Obje	ctive		Course Outcon	nes		
To provie	de practica	l knowledge on	• This cours	se will r	nake th	e student
Civil Eng	ineering co	onstruction works	competent c	on field work	KS.	
as well as	plumbing.		• The knowle	edge gained	on this of	course will
• To dev	elop supe	ervision related	help the stu	idents to sol	ve civil e	engineering
engineerin	ig skills.		related pract	tical problem	ns.	
Course Conte	ent			<u>.</u>		
Types of build wall structure capacity of so supervision of structures in b lintels and are arches; stairs: coverings; she distempering thermal insula	<b>Course Content</b> Types of building, components of a building, design loads, framed structure and load bearing wall structure; foundations: shallow foundation and deep foundation, site exploration, bearing capacity of soil, standard penetration test; brick masonry: types of brick, bonds in brickwork, supervision of brickwork, brick laying tools, defects and strength on brick masonry, typical structures in brickwork, load bearing and non-load bearing walls, cavity walls, partition walls; lintels and arches: different types of lintels and arches, loading on lintels, construction of arches; stairs: different types of stairs, floors: ground floors and upper floors; roofs and roof coverings; shoring; underpinning; scaffolding and formwork; plastering, pointing, painting; distempering and white washing; cement concrete construction; sound insulation: acoustics; thermal insulation: house plumbing: water supply and wastewater drainage					
		Text Books and/o	r Reference Ma	terials		
1. Hand notes	, slides, vide	os and field trips.				

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 2114	Engineering Mater	ials Sessional	Sessional	1.5	3.0	
Course Ration	nale						
Thecoursewille	enablethe stu	dentstoacquireknowle	edge on the testing	methods of e	ngineering	materials,	
their objectives	s, importance	e and practical applica	tions.				
Course Object	tives		Course Outcom	es			
<ul> <li>To lea engine</li> <li>To kno</li> <li>To kno</li> <li>constru</li> </ul>	arn and per ering materia ow the design ow the check action materi	form all kinds of als related tests n of concrete mix. ing processes of als quality.	<ul> <li>The stud on this co</li> <li>The stud materials engineerid</li> </ul>	ents will use ourse in their dents can u properties ing jobs relate	the knowle engineerin tilize thei s to t ed to mater	edge gained 1g jobs. r ideas on heir civil rials.	
Course Conte	Course Contents						
General discus	sion on prep	paration and propertie	es of concrete. Tes	t for specific	gravity. U	Jnit weight,	
voids and bul	king of agg	regates moisture con	tent and absorption	on of coarse	and fine	aggregates:	

voids and bulking of aggregates moisture content and absorption of coarse and fine aggregates; normal consistency and initial setting time of cement, direct tensile and compressive strengths of cement mortar, gradation of coarse and fine aggregates, design and testing of a concrete mix, strength and quality of bricks.

# **Text Books and/or Reference Materials**

- A textbook of engineering materials by M. A. Aziz.
- Engineering Materials by R. K. Rajput
- Engineering materials sessional lab manual of CE, LU

Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours
СЕ	CE 2116	Mechanics of Solid	ds Sessional	Theory	1.5	3.0
Course Ration	ale					
To introduce th	e students wi	th tension, hardness,	impact and shear t	test of steel or	r metal spe	ecimen,
compression an	id bending tes	st of beam and helica	ll spring test.			
Course Object	ive		Course Outcome	es		
• To le	earn and	perform tension,	• The stud	dents will a	able to u	tilize their
hardnes	ss, impact an	d shear test of steel	knowledg	ge on Mechai	nics of soli	ids sessional
or meta	al specimen.		in constr	uction field	where eng	gineers need
• To lear	n and perform	m compression and	verificati	ons of produc	ets.	
bending	g test of bean	n and helical spring				
test.						
Course Conter	nt					
Tension, direct	shear and ir	npact tests of mild s	steel specimen, con	mpression tes	t of timbe	r specimen,
slender column	test, static b	ending test, hardnes	s test of metals, he	elical spring	tests, deter	mination of
shear centre, load-deflection behavior of simple beam.						
Text Books an	d/or Referer	ce Materials				
1. Lab Manual	of Mechanic	s of Solids Sessional	(Dept. of CE, LU.	.)		

Course Code:GED 3271	Credits: 02	Semester: 1 <sup>st</sup>	Year: 2 <sup>nd</sup>
Course Title: Electrical Tech	nology in Buildings	I	
<b>Rationale:</b> Electrical Techno services, i.e. electrical system comfort and safety in modern drafting software in the field preparation of blueprints and o	logy in Buildings, is s and installations that buildings. Students can of architecture, con other engineering plan	introduces the design of at provide power, mover in also learn the application struction and manufactures.	of electrical building ment, communication, ion of computer-aided uring to assist in the
Course Objectives: This course	se has been assigned for	or the students	
<ul> <li>to foster an understandi</li> <li>to introduce to them BN</li> <li>To learn the system des and Earthling.</li> <li>To increase capability</li> <li>To make students efficient</li> </ul>	ng about electrical ser VBC code and other stating ign and estimation of l of household and sub- tient in design tools, s	vices in a building, andards related to service basic electrical appliances station design for a build pecially AutoACD	design. 5, Fittings & Fixtures ing.
Intended Learning Outcomes	(ILOs):		
After the successful completio	n of this sessional cour	rse, students will be able	to
ILO-1. Describe the lighting	process/design, require	ements for protection of b	uilding.
ILO-2. Recognize different se	ervice types, grounding	g system for building and	conductor size used.
ILO-3. Design electrical serv	ices for buildings in ac	cordance with industry re	egulations.
ILO-4. Identify symbols and	notations used on elec	trical drawings.	
ILO-5. Produce various electronic structure v	rical household, comm	ercial and industrial draw	vings with the help of
AutoCAD design tool.			
Course Contents:			
Electrical appliances, protect electrical appliances, Fittings & sub-station, safety rules, home transmission methods, intercom Conduit layout, Use of AutoCA	ing devices and group Fixtures, Grounding security and alarm s is, symbols in Fitting D.	unding., formulate illun and Earthling, sub-station system, LAN and Interco & Fixture and Conduit la	nination and lighting, ns, essentials parts of a om, LAN access and ayout and the symbols,
Recommended Books: 1. Handbook Of Electrica John E. Traister, The M 2. Power, system Analysis	l Design Details, 2nd l IcGraw-Hill.	Edition (2003), Neil Scla	ter and
<ol> <li>Fower system Analysis company Ltd, Ram Nag</li> <li>Electrical Wiring Ind Trinner; Nelson Publica</li> </ol>	gar, New Delhi-11005 ustrial, Fourth Canad	dian Edition; Herman,	Branch, Granelli,

4. Electrical Design of commercial and industrial building, 2011 edition; John Hauck; Joner and Bartlett Learning.

Course Code: MAT 2151	Credits: 03	Semester: 1 <sup>st</sup>	Year: 2 <sup>nd</sup>					
Course Title: Coordinate Geometry and Vector Analysis								
<b>Rationale of the Course:</b> The course will enable the students to acquire knowledge about differential and integral calculus of vector-valued functions and geometry. The students will be able to explain the uses and demonstrate their applications. This course will also help to enhance the students' knowledge in the subsequent related courses.								
Course Objectives:								
<ul> <li>to introduce to the</li> <li>to maximize their</li> <li>to have a proper un</li> </ul>	<ul> <li>to introduce to them coordinate geometry and vector calculus</li> <li>to maximize their ability of analyzing and evaluating critical problems</li> <li>to have a proper understanding of vector applications in engineering sector</li> </ul>							
Intended Learning Outcome	s:At the end of the course, stu	dents are expected to:						
<ul> <li>Find the equations of 1</li> <li>Differentiate vector fu</li> <li>Learn how to apply the</li> <li>Analyze three-dimensissurface, and volume in</li> <li>Use the Greens' and S</li> </ul>	<ul> <li>Find the equations of lines and planes</li> <li>Differentiate vector functions of one variable select</li> <li>Learn how to apply the use of vectors to different fields of engineering</li> <li>Analyze three-dimensional curves , calculate the divergence and curl of a vector field and line, surface, and volume integrals</li> <li>Use the Greens' and Stokes' theorems to facilitate integral calculation.</li> </ul>							
Course Contents:								
Part-A Coordinate Geometry: Tra degree, Pairs of straight line plane, Straight line, <i>Sphere</i> . Part-B Vector Analysis: Vector Co integration :Line Integrals,	<ul> <li>Part-A <ul> <li>Coordinate Geometry: Transformation of coordinates, Polar coordinates, General equation of second degree, Pairs of straight lines, Three dimensional geometry, Direction cosines and direction ratios, plane, Straight line, <i>Sphere</i>.</li> </ul> </li> <li>Part-B <ul> <li>Vector Analysis: Vector Component, Vector differentiation, Gradient, divergence and curl, Vector</li> </ul> </li> </ul>							
Divergence Theorem.								
TEXT BOO	TEXT BOOKS, RECOMMENDED BOOKS AND REFERENCES							
1. Coordinate Geometry with	th vector Analysis: Rahman&	Bhattacharjee						
2. Vector Analysis: Murray	R, Spigel							
3. "Vector Analysis with Ap	pplications: A AShaikh							

# b) Recommended Books:

1.Calculus and Analytic Geometry: Thomas & Finney

2. Elementary Vector Analysis with Application to Geometry and Physics : C E Weatherburn

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
EEE	EEE 2172	<b>Electrical Techno</b>	ology Lab	Sessional	1.5	3.0
<b>Course Ration</b>	ale					
This course is i technology.	ntended to pro	vide civil engineeri	ng undergraduate	s with the prac	ctice of ele	ectrical
<b>Course Object</b>	ive		<b>Course Outcon</b>	nes		
To dev technol	elop practical : logy.	skills on electrical	This cou on EEE.	urse will make	the stude	nts educated
<ul> <li>To solve practical electronics related problems.</li> <li>The knowledge gained on this course v support the students to solve practiproblems.</li> </ul>					course will ve practical	
<b>Course Conten</b>	nt					
Experiment 01 overview of el and how to use	Experiment 01: Familiarization with analog and digital measuring instruments; this experiment is an overview of electrical measuring instruments such as Ammeter, Voltmeter, Wattmeter, Multimeter and how to use these instruments. Experiment 02: Verification of Ohm's Law; this experiment verifies					

Ohm's law that is basic law of Electrical Engineering. Experiment 03: Verification of Kirchhoff's Voltage Law (KVL); This experiment verifies Kirchhoff's Voltage Law (KVL). In this experiment, voltage variation will be measured by voltmeter. Experiment 04: Verification of Kirchhoff's Current Law (KCL); This experiment verifies Kirchhoff's Current Law (KCL). In this experiment, change in current will be measured by ammeter. Experiment 05: Study on series and parallel connection in AC system; this experiment will demonstrate series and parallel connection of various electrical loads such as, bulb, fan, etc. Here power will be measured by wattmeter. Experiment 06: Experiment on wire splicing and jointing; in this experiment, wire splicing, and jointing will be demonstrated elaborately. Experiment 07: Electrical house wiring design; a complete wiring design of a house will be exercised in this experiment.

#### **Text Books and/or Reference Materials**

1. A textbook of electrical technology: in S.I. system of units / B L Theraja; A K Theraja. 2. Electronics fundamentals : circuits, devices, and applications / Thomas L. Floyd.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CSE	GED 2121	<b>Computer Progr</b>	amming	Theory	2.0	2.0
Course Rationa	le					
This course is designed to provide civil engineering undergraduates with the basic concepts of programming, algorithm and flowchart.						s of
Course Objecti	ve		Course Outcomes	8		
<ul> <li>To provid programmi</li> <li>To make algorithm.</li> <li>To develo issues relat</li> </ul>	le knowledg ng. the students p skills on ed to the flowo	e on computer conversant with problem solving thart.	<ul> <li>The students flowchart.</li> <li>The student principles ar civil engineer</li> </ul>	will have ad ts will app nd programn ring in future	cquired kn bly the t ning skills	owledge on fundamental related to
Course Content	t					

# Part A:

Basic components of computer system; Application of computer programming in civil engineering; introduction to programming languages; Introduction to Structured and object oriented Programming Languages, differences between Structured and object oriented Programming Languages; comparison between MATLAB/Python and C;

# Part B:

Algorithm and flow chart; Elements of structured programming language (C Programming): data types, operators, expressions, control structures, functions, loops and arrays, input and output; Introduction to MATLAB/Python; engineering problem solving process in the context of MATLAB/Python.

# **Text Books and/or Reference Materials**

• The art of computer **programming** / **Donald E. Knuth.** 

• Linear programming / G. Hadley.

# Second Year: Semester II

CECE 2211Numerical MethodsTheory2.02.0Course RationalCourse RationalThis course aims at providing the necessary basic concepts of a few metrical methods and jew procedures for selving numerically different kinds of problems ocurring in engineering and selving technology.Course ObjectiveCourse OutcomericalSelving numerical methods of numerical• To develop knowledge on numerical• The students will utilize their knowledge on engineering analysis.• To make student conversant with numerical integration.• This course vill help the students to understand linear and no-linear curve-fittingPart A:Introduction to metrical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solver on onlinear cal numerical integration; differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical integratic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical and algebraic integration. Central, backward and forward differences testeresText Books and/e testeres testeresText Books and/e testeresText Books and/e testeresSimpson's rule, C, and Reymond P. Canale. Numerical methods for engineers. 7th e	Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours	
Course Rationale         This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.         Course Objective       Course Outcomes         • To develop knowledge on numerical solutions.       • The students will utilize their knowledge on engineering analysis.         • To make student conversant with numerical differentiation and integration.       • This course will help the students to understand linear and non-linear curve-fitting         Course Content       • This course will help the students to understand linear and non-linear curve-fitting         Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;         Part B:       Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials       • Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7 <sup>th</sup> edition. New York: Megraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.	CE	CE 2211	Numerical	Methods	Theory	2.0	2.0	
This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.         Course Objective       Course Outcomes         • To develop knowledge on numerical solutions.       • The students will utilize their knowledge on engineering analysis.         • To make student conversant with numerical differentiation and integration.       • This course will help the students to understand linear and non-linear curve-fitting         Course Content       • This course in usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;         Part A:         Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials         • Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7 <sup>th</sup> edition. New York: Megraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning PVt. Ltd., 2012.	Course Rationa	Course Rationale						
procedures for solving numerically different kinds of problems occurring in engineering and technology.         Course Objective       Course Outcomes         • To develop knowledge on numerical solutions.       • The students will utilize their knowledge on engineering analysis.         • To make student conversant with numerical differentiation and integration.       • This course will help the students to understand linear and non-linear curve-fitting         Course Content       Part A:         Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical int=rolation;         Part B:       Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials         • Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7 <sup>th</sup> edition. New York: Megraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.	This course aim	ns at providin	g the necessary basic	c concepts of a few	numerical m	ethods and	l give	
technology.       Course Outcomes         Course Objective       Course Outcomes         • To develop knowledge on numerical solutions.       • The students will utilize their knowledge on engineering analysis.         • To make student conversant with numerical differentiation and integration.       • This course will help the students to understand linear and non-linear curve-fitting         Course Content       • This course will help the students to understand linear and non-linear curve-fitting         Part A:       • Throduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;         Part B:       Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials       • Umerical methods for engineers. 7 <sup>th</sup> edition. New York: Megraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.	procedures for s	solving nume	rically different kind	ls of problems occu	urring in engi	neering an	d	
Course Objective       Course Outcomes         • To develop knowledge on numerical solutions.       • The students will utilize their knowledge on engineering analysis.         • To make student conversant with numerical differentiation and integration.       • This course will help the students to understand linear and non-linear curve-fitting         Course Content       • This course will help the students to understand linear and non-linear curve-fitting         Part A:       • This course will help the students to understand linear and non-linear curve-fitting         Introduction to numerical methods: relevance at usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;         Part B:       • Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rule; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ortury Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials       • Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7 <sup>th</sup> edition. New York: Megraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.	technology.							
<ul> <li>To develop knowledge on numerical solutions.</li> <li>To make student conversant with numerical differentiation and integration.</li> <li>This course will help the students to understand linear and non-linear curve-fitting</li> <li>Course Content</li> <li>Part A:         <ul> <li>Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B:</li></ul></li></ul>	Course Objectiv	ve		Course Outcomes	5			
<ul> <li>solutions.</li> <li>To make student conversant with numerical differentiation and integration.</li> <li>This course will help the students to understand linear and non-linear curve-fitting</li> <li>Course Content</li> <li>Part A:</li> <li>Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B:</li> <li>Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	• To develo	p knowledg	ge on numerical	• The students	will utilize	their know	owledge on	
<ul> <li>To make student conversant with numerical differentiation and integration.</li> <li>This course will help the students to understand linear and non-linear curve-fitting</li> <li>Course Content</li> <li>Part A:</li> <li>Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B:</li> <li>Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	solutions.			engineering a	nalysis.			
numerical differentiation and integration.       linear and non-linear curve-fitting         Course Content       Part A:         Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;         Part B:       Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials       • Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7 <sup>th</sup> edition. New York: Mcgraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.	• To make	student	conversant with	• This course v	vill help the	students to	understand	
Course Content         Part A:         Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;         Part B:         Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.         Text Books and/or Reference Materials         • Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7 <sup>th</sup> edition. New York: Mcgraw-hill, 2011.         • Sastry, Shankar S. Introductory methods of numerical analysis. 5 <sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.	numerical d	numerical differentiation and integration. linear and non-linear curve-fitting						
<ul> <li>Part A: Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B: Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Course Content							
<ul> <li>Introduction to numerical methods: relevance and usefulness, aims and scope; Solution of algebraic equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B:</li> <li>Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Part A:							
<ul> <li>equations: solving non-linear equations using Bisection method, Regula-falsi method, Newton-Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B: Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods. Text Books and/or Reference Materials </li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011. Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li></ul>	Introduction to	numerical m	ethods: relevance a	nd usefulness, aim	s and scope;	Solution of	of algebraic	
<ul> <li>Raphson Method; curve fitting and numerical interpolation;</li> <li>Part B:</li> <li>Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	equations: solv	ing non-line	ar equations using	Bisection metho	od, Regula-fa	alsi metho	d, Newton-	
<ul> <li>Part B: Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge- Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Raphson Metho	od; curve fitti	ng and numerical int	erpolation;				
<ul> <li>Numerical integration: differences between numerical and algebraic integration, Trapezium rule, Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials <ul> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul> </li> </ul>	Part B:							
<ul> <li>Simpson's rule, Simpson's 3/8 and Boole's rules; Numerical differentiation: Central, backward and forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials <ul> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul> </li> </ul>	Numerical inte	gration: diff	erences between nu	imerical and algeb	oraic integra	tion, Trap	ezium rule,	
<ul> <li>forward differences; Numerical solution of Ordinary Differential Equations: Euler Method, Runge-Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Simpson's rule,	Simpson's 3	3/8 and Boole's rule	es; Numerical diffe	erentiation: C	Central, ba	ckward and	
<ul> <li>Kutta Methods.</li> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	forward differe	nces; Numer	ical solution of Orc	linary Differential	Equations: E	Euler Meth	od, Runge-	
<ul> <li>Text Books and/or Reference Materials</li> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Kutta Methods.							
<ul> <li>Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. 7<sup>th</sup> edition. New York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Text Books and	l/or Reference	e Materials					
<ul> <li>York: Mcgraw-hill, 2011.</li> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	Chapra, Ste	even C., and F	Raymond P. Canale.	Numerical methods	s for engineer	rs. 7 <sup>th</sup> editi	on. New	
<ul> <li>Sastry, Shankar S. Introductory methods of numerical analysis. 5<sup>th</sup> Edition PHI Learning Pvt. Ltd., 2012.</li> </ul>	York: Mcgraw-hill, 2011.							
2012.	• Sastry, Shar	nkar S. Introc	luctory methods of n	umerical analysis.	5 <sup>th</sup> Edition Pl	HI Learnin	g Pvt. Ltd.,	
	2012.							

Department	Course No	Course	Title	Course Type	Credit Hours	Total Contact Hours
CE	CE 2215	Mechanics of Sol	lids II	Theory	3.0	3.0
<b>Course Ratio</b>	nale					
The course ex loading condit	xplains the tions and Me	behavior of variou ohr's Circle.	us types of bean	ns and colu	mn under	different
Course Object	ctive		<b>Course Outcon</b>	nes		
<ul> <li>To provide a clear view on deflection of beam.</li> <li>To understand bulking of column.</li> <li>To familiarize with stress and strain considering various force condition.</li> <li>To acquainted with thin and thick Cylindrical and Spherical Shells.</li> </ul>			<ul> <li>The studen knowledge i</li> <li>The studer designing a</li> </ul>	its will abl in structural nts can us structure.	le to uti problems se their	lize their ideas in
<b>Course Conte</b>	ent					
<b>Part A:</b> Symmetric and unsymmetrical bending of beams; stresses due to axial load at bending; stress transformation, Mohr's circle of stresses; beam deflection by dire integration and moment area method; <b>Part B:</b> Elastic buckling of columns; elastic strain energy; cable theorem and cable support structures thin-walled pressure vessels					load and by direct supported	
	Text Books and/or Reference Materials					
1. Timoshenko 2. S.B.Junarka 3. Beer and Jo	o and Gere, ar and H.J.S.	Mechanics of Mate hah, Mechanics of chanics of Material	erials, CBS Publis Structures, Charc s. McGraw Hill I	shers, New I otar Publishe International	Delhi, 199 ers, Ananc Edition.	96. I, 1998. 1995.

4. E.P.Popov, Engineering Mechanics of Solids, Prentice Hall of India Pvt. Ltd., 1998.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
СЕ	CE 2231	Fluid Mechanics		Theory	3.0	3.0	
Course Rationa	.le						
The course is t fluids, their mo thorough under enhance stude Engineering.	The course is the study of fluids and help students to acquire knowledge about the characteristics of fluids, their movement and how they interact with the materials containing them. It will develop a thorough understanding of solving problems related to incompressible flow. This study will also enhance student's capacity to understand the subsequent related courses of water resources. Engineering.						
Course Objectiv	ve		Course Outcomes	8			
<ul> <li>To giv fluid, it various externa</li> <li>To d hydrost and sta applica energy</li> </ul>	<ul> <li>To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.</li> <li>To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.</li> <li>Understanding the basic concepts of fluid statics, kinematics and dynamics</li> <li>Understanding the basic concepts of fluid statics, kinematics and dynamics</li> <li>Understand the change of fluid flow due to different reasons</li> <li>Analysis of fluid flow problems in civil and energy equation in fluid flow.</li> </ul>					pts of fluid flow due to in civil and to design	
Course Content	t						
<b>Part A:</b> Fundamental concepts in fluid mechanics; Fluid properties, Hydrostatics, Conservation of mass and momentum using differential and integral balances; Fluid kinematics							
<b>Part B:</b> Fluid and velocity pranalysis, viscouvers and pitot	flow concepts ofiles in lami us flow in pi tubes. Civil e	s: Continuity equation nar and turbulent floo pes, drag and lift; F engineering application	ons, energy and m ows; incompressib Fluid measurement ons.	omentum equ le flow, simil in orifices,	ations, Shitude and on ozzles, vo	lear stresses dimensional enturimeter,	

Text Books and/or Reference Materials

K.R.Arora: Fluid Mechanics, Hydraulics and Hydraulic machines

R.S.Khurmi: Fluid Mechanics, Hydraulics and Hydraulic machines

Joseph B. Franzini: Fluid Mechanics

RK .Bansal: Fluid Mechanics and Hydraulic Machines;

**RK Rajput: Fluid Mechanics** 

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 2221	Environmental I	Engineering I	Theory	3.00	3.00	
Course Rationale							
The goal of environmental engineering is to ensure that societal development and the use of water, land and air resources are sustainable. This goal is achieved by managing these resources so that environmental pollution and degradation is minimized. The course explains the impact of various water quality parameters on human health & ecosystem. Treatment choices and working of technologies for various water quality parameters are discussed. Student should be able to make technology choice to deal with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems.							
Course Objective			Course Outcomes				
<ul> <li>To know the fundamental knowledge of Environment, surface, ground and rain water quality parameters</li> <li>To know the treatment process of impure water</li> <li>To know the Water supply networking system in rural and urban areas</li> </ul>			<ul> <li>The students will have acquired knowledge on the water quality parameters to identify the impure water and pure water.</li> <li>The students will apply the fundamental principles of water treatment process and distribution network.</li> <li>Appreciate the importance and methods of operation and maintenance of water supply systems;</li> </ul>				
Course Content							
Part A: Ecology and environment; climate change; biodiversity; energy and environment.         Introduction of Water supply engineering; water supply scenario in Bangladesh and SDG targets; water demands; water supply sources; ground water exploration: aquifer properties and ground water flow, well hydraulics, water well design, rainwater harvesting, and alternative water supplies for problem areas.							

**Part B:** Surface water collection and transportation; head works; pumps and pumping machineries; water distribution systems; analysis and design of distribution network; fire hydrants; water meters; leak detection; unaccounted for water.

Water quality requirements; water treatment: plain sedimentation, coagulation, flocculation, filtration, disinfection; miscellaneous treatment methods; low cost treatment methods for rural communities; water safety plan

Text Books and/or Reference Materials

Water Supply Engineering by M. A. Aziz, Hafiz Book Centre, Dhaka

Water Supply and Sewage by Terence McGhee. E. W. Steel, McGraw-Hill Int'l Edition, November, 1990 Water & Waste Water Treatment by Mark J. Hammer, Prentice-Hall of India, 4<sup>th</sup> Edition.

Water supply engineering by S K Garg

Water supply, Waste disposal and environmental Engineering by A. K Chatterjee

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
СЕ	CE 2222	Environmental Eng	Sessional	1.5	3.0		
		Sessional I					
Course Rationa	le				•		
This course der	nonstrate the	basic knowledge reg	garding determinat	ion of differe	nt physical	and	
chemical water	quality para	meters such as pH, al	lkalinity, DO, BOI	O COD, hardr	iess, Temp	erature,	
Turbidity, TS,	DS, TSS and	Alum dose and so or	n.				
Course Objecti	ve		Course Outcome	8			
• To learn	the handl	ing of different	Upon successful	completion	of this c	ourse, it is	
equipment	related to wa	ter and wastewater	expected that students will be able to:				
analysis			1. Characterize water and wastewater samples				
• To learn a	bout the pre	parations of stock	2. Predict the quality of treated water and				
and stand	ard solution	s, their handling,	wastewater samples				
storage, etc			3. Evaluate the efficiencies of the water and				
• To unders	tand the dif	ferent experiments	wastewater treatment plants.				
involved in	water and w	astewater analysis.	4. Make decisions regarding dosing of different				
• To learn	more abo	out the titration	chemicals involved in water treatment processes.				
techniques	of chemical a	analysis	5. Select the appropriate technologies for				
To develop	skills related	l to report writing.	wastewater treatr	nent			
Course Content	t						
Water and wast	tewater samp	ling techniques, sam	ple preservation, p	hysical, chem	nical and bi	iological	
tests of water a	nd wastewate	r; breakpoint chlorir	ation, alum coagu	lation, sampli	ng and lab	oratory	
analysis of air.							
Text Books and	l/or Referenc	e Materials					
1. Laboratory N	Aanual of En	vironmental Enginee	ring provided by the	he departmen	t		

2. Chemistry for Environmental Engineers - Sawyer and McCarty Tata McGraw Hill Publications

Department	Course No	Course Title			Course Type	Credit Hours	Total Contact Hours
CE	CE 2212	Quantity Surveyin	ng		Theory	1.5	3
Course Ratio	nale						
Thecoursewill	lenablethe s	tudentstoacquirekn	lowl	ledge on esti	mation of it	ems of c	ivil works,
analysis of ra	ites, use of	software in quant	ity s	surveying an	d specificati	ions of n	naterials of
construction projects.							
Course Obje	ctive		Course Outcomes				
To provide	e a clear vie	w on importance	• After completion of the course, students				
of civil en	gineering es	timation.	will be able to calculate earth works,				
• To unders	tand and cal	culate earth		building, br	ridge and truss.		
works, but	ilding, bridg	e and truss.	•	Students will able to analyze the rates			
• To analyze	e the rates an	nd learn the use		(software).			
of softwar	e in quantity	surveying.	• Students will intelligent enough to specify				to specify
• To specify	the materia	ls of construction	the materials of construction projects.				
projects.							
Course Conte	ent						
Earthwork ex	Earthwork excavation for roadway, earthwork computation from spot levels; estimation for						
residential b	uilding: est	imation of slab,	be	eam, columr	n, footing;	analysis	of rates,
specifications	, costing o	f residential buil	ding	g; estimation	and costi	ng of se	eptic tank;

residential building: estimation of slab, beam, column, footing; analysis of rates, specifications, costing of residential building; estimation and costing of septic tank; estimation and costing of underground water reservoir; estimation and costing of retaining wall; estimation and costing of slab culvert; estimation and costing of bridges; highways construction; estimation of steel truss; computer aided quantity estimation; construction site survey and estimation.

# Text Books and/or Reference Materials

Lab Manual of Quantity Surveying Sessional (dept. of CE, LU.)

Department	Course No	Course	Course Type	Credit Hours	Total Contact Hours			
CE	CE 2232	Fluid Mechanics Se	essional	Sessional	1.5	3.0		
Course Ration	ale							
To provide students the technical expertise and ethical qualities to design and execute in Civil engineering Projects.								
Course Objective Course			Course Outcomes	Course Outcomes				
• To understand and perform fluid mechanics related tests.			<ul> <li>The students will able to utilize their knowledge in water resource field.</li> <li>The students can use their knowledge in hydraulic structure related jobs.</li> </ul>					
Course Content	t							
Centre of pressure. Proof of Bernoulli's theorem. Flow through Venturimeter. Flow through orifice. Coefficient of velocity by coordinate method. Flow through mouthpiece. Flow over V notch. Flow over sharp crested weir. Fluid friction in pipe.								
Text Books and	l/or Referenc	e Materials: Lab Ma	nual of Fluid Mech	nanics Session	nal (Dept.	of CE, LU.)		

<b></b>	ſ	1						
Course Code: GED 1145	Credits: 02	Semester:	Year:					
Course Title: Bangladesh Studies								
<b>Rationale:</b> The course will try to conceptualize the evolution of society, cultural and ethnic diversity, art, language and literature, political history, philosophy, religious practice and economy along with major productions of Bangladesh from prehistoric date to present. The consequences of the study will also include geography, climate, flora and fauna. Moreover, notable intellectuals will be discussed for their contribution. The goal of this course is to familiarize students with overall speculation about our nation in a nutshell.								
Course Objectives: This course ha	s been offered for	the students						
• To facilitate the necessary inform location, climate, topography, linguistic and literary evide personalities at a	mation about the e bio diversity and ence, archaeology	mergence of Banglad environment, anthrop v, indigenous know	lesh including its pologic ancestry, wledge, notable					
<ul> <li>To recognize the importance's eventually got freedom which is</li> <li>To illustrate the scientific, philo</li> </ul>	of long cherishe essential base to u pophical, artistic	ed freedom through inite as a nation. and intellectual progr	movements and ress of Bengal in					
<ul> <li>every stages of our history.</li> <li>To understand the economic and</li> <li>To provide the knowledge of abiding laws.</li> </ul>	l productivity patte govt. system, con	ern of the country. stitution and legislat	ion system with					
Intended Learning Outcomes (IL	Os):							
At the end of this course, students sl	hould be able to							
<b>ILO-1:</b> Understand the impo	ortance's of unity	what we were able	to show through					
<b>ILO-2:</b> Know the depth of movem its utilization to the development of	ent Bengal. ent specially 1947 nationalism.	, 1952,1954,1966,19	69 and 1971 and					
<b>ILO-3:</b> Obtain the idea on every asp <b>ILO-4:</b> Provide overall knowledge	about socio econo	mic prospects and p	otentiality of our					
<b>ILO-5:</b> Generalize our Govt. system spectrum and oblige the laws to be a	m and adapt variou a good citizen.	us social problems in	the broad social					
Course Contents:								
	Part-A							
Anthropology of main stream B	engali population	Minor ethnicities	Language and					

Anthropology of main stream Bengali population. Minor ethnicities. Language and linguistics. Selected Literatures (Charyapad to contemporary), Performing art (Music, Jatra, Dance, <sup>e</sup>puppetry, films) Visual art (painting, sculpture, pottery, crafts, archaeology and architecture, textile). Culture (food, festivals, clothing and sports). Notable intellectuals (ancient to contemporary). Philosophy (ancient, folk, Bengal renaissance to present days)

# Part-B

Geography (land formation, Delta character, hill tracts, coast formation, swamp basin and mangroves) Climate and environment (weathers, seasons, natural calamities and future threats). Flora and fauna. Political history (an overall study from ancient to 1971 and recent events). Economy and production (agriculture, other industries, foreign remittance, RMG). Bangladesh's constitution and government system.

# **Recommended Books:**

- Brammer, Hugh., <u>Bangladesh: Landscapes, Soil Fertility and Climate Change</u>, December 2016, The University Press Limited (UPL)
- Giddens, Anthony., Sociology, 2010, McGraw Hill Publications
- <u>Haque, Mahmudul</u>., Bangladesh: <u>History, Politics, Economy, Society and Culture</u> <u>Essays in Honor of Professor Alamgir Muhammad Serajuddin</u>, 2016, The University Press Limited (UPL)
- Society and social structure of Bangladesh, Richard, T. Schaefer., Sociology, 2010, McGraw Hill Publications, Chapter five.pp 103--110 p, Chapter three p 53.
- Culture and diversity of Bangladesh: Schaefer and Giddens, Sociology: chapters of Culture p 55
- History of Bangladesh: 1905-2005, chapter one p 1-25 and chapter four p 187

Department	Course No	Course	e Title	Course Type	Credit Hours	Total Contact Hours	
CSE	GED 2222	Computer Progr Sessional	amming	Sessional	1.5	3.0	
Course Rationa	le						
This course is course programming, a	lesigned to pro algorithm and t	vide civil engineeri flowchart.	ing undergraduates	with the real	-life probl	ems of	
Course Objectiv	ve		Course Outcomes	S			
<ul> <li>To provide practical knowledge on computer programming.</li> <li>To make the students conversant with algorithm.</li> <li>To develop skills on problem solving issues related to the flowchart by using software</li> <li>To provide practical knowledge on programming.</li> <li>The students will have acquired knowledge programming.</li> <li>The students will apply the fundame principles and programming skills related civil engineering in future.</li> </ul>					owledge on fundamental related to		
Course Content	t						
Introduction to Object Oriented Programming (MATLAB/Python); Solving polynomial equations; Program to find Moment of Inertia and section Modulus of rectangular section; Program to find Moment of Inertia and section Modulus of rectangular section; Program to find Moment of Inertia and section Modulus of circular section; Plotting simple graphs; Solution of simple numerical problems with programming							
Text Books and	l/or Reference	Materials					
<ul> <li>Moore H, Sar 2007.</li> <li>Lutz, Mark. H</li> </ul>	nadhya S. <b>MA</b> ' Programming	TLAB for Enginee	ers. Upper Saddle I Media, Inc.", 2001	River, New Je 1.	ersey: Pren	ntice Hall;	

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	STA 2261	Statistics		Theory	2.0	2.0	
<b>Course Ration</b>	ale						
This course is of the theory and	lesigned to pro practice of stat	ovide civil engineen istics.	ing undergraduate	s with the ba	sic underst	tandings of	
<b>Course Object</b>	ive		<b>Course Outcome</b>	es			
<ul> <li>To develop</li> <li>To use engineering</li> </ul>	basic ideas on statistical computation a	statistics. knowledge on and research.	<ul> <li>tatistics.</li> <li>The knowledge gained on statistics will enric engineering and research skills in practical life</li> <li>The students will understand and implement knowledge in field.</li> </ul>				
<b>Course Conten</b>	nt						
Part A: Frequency dist deviationand o statistics. Part B: Elementary pro- negative binom	ribution. Mea ther measures obability theor tial. Continuot	n, median, mode 5 of dispersion. M 9 anddiscontinuous 1sprobability distrib	and other measur Ioments, Skewnes s probability distri putions, e.g. norma	es of central as and Kurto abution, e.g.	l tendency osis, goodi binomial, j ential. Cha	. Standard ness of fit poison and tracteristics	
Elementary pro negative binom of distributions	bability theor iial. Continuou . Elementarysa	y anddiscontinuous sprobability distrib spling theory. Est	s probability distri putions, e.g. norma imation. Hypothes	bution, e.g. al and exponential and exponential but	binomial, j ential. Cha regression	poison a racteristi analysis	

Text Books and/or Reference Materials
 Probability, Statistics, and Decision for Civil Engineers

# Third Year: Semester I

Department	Course No	Course Title			Course Type	Credit Hours	Total Contact Hours
CE	CE 3111	Structural Ana	lysis I		Theory	3.00	3.00
<b>Course Rational</b>	ę						
The students will	know how t	o analyze statical	ly determinate	e beam	s, frames, tru	sses and arc	ches finding
reactions, internal	loads and dra	awing AFD, SFD	, BMD. Studer	nts will	learn how to	draw influer	nce lines for
beams and frame	s. They will	also learn the con	ncept of the ap	pproxir	nate analysis	of frames a	nd building
subjected to latera	l and/or gravi	tational forces.					
Course Objective	9		Course Outo	comes			
$\succ$ To know the	fundamenta	l knowledge of	> The	student	s will have	acquired kn	owledge on
determinacy of	of various type	es of structures	appro	oximate	e methods	(portal,	cantilever,
➢ To analyze	the statically	indeterminate	appro	oximate	ed methods) t	o analyze in	determinate
structures usir	ng approximation	te methods	struc	tures;	1 / 1	1 6 11	1 1 1
➢ To analyze t	he vertical l	oad and lateral	They will understand and successfully apply the details of influence lines (for beam trues and				
from a by one	rminate mult	bodo	details of influence lines (for beam, truss, and girder beam)				
frames by app	oroximate met	nous	$\sim$ The students will have acquired knowledge on				
			analy	student	vind and earth	acquireu Kir	owieuge oli
Course Content			unury	515 01		iquile loude	
Part A.							
Stability and dete	erminacy of	structures. Analy	sis of statical	lv dete	rminate fram	es trusses	and arches.
Approximate ana	lysis of station	cally indetermina	te structures.	Mill h	ents braced	trusses Por	tal method
cantilever method	and vertical l	oad analysis of m	ulti storied bu	ilding f	rames: buildi	ng drift.	tur motnou,
Part B:							
Influence lines; M	loving loads o	on beams, frames	and trusses; W	ind and	l earthquake l	oads, code p	provisions.
Deflection of bea	ims, trusses a	and frames by vi	rtual work me	ethod;	Approximate	analysis of	suspension
bridges.		2				2	
		Text Books and	l/or Reference	e Mate	rials		
1. Structural A	analysis, Russ	ell C. Hibbeler, P	earson Prentic	e Hall,	8th or 10th ec	lition	
2. Theory of S	imple Structu	res, T.C. Shedd&	J. Vawter, Joh	nn Wile	ey & Sons, 2n	d edition.	
3. Elementary	3. Elementary Structural Analysis by Charles Norris, J. Wilbur & SenolUtku McGraw-Hill						
Int'l, 4th E	dition.						
4. Elementary	Structural Ar	alysis - Norris, W	Vilbur and Utk	u, McG	raw Hill.		
5. Intermediate Structural Analysis - C.K. Wang, McGraw-Hill.							

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 3133	Open Channel F	low	Theory	3.00	3.00	
Course Rationale Open channel flow discusses about the properties of flow in open channel and the design of channel for various flow conditions. This course includes change in properties of flow due to various hydraulic structures and their adjustments.							
Course Objective			Course Outcomes				
<ul> <li>Introduce open channel flow and establish its relevance to civil engineering</li> <li>Explaining the types of open channel and their behaviors, the principle and causes of such behavior</li> <li>Enabling students to identify the mechanism behind open channel flow and to design, analyze and management of the types.</li> </ul>			<ul> <li>Acquire knowledge on various flow characteristics of open channel .</li> <li>Describe and calculate the effects of local changes in the channel geometry on the flow</li> <li>Acquire knowledge on estimation flow profiles using different equations</li> <li>Analyze the flood propagation through the channel</li> <li>Able to solve the problems in hydraulic engineering in a simple and efficient way.</li> </ul>				
Course Content Part A: Open channel flow and its classification. Velocity and pressure distributions. Energy equation, specific energy and transition problems. Critical flow and control. Principles of flow measurement and devices. Part B: Concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and							

**Part B:** Concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow. Momentum equation and specific momentum. Hydraulic jump. Computation of flow profiles. Design of channels, Flow through channel transition, Varied flow, Flow through non-prismatic channel section (Culverts, Bridge piers, channel junction, Obstruction etc).

Text Books and/or Reference Materials

Open Channel Hydraulics by VenTe Chow, McGraw-Hill Book Company

Open Channel Flow by K Subranmanya, TMH, Third Ed.

Open Channel Hydraulics, Sturm, T.W. (2001), McGraw-Hill, NY, NY, 493 pp

Department	Course No	Course Title			Course Type	Credit Hours	Total Contact Hours
CE	CE 3135	Hydrology			Theory	3.00	3.00
Course Rationale	e						
The purpose of t	his course is	to get acquainta	ance	in the field of	hydrology.		
Course Objective	e		Co	ourse Outcomes			
• To know the	fundamenta	ls of	•	The student	s will ha	we know	ledge on
hydrology				fundamentals	of hydrology		-
<ul> <li>To know the theory of different hydrological applications</li> <li>To know how to solve hydrological problems</li> </ul>			<ul> <li>The students will have knowledge on stream flow and statistical methods in hydrology.</li> <li>The students will be able to apply techniques in hydrology related design.</li> </ul>				
Course Content							
Course Content         Part A         Introduction to Hydrology. Importance and role of hydrology in engineering. Hydrologic cycle, Weather and Hydrology, Climate Change. Precipitation, Evaporation, and transpiration. Infiltration. Stream flow measurement. Rainfall runoff relations.         Part B         Hydrographs, unit hydrographs. Hydrologic routing. Statistical methods in hydrology. Cyclone and Drought analysis. Assessment of Environment Flow.         Text Books and/or Reference Materials							

2. Engineering Hydrology by K. SubramanyaTata McGraw Hill Publishers
| Department Course No  | Cou   | Course Title   |  | Credit<br>Hours  | Total<br>Contact<br>Hours   |  |
|---|---|--|--|--|---|--|
| CE CE 3113  | Design of Conc  | rete Structures I  | Theory   | 3.00   | 3.00  |  |
| Course Rationale  |   |  |  |  |   |  |
| The course will demonstrate the properties, performance and codified requirements of concrete and steel, and to show how strength criteria and fundamental principles can be applied to reinforced concrete in a unified way. The course will also allow the student to learn the theories of reinforced concrete, design philosophy and techniques for the analysis, design and detailing of reinforced concrete elements, such as beams, slabs etc. |   |  |  |  |   |  |
| Course Objective  |   | Course Outcomes  |  |  |   |  |
| <ul> <li>To know the fundament<br/>properties of reinforcement</li> <li>To Understand the<br/>philosophy and to krick<br/>design of reinforcement<br/>singly reinforced, doub<br/>beam, Shear reinforcement<br/>Bond and anchorage and<br/>way slab</li> </ul>  | ntal knowledge &<br>ent concrete.<br>Design basics,<br>now the Flexural<br>concrete such as<br>ly reinforced, T-<br>ent design of beam,<br>nd design of one | <ul> <li>Students will g<br/>properties, loads</li> <li>Students will be<br/>reinforced conc<br/>slab) for flexure<br/>code.</li> <li>The students wi<br/>and diagonal ter<br/>reinforcement.</li> <li>The student will<br/>of beam and sla<br/>out in codes.</li> </ul> | et clear und<br>on structure<br>able to perce<br>rete structure<br>/bending and<br>ll have acqui<br>nsion of bear<br>l be able to<br>b to comply | lerstanding<br>and design p<br>eive, design<br>ral element<br>l shear follo<br>red knowlec<br>n, bond & a<br>detail the re<br>with the reş | on Material<br>philosophy<br>and analyze<br>(beam and<br>wing design<br>dge on shear<br>inchorage of<br>einforcement<br>gulations set |  |
| PART A  |   |  |  |  |   |  |

Introduction: Material and properties of reinforcement concrete, Fundamental behavior of Reinforced Concrete and loads on structures, Introduction to Ultimate strength design method and working stress design method, Flexural design of reinforcement concrete Beam (Singly reinforced, doubly reinforced) USD & WSD methods

# PART B

Flexural design of reinforcement concrete T-beam according to WSD and USD methods; Design of beam for shear and diagonal tension, bond & anchorage of reinforcement and its detailing, Design of One way Slab.

- 1. Design of Concrete Structures by George Winter, o' Rourke, Nilson, Tata McGraw Hill Publishers
- 2. Design of Concrete Structures by Nilson, Drawing, Charles Dolan, McGraw-Hill Higher Education
- 3. Reinforced Concrete Design by Chukia Wang & Charles G. Salmon, John Wiley & Sons
- 4. Civil & Structural Engg Design of Reinforced Concrete Structure by A. W. Kaplan AEC Education
- 5. American Concrete Institute, ACI Codes, 2003
- 6. Reinforced Concrete Fundamentals by Ferguson, Breen, Jirsa, John Wiley & Sons
- 7. Structural Concrete (Theory and Design) by M. NadimHassoun and Akthem Al Manaseer

Department	Course No	Cour	se Title	;	Course Type	Credit Hours	Total Contact Hours
CE	CE 3141	Geotechnical E	Engineer	ing I	Theory	3.00	3.00
Course Rationale	e						
This course is aimed to develop analytical skills in dealing with soil as a medium for structural supports and a primary building material, its classification and properties. Understanding of the principles of effective stress, Soil settlement, ground improvement through soil compaction and lateral earth pressure on structure.					uctural g of the tion and		
Course Objective		Course	e Outcomes				
<ol> <li>To know th of propertie various soils</li> <li>To know th such as shear consolidation</li> </ol>	e fundamen es and co he engineer r strength, co n etc. of soils	tal knowledge mposition of ing properties ompaction, and s.	1. 2. 3. 4. 5.	The stude on engine of soil. The stude on various Estimate foundation Solve p consolidat settlement Can dete foundation	nts will have ering charact onts will have soil improve the stresses n loads. ractical pro- ion settlement rmine latera n and earth re	e acquired eristics and e acquired ement techn under any oblems ro t and time l earth pr taining stru	knowledge properties knowledge iques. system of elated to dependent ressure on cture.
Course Content							

## PART A

Introduction to geotechnical engineering, formation, type and identification of soils, soil composition, soil structure and fabric, index properties of soils, engineering classification of soils, soil compaction, permeability and seepage

# PART B

Principles of total and effective stresses, , stress-strain-strength characteristics of soils, Stress distribution, compressibility and settlement behavior of soils, lateral earth pressure.

Text Books and/or Reference Materials

Soil Mechanics & Foundation Engineering by Dr. K.R. Arora, Standerd Publishers Distributors Foundation Engineering by Ralph B. Peck Hanson, Thornburn Wiley Eastern Limited, Dhaka. Principles of Geotechnical Engineering by B.M. Das, Thomson Brooks/Cole Geotechnical Engineering-Principles & Practice by Donald P. Codute Prentice-Hall of India Soil Mechanics & Foundation by B.C. Punmia, Laxmi Publication

Department	Course No	Cou	Course Type	Credit Hours	Total Contact Hours	
CE	CE 3142	Geotechnical En	gineering Sessional I	Sessional	1.50	3.00
Course Rationale						
To provide the hands on training in determination of Engineering and index properties of soils, applied in field problems.						
Course Objective Course Outcomes						
<ul> <li>To examine the various physical characteristics of soil</li> <li>To examine the index and engineering properties of soil</li> <li>The students will have acquired knowledge strength, density and improvement properties of soil</li> </ul>				owledge on owledge on ties of soil.		
Course Content						
Field identification tests of soils, grain size analysis by sieve and hydrometer, specific gravity test, Atterberg limits test, unconfined compression test, compaction test, relative density test, direct shear tests, consolidation tests, and Permeability (Constant head and Variable head) test.						
Text Books and/or Reference Materials						
Soil Testing for E Soil Testing Man	ngineers by T al:Procedure	Г. William Lambe e,Classification Da	, MIT tta & Sampling Practic	es by Rober	t W. Day, M	cGraw-Hill;

Department	Course No	Course Title			Course Type	Credit Hours	Total Contact Hours
CE	CE 3116	Engineering Com	nputat	ion	Sessional	1.50	3.00
		Sessional					
Course Rationale							
The aim of the course is to develop knowledge and understanding of the computational programming							
tools inherent in solution of engineering problems							
Course Objective			Cou	irse Outcom	ies		
• To introduce l	oasic engii	neering oriented	•	The students	s will have a	acquired kno	owledge on
computational programming tools in				the computa	tion program	nming tools	in Python
MATLAB or Python.				or MATLAB.			
• To apply computational programming tools to				The students	s will have e	enough fund	amental on
fit an engineering	problem for	r solution	the solution of engineering problems in				
				programmin	g language	e and cor	nputational
				basics.			
Course Content							
Introduction to high	level comp	utational programi	ming	tools; applic	cation to nu	merical anal	lysis: basic
matrix computation,	solving sys	tems of linear equ	uatior	ns, non-linea	r equations,	differential	equations,
interpolation and curv	ve fitting, nu	merical differentia	tion,	numerical int	egration; ap	plication to e	engineering
problems: solving pro	blems relate	ed to mechanics, nu	ımeri	cal solution o	of equation o	f motion etc.	
Text Books and/or R	Reference M	aterials					
1. Introduction	Fo MATLA	B for Engineering	Stude	ents, David H	oucqueNilso	on.	
2. Amos Gilat, MATLAB - An Introduction with Applications, 14e, John Wiley & Sons.							
3. Hanselman an	nd Littlefield	l, Mastering MATI	LAB	, 1e, Pearson	Education, 1	Inc.	

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 3132	Open Channel F	Flow Sessional	Lab	1.5	3.00
Course Rationale						
Open channel flow sessional discusses and demonstrateslaboratory techniques used on open channel flow study.						
Course Objective			Course Outcomes			
• To give hands on training on laboratory techniquesused in open channel flow analysis			• The students various labora related subjects	will have ha tory analysis	nds on kno of open c	owledge on hannel and
Course Content						
Broad-crested weir; sluice gate; venturi flume; parshall flume; cutthroatflume; hydraulic jump; velocity distribution profile; Manning'sroughness coefficient; specific force and specific energy						
Text Books and/or Reference Materials						
Lab manual provi	Lab manual provided by the Department					

Course Code: CED 2211	Course Title: Smart Village	Somester	Voom				
Course Coue: GED 5211	Studiog	Semester:	rear:				
	Credits: 2+1-3		<u> </u>				
Dationala: The main chief	creans: 2+1=5	the concente	contaxt and				
<b>Kationale:</b> The main object	neerly and areas of Danaladash	Their living	context and				
stakenoluers of the futal people and areas of Dangiadesh. Then fiving patients and							
relationship, needs, challen	ges, assets and opportunities available	e. Determine st	rategies and				
applying action plans for t	he development of the smart commu	nities. All these	e issues will				
acquaint the students with	n rural community and developmer	nt of the smar	t village in				
Bangladesh.							
Course Objectives: By stuc	lying this course students will be able	to:					
1. Understand the conc	cept of Village, context and stakehold	lers of rural cor	nmunity and				
issues prevailing in t	he rural areas.						
2. Acquaint living patte	erns, local support systems and relation	ships among the	em.				
3. Identify challenges,	needs, assets and opportunities av	ailable in villa	ige areas of				
Bangladesh.							
4. Explore alternative s	olutions and smart village strategies fo	or rural developr	nent.				
5. Determining action	plans, applying the strategies and	l plans for Sr	nart Village				
Development.		-	-				
-							
Intended Learning Outcome	s:						
ILO 1: To get ideas on the c	oncepts of village, rural areas and rura	l development in	ncluding				
patterns of living. Differenti	ate between the concept of village and	smart village T	o get ideas				
on the concepts of village, r	ural areas and rural development includ	ding patterns of	living.				
Differentiate between the co	incept of village and smart village.	01	C				
ILO 2: Providing ideas on th	he assets, and resources available in the	e rural economy	of				
Bangladesh including their r	nature and patterns of distribution. Soc	ial facilities and	amenities				
available: educational and re	eligious institutions, different social mo	onuments and sc	ocial				
institutions legal aspects and	d settlement of disputes		, • 141				
II $\bigcirc$ 3. Discussing sources $\bigcirc$	of occupation and income generating ac	rtivities includin	a amenities				
and enterprising in the rural	areas of Bangladesh	Arvices merudin	g unientites				
II $O_{4}$ : Studying on the supr	lying the availability of input factors	utility carvicas.	alactricity				
as mobile and internet faci	ilitian including human and information	n resources.	ciccularly,				
gas, mobile and internet fact $U \cap S$ : Introducing and Ana	lyzing technological and financial fact	org availability f	for rural				
development institutional in	freetweetunes. COs and NCOs energi	ors availability i	lonmont in				
Development, institutional in	infastructures. GOs and NGOs operatin	ig for rural deve	iopment m				
Bangladesh.	die endingenoted and the second for the second						
ILO 6: Comprehensive, holi	stic and integrated process for the sma	rt village develo	pment and				
applying strategies as well a	s action plans for smart rural developm	nent.					
Course Contents:							
	<u>Part - A</u>	C 111					
1. Concepts and Evoluti	on of Smart Village: The concept o	f village, nature.	, origins and				
growth of smart village	, people of the smart village, culture,	different stakeh	olders in the				
rural areas, their nature	of participation, nature and types of f	amily relationsh	ips and their				
living patterns in rural	Bangladesh. The difference between	n village and si	mart village.				
Taking examples of sn	nart village concepts from case of the	e developed and	1 developing				
countries such EU, ASE	EAN and our neighboring countries Ind	lia.					

2. Legal practices, Landowning Patterns, Resource Structure and Using Electronic

**Technology in Different Functions:** Land owning, their patterns of distributions, different types of household considering the possession of resources, water bodies, forestry and forest resources, public properties including heritage assets that may provide the potentials of sustenance, cooperation, interdependence, footings of economic activities and occupational variations in the society. Legal issues and dispute settlements, sustainability issue of using the resources including e-health, e-legal services and e-land settlements, e- educational services should be discussed etc.

- 3. **Rural Agricultures and Rural Industries:** Digital agriculture, irrigation systems, modern tools for harvesting, horticulture, fishing, tourism, arts and crafts, cultural and heritage industries, local products and processing, renewable industry and social enterprise, micro, small, cottage and medium enterprise, demands for retail and house hold products, education, personal, communication and services, IT and software firms.
- 4. Housing pattern, Healthcare and Sanitary System of Smart Village: E-health services, focusing discussion on all of the supply factors and services, process of obtaining services, using services as per as needs of the clients and enterprises. Human resource development including training facilities available. Focusing on the e-transportation and e-distribution systems.

## <u> Part – B</u>

- 5. Using Technology, Institutional Support Services and Smart Money Services: Applications and impacts of technology in making smart village, defining technology in local consideration, components of technology and opportunities created from them; institutions providing the technological support. Activities of BSCIC, BRDB, BARD, Cooperative Department of Bangladesh, Department of Youth Development, Some of the NGOs operating in Bangladesh for village development, use e-banking and smart financial services such as bkash, Rocket, Nagad etc. for smart village development.
- 6. Smart Village Development Process: Getting started through designing roadmap consulting with local representatives, activists, NGOs; mapping context and stakeholders; Engaging stakeholders; DesigningStrategies: integrated set of interventions, including overall, specific and operational objectives, planning activities in response to challenges and needs, building on assets and opportunities available in the locality; Smart Village Strategy for innovative solutions (digital, technological, social or other); Planning actions: detailed process of setting out of expected costs and resources to finance these, timing, identification of potential risks and barriers, planning community involvementetc.; Generating actions: allocating local human and financial resources, external resources, generating projects with the community, Monitoring and evaluation.
- 7. **Problems Identifications:** Chalking out problems in the practical course developing, designing and implementing smart village projects influencing by above mentioned issues, factors, processes and perspective.
- 8. Using ICT and Social Marketing Tools: Alternative frameworks may be presented to the students to use the ICT and Internet as well as social marketing tools such as Facebook, Instagram, whatsApp, e-mail and e-commerce can be used for smart village development focusing smart institutional networks, smart distribution, smart utility and smart energy services development.
- 9. **Residency Requirements:** Students will complete the residency under supervision by the teacher and will prepare, submit as well as present the report. Participatory meeting on specific issue.

**Books Recommended:** 

- 1. Rural Development in the Era of Globalization in Bangladesh: Economic Issues, Problems and Perspectives, JannatulFerdous, November 06, 2020, Nove Science Publishers, DOI: 10.52305/YPUV4547
- 2. Smart Development for Rural Areas, Edited By André Torre, Stefano Corsi, Michael Steiner, Frédéric Wallet, Hans Westlund; 2020, published by Routledge ISBN 9780367374792
- 3. Rural Transformation : Insights from Bangladesh, By Abdul Bayes and Mahabub Hossain, 2018, The University Press Limited, ISBN: 978 984 506 2602
- 4. Leading Issues in Rural Development: Bangladesh Perspective, 2015, Edited byMahabubHossain and Abdul Bayes, A H Development Publishing House, ISBN-10 : 9849146702, ISBN-13 : 978-9849146704
- 5. Rural Development by NGOs in Bangladesh, by Aka Firowz Ahmad, 2013, Osder Publications, ASIN : B00GPSBI98.
- 6. Rural Economy & Livelihoods: Insights from Bangladesh, MahabubHossain, 2009, A H Development Publishing House, ISBN-10: 9848810064, ISBN-13: 978-9848810064
- 7. Differentiation, Polarization and Confrontation in Rural Bangladesh, B.K. Jahangir, 1979, (Dhaka: Centre for Social Studies, DU). S.A. Qadir (1960), Village Dhanishwar: Three Generations of Man-land Adjustment in a BangladeshVillage, Comilla: Bangladesh Academy for Rural Development.
- 8. A BangladeshVillage: AStudy of Social Stratification, A. Chowdhury, 1978, Dhaka: Centre for Social Sciences, DU.

# Third Year: Semester II

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 3211	Design of Stee	l Structure	Theory	2.00	2.00
<b>Course Rationa</b>	lle					
To develop know	vledge in des	signing structura	al elements made of	f steel		
<b>Course Objectiv</b>	ve		<b>Course Outcome</b>	es		
<ul> <li>To know the principles of structural steel members.</li> <li>To know the principles of tension and flexural behavior of steel members.</li> </ul>			<ul> <li>Recognize the design philosophy of the steel structures.</li> <li>Understand the structural behavior of different steel structural elements and their analysis.</li> <li>Use the techniques, skills, and modern engineering tools necessary for design and detailing.</li> <li>Interact and manage work with professionals of diverse background and talent</li> </ul>			
Course Content	t					
<ul> <li>Part A:Behavioral principles and design of structural steel; design of tension members, residual stress; bolted and welded connections; compression members; local buckling, effective length; flexural members; lateral torsional buckling, flexure and shear strength,</li> <li>Part B: Point loads on beam, design for deflection. Introduction to beam-columns; non-sway frames. Connection design: simple connection, moment connection, column bases; introduction to floor systems for steel buildings.</li> </ul>						
Text Books and/or Reference Materials						
Design of Steel S Design of Steel S	Structures by Structure by	Gaylord &Gay N Subramanian	lor McGraw-Hill E , Oxford University	Book Compar Press, New	ny Delhi.	

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 3214	Concrete Struc	tures Sessional I	Sessional	1.50	3.00	
Course Rationale							
This course will enable the students to achieve knowledge on designing bridge slab and designing							
of singly beam, doubly beam and floor slabs.							
Course Objective			Course Outcomes	5			
• To know the hydraulic design of bridge			• The students w	ill have acq	uired know	ledge on	
• To know the analysis and design of			basics of designing of concrete bridge slab.				
beams and fl	oor slabs		• The students will have acquired knowledge on				
• To know the	analysis and	l design of	design of bridge slab and relevant hydraulics				
bridge slab			• The students will have acquired knowledge on				
			design of beams and floor slabs				
Course Content	t						
Criteria to locate	e bridge site;	Hydraulic Desig	gn of a bridge; Anal	ysis and des	ign problen	ns based	
on CE 3113, Pre	liminaries of	f RCC design, O	verview of concrete	e bridges, de	sign of a sla	ab bridge.	
Text Books and/or Reference Materials							
1. Design of Cor	ncrete Struct	ures by George	Winter, Nilson, Mc	Graw-Hill H	igher Educa	ation	
2. Design of Brid	dges by N. K	KrishanaRaju, Oz	xford & IBH Publis	hing Compa	nt Ltd.		

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 3251	Transportation I	Engineering I	Theory	3.00	3.00
<b>Course Rationale</b> Engineering and Highway Enginee	e: The aim o basic element ring	f this course is to s of Highway E	teach students the e ngineering and Geor	ssential componential comp	onents of Trans ay Design; P	ansportation Principles of
Course Objective			Course Outcomes			
<ul> <li>To know the fundamentals of transportation engineering and systems.</li> <li>To know the theory of Transportation planning concepts and geometric design of highways.</li> <li>To know the traffic characteristics and basics of railway engineering.</li> <li>The students characteristics and of railway engineering.</li> </ul>				will have a systems. will have a gn of traffic sy will under and analysis. ill have acquin neering.	cquired kno cquired kno stem in high rstand vari- red knowled	owledge on owledge on way. ous traffic ge on basics
Course Content						
<b>Part A:</b> Transportation engineering: Introduction to transportation engineering, development of transportation systems, elements of transportation system, transportation in Bangladesh, Transportation planning concepts: collection, study and analysis of basic data, highway location and surveys, geometric design of highways: elements of design, cross-section elements, curves and sight distances, road intersections control and design. <b>Part B:</b> Introduction of Traffic Engineering: The road/traffic system, vehicle and traffic characteristics, traffic control devices, traffic studies and analysis, traffic operation, parking studies, road marking, sign, signal design, roadway lighting; waterways and terminals. Railways Engineering: General requirements, alignment permanent way station and yards signaling points and crossings maintenance						
Text Books and/or	r Reference M	laterials				
<ol> <li>Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand &amp; Bros</li> <li>Principles of Railway Engineering by RangwalaCharotar Publishing House, India</li> <li>Highway Engineering by Paul H. Wright, Karen Dixon John Wiley &amp; Sons, Inc.Transportation Engineering &amp; Planning by C.S. Papacostas, P.D. Prevedouros</li> <li>Transportation Engineering – An Introduction. 3<sup>rd</sup> ed., By C. Khisty and B. Lall, Prentice-Hall Inc.</li> <li>Transportation Engineering, 7<sup>th</sup> edition. By: J. Banks, McGraw-Hill, New York, 2001.</li> <li>AASHTO Guide for Design of Pavement Structures. AASHTO, 1997</li> </ol>						

Department	Course No	Course	e Title	Course Type	Credit Hours	Total Contact Hours
СЕ	CE 3212	Structural Analysis and Design Sessional I		Sessional	1.50	3.00
Course Rationale						
The course will de	monstrate the	concept and des	sign of a low-ris	se steel build	ling. The	course also aims to
encourage students	to go through	the principle and	design of a roof	truss.		
Course Objective			Course Outcom	nes		
<ul> <li>To know the members, connection low-rise steel members.</li> <li>To know the particular truss system</li> </ul>	<ul> <li>The students will have acquired knowledge on the steel structure system</li> <li>The students will have acquired knowledge on the principle and design of a steel frame building</li> <li>The students will be able to design a roof truss.</li> </ul>					
Analysis and design c columns bases; Analy Text Books and/or l	of low-rise mor rsis and design Reference Ma	nent frame building of a roof truss. terials	; for gravity and w	rind loads; des	ign of mem	bers, connections and
<ol> <li>Theory of S</li> <li>Elementary</li> <li>Theory of S</li> <li>Steel Struct</li> </ol>	Simple Structu Structural Ar tructure by S ures: Design	ures by T.C. Shedd halysis Charles by . Timoshenko and Practice By N	d& J. Vawter Norris, J. Wilb Subramanian	ur &SenolUt	ku	

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 3252	Transportation En	gineering Sessional I	Sessional	1.50	3.00	
Course Rationale							
The students would be able to know and analyze bitumen and its engineering properties, aggregate & its engineering properties for roads and traffic behavior.							
Course Objective			Course Outcomes				
<ul> <li>To know the physical tests of bituminous materials.</li> <li>To know the mechanical tests of road materials.</li> <li>To determine roadway capacity.</li> </ul>			<ul> <li>The students we quality of bitumin</li> <li>The students we strength capacity</li> <li>The students will &amp; peak time for a</li> <li>The students will of a location and</li> </ul>	vill have a nous materia vill have a of road mat be able to f a given locat be able to c road capacit	cquired kno ils. cquired kno erials. ind out peak ion on the ro alculate satu	owledge on owledge on thour traffic oad. ration flow	
Course Content							
Tests of bitumino roadway capacity	ous materia analysis, ap	ls, tests on subgrad plication of analyti	de, sub-base and base cal, simulation and sta	e materials, tistical packa	bituminous ages.	mix design,	
Text Books and/or	Reference	Materials					
1. Introducti	on to Trans	portation Engineeri	ng by William W. Hay	John Wiley	, New York.		
2. Highway	2. Highway Engineering by Paul H. Wright, Karen Dixon John Wiley & Sons, Inc.						
3. Lab Manu	al of Trans	portation Engineeri	ng Sessional I By Dept	t. of CE, LU	•		

Department	Course No	Cour	rse Title	Course Type	Credit Hours	Total Contact Hours
CE	CE 3213	Structural Analy	vsis II	Theory	3.00	3.00
Course Rationale						
The course will demonstrate the concept of structures and the deformations of structures under different types of loadings. It will also aim to understand the force method and moment distribution method for analysis of statically indeterminate structures.						
Course Objective			Course Outcomes			
<ul> <li>To know the defl</li> <li>To understand Method to ana structures</li> <li>To understand to Distribution staticallyindeterm</li> </ul>	ection behavi the fundame lyze statica he fundamer Method hinate structur	or of structures ental of Force llyindeterminate tal of Moment to analyze res	<ul> <li>The students we pattern of beam</li> <li>The students we of statically Distribution M</li> <li>The students we of statically income sta</li></ul>	ill have acquir ns, frames and vill have acquir indeterminate ethod. vill have acquir leterminate str	red knowled trusses. ired knowle structures ired knowle uctures by F	ge on deflection dge on analysis by Moment dge on analysis orce Method.
Course Content						
Part A Analysis of statically indeterminate structures (beams, frames and trusses) by Force Method; Deflection of beams and frames using Virtual Work method. Part B Analysis of statically indeterminate structures by Moment Distribution Method; Deflection of beams using Conjugate Beam method:						
Text Books and/or R	eference Mate	erials				
<ol> <li>Structural Ar</li> <li>Matrix Analy</li> <li>Elementary S</li> <li>Indeterminat</li> <li>Statically Inc.</li> </ol>	<ol> <li>Text Books and/or Reference Materials</li> <li>Structural Analysis, Russell C. Hibbeler, Pearson Prentice Hall, 8th or 10th edition</li> <li>Matrix Analysis of Framed Structures by William Weaver, James Gere CBS Publishers &amp; Distributors</li> <li>Elementary Structural Analysis by Charles Norris, J. Wilbur &amp; SenolUtkuMcGraw-Hill Int'l Edition</li> <li>Indeterminate Structural Analysis by J.S. Kinney Oxford &amp; IBH Publishing Company Ltd.</li> <li>Statically Indeterminate Structures by C.K. Wang McGraw Hill Book Company</li> </ol>					

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 3215	Design of Con II	crete Structures	Theory	3.00	3.00	
Course Rationale							
The course will demonstrate the design of several structural components like Continuous beam, Two way edge and column supported slabs, Column, Footing foundation, Staircases and Retaining walls.							
Course Objective			Course Outcomes	S			
<ul> <li>To know the fundamentals of floor systems of RCC buildings</li> <li>To know the theory of two way edge supported slab, two way column supported slabs such as flat slab, flat plate and their design.</li> <li>To know the fundamentals of column, footing, staircase, retaining wall and their design.</li> <li>To know the fundamentals of column, footing, staircase, retaining wall and their design.</li> <li>To know the fundamentals of column, footing, staircase, retaining wall and their design.</li> </ul>							
Course Content							
PART A         Introduction to Floor systems of RCC buildings; Two way edge supported slabs, Two way column supported slabs (Flat Slab, flat plate); Concentric column, Design of continuous beam,         PART B         Interaction diagram of column and Design of eccentric column, Footings; Retaining walls; Stairs.							
Text Books and/or	Reference M	laterials					
<ol> <li>Design of Concrete Structures by George Winter, o' Rourke, Nilson, Tata McGraw – Hill Publishers</li> <li>Design of Concrete Structures by Nilson, Drawing, Charles Dolan, McGraw-Hill Higher Education</li> <li>Reinforced Concrete Design by Chukia Wang &amp; Charles G. Salmon John Wiley &amp; Sons</li> <li>Reinforced Concrete Fundamentals by Ferguson, Breen, Jirsa John Wiley &amp; Sons</li> <li>Reinforced Concrete Design by George F. Limbrunner&amp; Leonard Spigel Prentice-Hall of India</li> </ol>							

Department	Course No	Cour	rse Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 3243	Geotechnical E	Engineering II	Theory	3.00	3.00	
Course Rationale							
To develop an understanding of the behavior of foundations for engineering structures and to gain knowledge of the design methods that can be applied to practical problems. The course will also demonstrate the geotechnical analysis and design of footings, rafts, piles, retaining walls and stability of slopes.							
Course Objective			Course Outcomes	5			
<ul> <li>To know the investigation te</li> <li>To know the bearing capacit</li> <li>To know the a footings and state</li> </ul>	e fundamen chniques theory of s y of soil nalysis of va ubility of slop	ntals of soil settlement and arious types of be	<ul> <li>The students will have acquired knowledge on bearing capacity of shallow and deep foundations</li> <li>The students will have acquired knowledge on geotechnical analysis of footings, rafts, piles and retaining walls considering bearing capacity and settlement.</li> <li>The students will have knowledge on stability of slopes.</li> </ul>				
Course Content							
PART A Soil investigation techniques; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; PART B Analysis and geotechnical design of footings, rafts, piles and retaining walls; slope stability analyses.							
Text Books and/or	Reference N	Iaterials					
<ol> <li>An Introduction</li> <li>Foundation Designation</li> <li>Foundation Designation</li> <li>Foundation Engines</li> <li>Principles of Geometry</li> </ol>	to Soil Mech gn & Constru gn & Constru neering by F otechnical E	nanics & Founda uction by M.J. 7 uction by W.C. 7 Ralph B. Peck H ngineering by B	ntion by C.R. Scott Fomlinson Addision FengMcGraw-Hill anson, ThornburnV .M. Das, Thomson	Applied Sci n Wesley Lor Book Compa Viley Eastern Brooks/Cole	ence Publis ngman Ltd. ny Limited, D	bhers Dhaka.	

# Fourth Year: Semester I

Department	Course No	Cour	rse Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4116	Concrete Struc	tures Sessional II	Sessional	1.50	3.00	
<b>Course Rationa</b>	Course Rationale						
Thiscoursewiller	nablethe stud	lentstoachievek	nowledge on design	ning of a con	nplete R.C.	C. building	
by hand calculat	by hand calculation and also by using Microsoft excel file. After completing the course one can						
analyze and desi	gn of a com	plete framed str	ucture with various	s structural c	omponent c	considering	
different loading condition. Design of Slab, beam, column, foundation, water tank, septic tank,							
stair, shear wall is the major components that are covered in this course.							
Course Objectiv	ve		Course Outcome	s			
• To know the	e design of	column, beam	• The students will have acquired knowledge on				
and floor of l	low-rise buil	ding	design of column, beam and floor slab				
• To know the	e behavioral	phenomena of	• The students will have acquired knowledge on			wledge on	
earthquake re	esistant build	ling	earthquake res	sistant buildir	ng.		
<b>Course Content</b>	t						
Design of a lov	w-rise reinf	orced concrete	building (wall sy	vstem), Desig	gn of a m	ulti-storied	
reinforced concrete building (beam-column system) including earthquake resistant design.					gn.		
Text Books and/or Reference Materials							
1. Design of Cor	crete Struct	ures by George	Winter, Nilson Mc	Graw-Hill Hi	gher Educa	tion	

2. Design of Bridges by N. KrishanaRaju Oxford & IBH Publishing Compant Ltd.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 4123	Environmental l	Engineering II	Theory	3.00	3.00	
Course Rationale The course will er design, Wastewate	hable the stud	ents to acquire kn nethods, Environi	owledge about the V nental sanitation, Lo	Vastewater ch w-cost sanita	naracteristics	, Sewer ogy,	
Course Objective	llution contro	and prevention	Course Outcomes	on to Plumbi	ng design.		
<ul> <li>To provide a students for engineering 1 solid Waste 1 etc.</li> <li>To analyze waste water control waste water control events and the section of th</li></ul>	a coherent dev the courses ike Waste V Management, the Waste was haracteristics. lop various cess. an exper- plied in field cess. he foundation tools and c il Engineering	velopment to the s in sector of Vater treatment, house drainage ater sources and waste water tience in the eering concepts of waste Water ater sources and s of many basic oncepts related g.	<ul> <li>The students we characterization methods</li> <li>The students we treatment and set to and practical are along with the students we along we along</li></ul>	vill have acqu n of wastewa vill have acqu safe disposal vill learn to un spects of enve design and m	ired knowled ter and its tro ired knowled of sewage. nderstand the ironmental e nanagement a	lge on eatment dge on e theoretical ngineering applications.	
Course Content							
<b>Part A:</b> Wastewater Engineering: introduction; estimation of wastewater; wastewater collection systems; hydraulics of sewer; design, construction and maintenance of sanitary sewer and storm drainage system; sewer appurtenances. Wastewater characteristics; microbiology of wastewater							
<b>Part B:</b> Wastewar coverage in Bang (FSM), septic tan treatment systems	ter treatment a gladesh and S nk system ar , Plumbing sy	and disposal; slud SDG targets; ons ad design , Anae ystem. Sustainabil	lge treatment and dis ite sanitation system erobic Baffled Reac- ity of water and sani	posal. Sanita n including f ctor (ABR); itation service	tion and heat fecal sludge decentralize es, Introducti	lth; sanitation management d wastewater ion to EIA.	

Text Books and/or Reference Materials

1. Water Supply & Sanitation by M. Feroz Ahmed, Md. MujiburRahman ITN Bangladesh

2. Environmental Engineering by Howard Peavy, Rowe, Tchobanoglous McGraw-Hill Book Company

3. M.L. Davis and D.A. Cornwell, Introduction to Environmental Engineering,

4. Metcalf and Eddy,(Revised by G. Tchobanoglous) Wastewater Engineering & Treatment, disposal Reuse, Tata-McGraw Hill, New Delhi

Department	Course No	Cou	rse Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4137	Irrigation and F	lood Control	Theory	3.00	3.00	
Course Rationale							
This course contains fundamental information on irrigation and flood control. After completion of this course one should be able to design an irrigation project which includes water requirements, canal design and hydraulic structures for irrigation project. In addition one should be able to design hydraulic structures for flood protection.							
Course Objective			Course Outcomes				
<ul> <li>To know the f about irrigatio</li> <li>Identify the cr comprehendir economy and</li> <li>Explanation o movement ,so influencing w</li> <li>Acquire skill f</li> <li>Assess different structures</li> </ul>	Fundamental in on and related coss-sectoral 1 ag wider aspect the environm f water retent il moisture co ater movement to design irrig	nformation terms inkages ots of society, ent ion, water ontent, factors at gation canal flood control	<ul> <li>Explain the late drainage, floor consolidation development;</li> <li>Apply the hydrological the implementation protection sc multidisciplinat</li> <li>Support develution users in the management protection sch implementation financing and p</li> <li>Demonstrate contemporary the water development</li> </ul>	est concepts a d protection, technologie latest hydrau methods in n of irrigatio hemes, inde ry team; opers, system e participato of irrigation, nemes for th n, operation performance as knowledge a research issues nent.	nd theories of land reclates for ulic engine planning, of n, drainage pendently n managers ry develop drainage heir plannin and n ssessment and unders in the field	of irrigation, mation and sustainable eering and design and and flood or in a and water oment and and flood ng, design, naintenance, tanding of of land and	
Course Content	c · · ·		1 12 6 2 2		<b>N</b> 11	1 1.	
<b>Part A:</b> Importance of irrigation. Sources and quality of irrigation water. Soil water relationship. Consumptive use and estimation of irrigation water requirements. Methods of irrigation. <b>Part B:</b> Design of irrigation canal system. Irrigation structures. Irrigation pumps. Problems of irrigated land. Flood and its control.							

Irrigation Engineering & Hydraulic Structures by Santosh K. GargKhanna Publishers Irrigation principles & practices by V. Hansen, W. Israelsen, Stringham John Wiley & Sons, Inc. Irrigation Water Management: Principles & practice by D.K. Majumder Prentice-Hall of India Irrigation, Water Resources and water power engineering- Dr. P. N.ModiPubl Standard book house.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 4104	Project / Thesis			3	6	
Course Rationale							
The students will	The students will learn on research works and writings of thesis from this course.						
Course Objective			Course Outcomes				
• To investigate the various problems in different civil engineering topics following the standard methodology.			<ul> <li>The students will have knowledge on the methodology of problem solving under deep assessment.</li> <li>Student will also learn how to write research paper and research proposal.</li> </ul>				
Course Content							
Experimental and theoretical investigation of various topics in structural engineering, concrete technology, environmental engineering, transportation engineering, geotechnical engineering, and Water Resources Engineering. Individual or group study of one or more topics from any of the above fields. The students will be required to submit thesis/project report at the end of the work.							
Text Books and/or	Text Books and/or Reference Materials						
A Manual for Write Eighth Edition	ters of Resear	ch Papers, Theses	, and Dissertations by	<b>YKATE L.</b> 1	<b>FURABI</b>	AN	

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 4101	Project Planning	g and Management	Theory	3.00	3.00	
Course Rationale							
The aim of this construction mana of a project planni	course is to agement and a ing or constru	provide basic un making the studen ction team.	nderstanding of var nts competent in ful	ious aspects of filling their res	of project pl sponsibilities	lanning and s as a leader	
Course Objective			Course Outcomes				
<ul> <li>To know the p works manage</li> <li>To know the c and schedulin</li> <li>To know the c analysis, CPM</li> <li>To demonstra leadership and projects, proje</li> </ul>	orinciples of c ement. construction v g. details about of and PERT of te effective of change skill ect teams, and	onstruction works planning cost-benefit f a project. ganizational s for managing stakeholders.	<ul> <li>The students construction we system and knowledge on the students project planner and maintain both economic</li> <li>The students planning and control the basis/limita and PERT.</li> </ul>	will have a vork manageme the students Project plannin will learn the and construct good planning ally and techni will know h control techniq ations of his/he	cquired kno ent and cost will hav ng and sched roles and ion manager and contro cally. now to sele ues while un er choice bas	owledge on accounting e acquired uling. duties of a to promote l of project ect suitable iderstanding sed on CPM	
Course Content							

Principles of management; principles of construction management; construction contracts and specifications; inspection and quality control; construction safety; construction planning and scheduling; PERT, CPM, case studies, resources scheduling; PERT;

## Part B:

Cost accounting system, linear programming. Psychology in administration; materials management; demand forecasting; inventory control; stores management; procurement. Project planning and evolution; feasibility reports, cash flow, payback period, internal rate of return. Benefit-cost ratio, construction equipment and plants. Replacement studies. Management for engineers; Environmental project management.

Text Books and/or Reference Materials

1. Project Management: A systems Approach to Planning, Scheduling & Controlling by Harold Kerzner John Wiley & Sons, Inc.

2. Production Systems: Planning Analysis & Control by James L. Riggs John Wiley & Sons, New York

3. Construction Project Management by Richard H. Clough, G.A. Sears John Wiley & Sons.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 4153	Transportation	n Engineering II	Theory	3.00	3.00
Course Rationale						
To give an overview about the highway engineering with respect to planning, design, construction and maintenance of highways.					on and	
Course Objective			Course Outcomes			
<ul> <li>To know the stabilization.</li> <li>To know the pavements.</li> <li>To know the d</li> <li>To know safet</li> </ul>	highway engine design of flexi etails about accid ty audit and ITS	ering and soil ble and rigid lent study.	<ul> <li>The students wi engineering and</li> <li>The students wi and rigid pavem</li> <li>The students v components of controls.</li> <li>Understand va suitability under</li> </ul>	Il have acquired transportation n ill have acquired ent design. vill be able to highways, plann rious Highway different condit	knowledge nodeling. I knowledge understand ing concept materials tions.	on highway e on flexible the various ts and traffic and their
Course Content						

Highway Engineering: Highway materials, sub-grade, sub-base and base courses, soil stabilization and soil aggregates in road constructions, low-cost roads, production, properties and uses of bituminous materials and mix design methods, design, construction and maintenance of flexible and rigid road pavements, equipment, highway drainage.

## Part B:

Safety and Transportation Management: Transportation system management, Intelligent transport system, introduction of transportation modeling, accident definition and classification, causes problems (global and national perspectives) and cost of accident, collection and analysis of accident data, hazardous road location identification, road safety strategies, road safety audit, high tech solution for road safety, Introduction to Flyover.

- 1. Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand & Bros
- 2. Principles of Railway Engineering by RangwalaCharotar Publishing House, India
- 3. Highway Engineering by Paul H. Wright, Karen Dixon John Wiley & Sons, Inc. Transportation Engineering & Planning by C.S. Papacostas, P.D. Prevedouros
- 4. Transportation Engineering An Introduction. 3<sup>rd</sup> ed., By C. Khisty and B. Lall, Prentice-Hall Inc.
- 5. Transportation Engineering, 7<sup>th</sup> edition. By: J. Banks, McGraw-Hill, New York, 2001.
- 6. AASHTO Guide for Design of Pavement Structures, AASHTO, 1997

Department	Course No	Cou	rse Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4115	Structural Analy	ysis III	Theory	3.00	3.00	
Course Rationale							
The course explains the analytical fundamentals of indeterminate structures such as Beams, Frames and trusses adopting Stiffness Matrix methods and Slope Deflection Methods.							
Course Objective			Course Outcomes				
<ul> <li>To know the method for structures</li> <li>To know the method for structures</li> </ul>	principles of analysis of principles of analysis of	slope deflection indeterminate stiffness matrix indeterminate	<ul> <li>The students of analysis of deflection method</li> <li>The students of analysis of i matrix method</li> </ul>	will have acc indeterminat nod will have acc ndeterminate	quired know e structures quired know structures	ledge on the by slope ledge on the by stiffness	
Course Content							
Part A Analysis of statically indeterminate structures such as beams, frames and trusses by Slope deflection method Part B Analysis of statically indeterminate structures such as beams, frames and trusses by Stiffness matrix							
Text Books and/o	r Reference N	<b>I</b> aterials					
<ol> <li>Structural An</li> <li>Matrix Analy</li> <li>Elementary S</li> <li>Indeterminate</li> <li>Statically Indetection</li> </ol>	<ol> <li>Text Books and/or Reference Materials</li> <li>Structural Analysis, Russell C. Hibbeler, Pearson Prentice Hall, 8th or 10th edition</li> <li>Matrix Analysis of Framed Structures by William Weaver, James Gere CBS Publishers &amp; Distributors</li> <li>Elementary Structural Analysis by Charles Norris, J. Wilbur &amp; SenolUtkuMcGraw-Hill Int'l Edition</li> <li>Indeterminate Structural Analysis by J.S. Kinney Oxford &amp; IBH Publishing Company Ltd.</li> <li>Statically Indeterminate Structures by C.K. Wang McGraw-Hill Book Company</li> </ol>						

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 4118	Structural Analy Sessional II	vsis and Design	Sessional	1.50	3.00	
Course Rationale	Course Rationale						
The aim of the course is to develop knowledge and understanding the principles and design of different RCC bridges							
Course Objective			Course Outcomes				
<ul> <li>To know the principle and design of different types of RCC bridges</li> <li>To know the basic code provisions for bridge design</li> </ul>			<ul> <li>The students will have acquired knowledge on the design of a cantilever bridge</li> <li>The students will have acquired knowledge on the design of a Girder bridge</li> </ul>				
Course Content							
Design and detailing of a slab bridge; design and detailing of a balanced cantilever bridge; design and detailing of a PC Girder Bridge.							
Text Books and/	or Reference	e Materials					
1. Tali, N.(1997). Design of Modern Highway Bridges.							
2. Nilson, A. H.,	, Darwin, D.	and Dolan C. W.	(2010). Design of C	Concrete Stru	ctures.		

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 4102	Capstone projec	t		3.0	6.00
Course Rationale						
The students will learn on project works and writing reports on specific jobs.						
Course Objective			Course Outcomes			
• To investigate the student's project works and project reports.			<ul> <li>The students will have knowledge on the methodology of projects.</li> <li>Student will also learn how to write project reports and project proposal.</li> </ul>			
Course Content						
Planning, analys structural engine engineering spec methodologies, a project includin engineering and project including	sis and designering/ environment cialization. Solution and skills to and skills to be design and cross- discong Bill of Qua	gn of an integra conmental engin students shall w assess the techn nd cost estima iplinary knowle .ntity (BoQ) and	ated civil engineer neering/ transportat ork in teams to ap nical, environment tion. Student sha edge to prepare pl tender documents.	ing project we tion engineer oply civil eng al, and social all engage the lans and spe	with empl ing/ geot ineering feasibilit ineir diver cification	hasis on echnical theories, ty of the cse civil s of the

# Fourth Year: Semester II

Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours		
СЕ	CE 4217	Introduction of I Method	Finite Element	Theory	2.00	2.00		
<b>Course Ratio</b>	nale							
The material presented in this course will provide the foundation for finite element method, application of the basic properties, behavior and usage of different types of finite elements and evaluation of the quality of the results of FE simulations using Software.								
Course Object	ctive		<b>Course Outcome</b>	es				
<ul> <li>To apprise the students about the basics of Finite Element theory, computer implementation of this theory and its practical applications.</li> <li>Understand the fundamental concepts of the Finite Element Method (FEM).</li> <li>Apply the basic properties, behavior and usage of different types of finite elements</li> <li>Create Finite Element models and solve typical Civil Engg. Problems using FEM.</li> <li>Interpret and evaluate the quality of the results of FE simulations using Software.</li> </ul>								
<b>Course Conte</b>	ent							
Part A:Introduction to finite element method as applied to stress analysis problems; basic equations in elasticity, matrix displacement formulation, element shapes, nodes, nodal unknowns and coordinate system, shape functions, strain displacement matrix, methods for assembling stiffness equations e.g. direct approach. Part B:Galerkin's method, virtual work method, principle of minimum potential energy; introduction to isoperimetric formulation; discretization of a structure and mesh refinement, one dimensional stress-deformation and two dimensional plane stress and plane strain analysis of strangedeformation problems; part integration and computer analysis.								
Text Books an	nd/or Refer	ence Materials						
<ol> <li>Chandrupat</li> <li>Third Edition,</li> <li>Krishnamoo</li> <li>Hill Education</li> <li>David V. H</li> <li>Daryl L. Lo</li> <li>Krishnamoo</li> <li>1995.</li> </ol>	<ul> <li>Text Books and/or Reference Materials</li> <li>1. Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2003.</li> <li>2. Krishnamoorthy C. S., "Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 1994</li> <li>3. David V. Hutton, "Fundamentals of Finite Element Analysis", Tata McGraw Hill, 2004</li> <li>4. Daryl L. Logan, "A First Course in Finite Element Method", Cengage Learning, 2012.</li> <li>5. Krishnamoorthy, C.S, Finite Element Analysis Theory &amp; Programming, McGraw-Hill, 1005</li> </ul>							

Department	Course No	Course Title			Course Type	Credit Hours	Total Contact Hours	
CE	CE 4201	Professional Practice	es and	l Ethics	Theory	2.00	2.00	
Course Rationa	le							
This course is designed to provide fundamental concepts and principles of professional communication skills applied by the civil engineers to deal with different types of people around the world.								
Course Objecti	ve		Cou	Course Outcomes				
<ul> <li>To know the ethics of Civil engineering</li> <li>To provide exposure to a variety of critical skills necessary to succeed in the civil engineering field.</li> <li>Upon completion of the course, the student will:</li> <li>Develop an understanding of professional and ethic responsibility and evaluate their impact on career decisions</li> <li>Improve effective communication both written and spoken</li> <li>Develop a knowledge of professional and manage aspects of civil engineering projects.</li> </ul>						ill: and ethical n career ritten and managerial		

Project life cycle; type of contracts; procurement regulations and law; documents for procurement of works; techniques of specification writing; project proposal; contractual provisions; contract strategy; tender procedure; claims, disputes and arbitration procedure; measures for reducing fiduciary risks; evaluation of bids; insurances; Ethics: engineer's ethical code, the ASCE code of ethics;

# Part B:

Introduction to communication concepts, modes of communication, methods of effective communication; writing reports; oral presentation of reports; writing proposals; writing CV and cover letter; professional and academic email communication; job application process, interviews and follow-ups; social networking and important social networking platform for professionals; academic and professional presentation, preparing small reports and proposals, class room presentations and individual reports etc.

- Civil Engineer's Handbook of Professional Practice by Karen Hansen, Kent Zenobia (ASCE)
- Frankena, W.K., Ethics, Prentice Hall of India, New Delhi, 1990.

Department	Course No	Course	e Title	Course Type	Credit Hours	Total Contact Hours
СЕ	CE 4215	Pre-stressed Co	oncrete	Theory	2.00	2.00
Course Rationa	le					
To provide an e Elements.	xposure to t	he design of Pre-	stressed Concrete	e Structures	and Struc	tural
Course Object	ive		<b>Course Outcon</b>	nes		
<ul> <li>To introduce the need for pre-stressing as well as the methods, types and advantages of pre-stressing to the students.</li> <li>Students will be introduced to the design of pre-stressed concrete structures subjected to flexure and shear.</li> </ul>			<ul> <li>Student shall have a knowledge on methods of pre-stressing and able to design various pre-stressed concrete structural elements.</li> <li>Analyze the flexural behavior of simple and composite pre-stressed concrete girders.</li> <li>Capable to calculate pre-stress losses for simple pre-stressed concrete girders.</li> <li>Able to design pre-stressed concrete</li> </ul>			
<b>Course Conter</b>	nt					
<ul> <li>Part A:Prestressed Concrete: concepts of prestressing; materials; anchorage systems; loss of prestress; analysis of sections for flexure, shear, bond and bearing; analysis of end block and composite sections; beam deflections; cable layout; partial prestress.</li> <li>Part B:Design of prestressed concrete beams for simple and continuous spans; ideas about use of AASHTO – PCI sections for standard spans; design considerations for prestressed concrete pipes, piles, poles and railway sleepers.</li> </ul>						
Text Books and/or Reference Materials						
<ol> <li>Krishna Raj</li> <li>Lin T.Y. an</li> <li>Wiley India Pvt</li> </ol>	u N., Pre-st d Ned.H.Bu . Ltd., New	ressed concrete, rns, "Design of Delhi, 2013.	Tata McGraw H prestressed Conc	Iill Compan prete Structu	y, New I ires", Thi	Delhi 1998 rd Edition,

Dept.	Course No	Course	Course Type	Credit Hours	Total Contact Hours		
СЕ	CE 4203	Research Methode	ology	Theory	2.0	2.0	
Course Ratio	nale						
This course is	s designed to	provide the basic co	onception of resea	rch, fundame	ntal steps	of research,	
research types	s, research de	esign, data analytica	al methods, refere	encing styles	and forma	ats, research	
paper and thes	sis paper writi	ing processes and lar	iguage improveme	ent techniques			
Course Obje	ctives		Course Outcomes				
• To d	evelop know	ledge on research	• The stue	dents will be	able to	do research	
conce	ption and	basic steps for	works or	n their expected	ed fields.		
resear	ch works.		• This cou	urse will help	the stude	ents to gain	
• To ma	ake the studer	ntsfamiliar with the	knowled	ge on the	research	n methods,	
research activities.			research paper and thesis paper writing				
			systems.				
Course Conto	ents						

Definition of research, Characteristics of research, steps and types of research, research problem, research instruments and questionnaire, methods of data collection, qualitative and quantitative data analysis.

# Part B:

Introduction to technical report writing, writing research proposal, writing thesis proposal, technical presentation of academic thesis, conference paper and project etc., Introduction to referencing system, Guideline of APA, Harvard and Vancouver referencing system and guideline of academic thesis writing.

- 1. Essentials of research design and methodology by Geoffrey R. Marczyk
- 2. Research Methodology: A Step-by-Step Guide for BeginnersbyRanjit Kumar
- 3. Research Methodology Methods and Techniques: Second Revision Editionby C.R Kothari

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
СЕ	CE 4204	Remote Sensing a Sessional	nd GIS	Sessional	1.5	3.0
Course Rationa	le					
The course will	demonstrate	the basic knowledge	e of remote sensing	g and GIS in t	he field of	civil
engineering. Th	ne course also	deals the data acqui	sition of satellite in	mages and the	eir charact	eristics.
Course Objecti	ve		Course Outcomes	8		
<ul> <li>To know about the principles of remote sensing and spectral signatures</li> <li>To study about the history and components of GIS</li> </ul>			<ul> <li>e Students should be able to learn the basic principles of remote sensing.</li> <li>Explain the concepts and fundamentals of GIS.</li> <li>Have hands on training on different GIS and RS</li> </ul>			
• The applic	ations of re	emote sensing and	techniques			
GIS						
Course Content	1 1	. 1		71	<b>1</b>	Ĉ
Course Content GIS definition, development, application areas, Map-Definition, Elements of Maps, Types of maps, Advantages and disadvantages of analog/digital maps, Coordinate Systems- Geometric models of earth, Global/Local coordinate system, Projection Systems- Classification, Cylindrical projection, Conical projection, Selection of a particular projection; Modeling Real World Features- Raster data model, vector datamodel, Data Formats- Spatial and Non- Spatial data, Data collection and Input, Data conversion, Definition of remote sensing and its components; Types of Data Products – types of image interpretation – basic elements of image interpretation visual interpretation keys –Supervised and unsupervised. Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System. Hardware & software Requirements. Topology – Editing and Error Rectification, Types of topology, Topological Relationships. Spatial Analysis – Buffer Analysis-Variations in Buffering, Applications of buffering, Overlay Analysis-Feature type and overlay, Vector Overlay methods, Network Analysis- Impedance, Shortest path analysis, closest facility, Concepts of Proximity analysis, Neighborhood operations						
Text Books and	Text Books and/or Reference Materials					
C.P. Lo, Albert Hall India Pvt.	K. W. Yeun Ltd, New De	g, Concepts and Tecl lhi, 2002.	hniques of Geogra	phic Informat	ionSystem	s, Prentice

Kang-Tsung Chang, Introduction to Geographic Information Systems, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
СЕ	CE 4212	Structural Analysis Sessional III	and Design	Theor y	1.50	3.00	
Course Rationa	ıle						
Thiscoursewillhelpthe studentstoacquire completeknowledge on designing of R.C.C as well as ste structure using combination of ETABS and SAFE software. Analyze and design of different structur component like as beam, column, slab, foundation, water tank considering various types of loa including earthquake and wind can be appropriately done by using those software.						well as steel nt structural pes of load	
Course Objecti	ve		Course Outcomes				
• To introduce the students about design software, and its use in structural analysis, design andoptimization of structures under various types of loading.			<ul> <li>Students will capable of designing any types of building structures under various loading condition using Structural design software.</li> <li>Students will acquire knowledge on modeling, assigning loads on structure, preparing load combination, analysis and design of modeled structure using software.</li> </ul>				
Course Conten	t						
Use of structural analysis and design software; Modeling and analysis of beam, frame, Steel truss using ETABS,Design and analyses of various reinforced concrete structures, e.g. building, water tower etc. under gravity and lateral load, Design and Analysis of slab and foundation using SAFE.							
Text Books and/or Reference Materials							
1.Building Sup	port Structu	res: Analysis and Des	ign with SAP2000 Sc	oftware Ha	ırdcover		

by Wolfgang Schueller.

Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4219	Dynamics of Struct Earthquake Engine	tures and ering	Theory	2.00	2.00	
Course Rationa	le						
The course will structures for s concepts on the and its resistant	The course will demonstrate to analyze structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions. The course will also concentrate on the basic concepts on theory of vibrations, fundamental of structural dynamics and knowledge on earthquakes and its resistant features for various types of buildings.						
Course Objecti	ve		Course Outcomes				
<ul> <li>The main objective of the course is to introduce dynamic loading and the dynamic performance of the structures under earthquake load to the students.</li> <li>Fundamentals of the structural dynamics to be discussed. The detailed study on the performance of structures under earthquake loading is also one of the</li> <li>To acquire knowledge on fundamental</li> </ul>					vill have the subjected to tructures for ns. , causes and nitigating its amental of		
Course Content	-						
<ul> <li>PART A         Fundamental of structural dynamics; Formulation of equation of motion; free vibration response, SDOF and MDOF systems, response to harmonic and impulse loading and vibration analysis by Rayleigh's method;     </li> <li>PART B         Response spectrum analysis; Basics of earthquake: definition, causes and effects of earthquake; earthquake measuring scale and its development, liquefaction phenomenon, earthquake resistant design of buildings.     </li> </ul>							
Text Books and	Text Books and/or Reference Materials						
1. Chopra, A.K Engineering", 4 2. Agarwal. P a Hall of India P	<ol> <li>Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011.</li> <li>Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007</li> </ol>						

Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4211	Theory of Elasticity	y& Elastic	Theory	2.00	2.00	
		Instability of Struct	tures				
Course Rationa	le						
The material p	resented in th	is course will provi	de the foundation fo	r pursuing	other solid	d mechanics	
courses such a	as theory of	plates and shells,	elastic stability, co	mposite st	ructures a	and fracture	
mechanics. Th	is course wi	ll introduce basic d	efinitions of strain	and stress	tensors, d	lerive strain	
Deformation re	elationships for	or finite and small de	eformations, derive c	ompatibilit	y conditio	ns for strain	
tensors, equilit	prium equation	ons, and formulate	constitutive propert	ies of orth	otropic a	nd isotropic	
elastic material	s;						
Course Objecti	ve		Course Outcomes				
• This course	e deals with s	ome of the special	• At the end of the	nis course tl	ne student	shall be	
aspects wit	h respect to C	Civil Engineering	Able to design some of the structures used in				
structures i	n industries		industries.				
			• Apply principl	les of con	tinuum m	echanics to	
			design a struct	tural eleme	int to achi	leve desired	
			performance ur	ider realisti	c constrair	nts.	
Course Content	t						
PARTA							
Introduction t	o theory of e	elasticity, plane stre	ess and plane strain	condition	s, Two-di	mensional	
problems in re	ectangular ai	nd polar coordinate	es				
PART B							
Torsion of cire	cular and no	n-circular shafts, in	nstability of structu	res, stabili	ty functio	ons.	
Text Books and	l/or Referenc	e Materials					
Theory of Elast	ticity, S. P. T	imoshenko and J. N.	Goodier, 3rd Edition	n, McGraw	Hill Comp	any,1970.	
Elasticity in En	gineering Me	chanics, 2nd Editior	n, A. P. Boresi and K	. P. Chong,	John Wile	ey & Sons,	
2000.							
Advanced Stree	ngth and App	lied Elasticity, A. C.	Ugural and S. K. Fe	nster, 2nd I	Edition,Els	sevier	
Science Publish	ning Co., Inc.	, 1987.					

Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours	
СЕ	CE 4213	Earthquake Resist retrofitting	tant Design and	Theory	2.00	2.00	
Course Rationa	le						
To impart the k	nowledge ab	out the fundamentals	structural dynamics	and their a	pplication	to the	
design of earth	quake resistai	nt structures.					
Course Object	ives		<b>Course Outcomes</b>				
<ul> <li>To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.</li> <li>To understand the dynamics of earth and to estimate dynamic properties of soils.</li> <li>To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential</li> </ul>			<ul> <li>Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.</li> <li>Students are able to perform site specific response analysis to develop design spectra and to do detailed liquefaction analysis using SPT data</li> </ul>				
Course Conter	nts						
<ul> <li>Part A: Review of structural dynamics and earthquake engineering; Control of dynamic response: Active and passive control, base isolation, TMD, TLD, diagonal bracing.</li> <li>Part B: Seismic response and design of masonry and RC structures: Seismic detailing for RC structures, repair and retrofitting of existing masonry and RC structures.</li> </ul>							
Text Books and/or Reference Materials							
<ol> <li>Text Books and/or Reference Materials</li> <li>1. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice Hall, International Series, Pearson Education Inc and Donling Kindersley Publishing Inc. 2013</li> <li>2. Roberto Villaverde, "Fundamental Concepts of Earthquake Engineering", CRC Press Taylor &amp; Francis Group, 2009.</li> <li>3. KameswaraRao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing – New Del 2000</li> </ol>				ies, ylor & Jew Delhi,			

Department Course No		Course Type	Credit Hours	Total Contact Hours
CE CE 4221 Solid Waste Man	agement	Theory	2.00	2.00
Course Rationale				
This course will explain to the students on the di environmental policies for solid waste managem	fferent solid waste m ent.	anagement	processes,	, design and
Course Objectives	<b>Course Outcomes</b>			
<ul> <li>This course will learn the students about the collection and disposal systems of solid waste.</li> <li>Students will gather knowledge on landfill design and leachate treatment.</li> </ul>	<ul> <li>Evaluate the su economical poin general solid wa</li> <li>Explain the hie management ar solution.</li> <li>Examine the te- set up a solid wa</li> <li>Make an econ management sy</li> </ul>	bject from t ts by learnir ste manager trarchical st ad a require chnical poin tste manage omic analys stem.	the technic ng of all terr nent. ructure in ment for a ts that are ment syster sis of the	al, legal and ms related to solid waste in integrated required to m. solid waste

Sanitation: Code of practice for adequate environmental facilities in an infrastructure, housing and buildings: Space, lighting, air movement and circulation, temperature control, plumbing facilities, ventilation and air conditioning, Principles of excreta disposal, Duckweed treatment for waste; Bio-gas plant; Different sanitation options; Sanitation practices in Bangladesh.

### Part B:

Solid 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 Waste Management: Industrial solid waste collection and disposal, hazardous waste management.

- 1. Municipal Solid Waste Management Bangladesh Perspective (Hardcover) by <u>K. M.</u> <u>Nurul Huda</u>.
- 2. <u>Solid and Hazardous Waste Management</u> by <u>Abdullah Al-</u> <u>Muyeed, HabiburRahman</u>.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 4225	EIA and Developm	ent projects	Theory	2.00	2.00
Course Rationa	le					
In this course, t development pr	In this course, the student will learn on environmental impact assessment methods of different development projects.					
<b>Course Object</b>	ives		Course Outcomes	;		
<ul> <li>To impart managemen Assessment.</li> <li>To give ide tools</li> </ul>	knowledge t and Env ea related to	on Environmental vironmental Impact the EIA assessment	<ul> <li>Carry out scope projects for environmental results</li> <li>Explain different impact prediction</li> <li>Plan environmental results</li> <li>Evaluate environmental results</li> </ul>	ing and scre ironmental ar nt methodolo on and assess nental imp nanagement	ening of d nd social as ogies for e ment act asses plans act assessm	evelopmental sessments environmental sments and ent reports
<b>Course Conten</b>	nts					

Environment and Development Projects, environment and sustainable development, environmental policies and legislation, environmental implication of sectoral development, environmental quality standards, environmental issues and priorities, environmental impact assessment of development schemes - baseline studies, assessment methodologies, economics of environmental management, special topics. community development, community participation, stakeholder analysis,

## Part B:

Problem analysis, analysis of objectives, analysis of strategies, self-esteem, associative strengths, resourcefulness, action-planning and responsibility (SARAR), participatory rural appraisal (PRA), rapid rural appraisal(RRA), participatory tools for community participation, advocacy, mobilization, gender approach, participatory management and planning in development sector, institutional aspects, implementing intervention in project cycles.

# Text Books and/or Reference Materials

1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996.

2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

3. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

4. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007.
| Department   | Course<br>No  | Course Title      |  | Course<br>Type  | Credit<br>Hours | Total<br>Contact<br>Hours |
|--|---------------|-------------------|--|-----------------|-----------------|---------------------------|
| CE   | CE 4222       | Environmental     | Engineering                                    | Sessional;      | 1.50            | 3.00                      |
|  |               | Sessional II      |  |                 |                 |                           |
| Course Rationale   |               |                   |  |                 |                 |                           |
| The students would be able to know and analyze the environmental engineering related issues. |               |                   |  |                 |                 |                           |
| Course Objective Course Outcomes   |               |                   |  |                 |                 |                           |
| • To know the design of water supply and   |               |                   | • The students w                               | vill have acqui | red knowled     | ge on                     |
| sewage systems   |               |                   | design of wastewater purification systems      |                 |                 |                           |
| • To know the  | design of wat | er and            | • The students will have acquired knowledge on |                 |                 |                           |
| wastewater ti  | reatment plan | t                 | design of water and wastewater supply systems. |                 |                 |                           |
| Course Content   |               |                   |  |                 |                 |                           |
| Quantity estimation  | on of storm   | water; hydraulic  | design of swears ar                            | nd storm wate   | r drains; de    | sign of unit              |
| processes of wate  | er and wastev | vater treatment p | lant: bar screen cha                           | mber design,    | design of gi    | rit chamber,              |
| Primary sediment   | tation tank d | lesign, design of | f trickling filter, co                         | mputer applic   | ation in en     | vironmental               |
| engineering (EPANET 2.0), field visits and reporting.  |               |                   |  |                 |                 |                           |
| Text Books and/or Reference Materials  |               |                   |  |                 |                 |                           |
| • Departmenta  | l Lab manual  | of Environmental  | l Engineering Session                          | nal II          |                 |                           |
| • Water & Was  | ste Water Tre | atment by Mark J  | . Hammer Prentice-H                            | Hall of India   |                 |                           |

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 4223	Environmental Polle Control	ution and its	Theory	2.00	2.00
Course Rationa	lle					
The students w	ould be able	to know and analyze	Environmental Pollu	ution and it	s Control.	
Course Objecti	ve		Course Outcomes			
<ul> <li>To finding technologic solutions to To study th living organ</li> <li>To study th biodiversity control and</li> </ul>	and implement cal, economic o environment in interrelation nism and environment in integrated y, natural resolves waste manage	enting scientific, c and political ntal problems. onship between vironment. themes and sources, pollution gement.	<ul> <li>Public awarene stage. Ignoranc led to misconce</li> <li>Development a has led to serio</li> </ul>	ess of enviro e and incor eptions and improve us environi	onmental is nplete kno ement in st nental disa	s at infant wledge has d. of living isters
Course Content	t					

### Part A:

Environmental Pollution and Its Control: Water Pollution-Sources and Types of Pollutants; Waste Assimilation Capacity of Streams; Dissolved Oxygen Modeling; Ecological Balance of Streams; Industrial Pollution; Heavy Metal Contamination; Detergent Pollution and Eutrophication;

### Part B:

Groundwater Pollution; Marine Pollution; Pollution Control Measures, Water Quality Monitoring and Management. Air Pollution - Sources and Types of Pollutants; Effects of Various Pollutants on Human Health, Materials and Plants; Air Pollution Meteorology; Global Warming and Green House Effects; Air Pollution Monitoring and Control Measures

Text Books and/or Reference Materials

1. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004

2. Benny Joseph, 'Environmental Science & Engineering', Tata McGraw Hill, New Delhi, 2006.

3. Rao M.N. and Rao H.V.N - Air Pollution, Tata – McGraw Hill Publishing Ltd., 1993.

4. De A.K - Environmental Chemistry, Tata - McGraw Hill Publishing Ltd., 1999.

Department	Course No	Course T	itle	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4227	Introducti	on to	Theory	2.00	2.00	
Carrie Dations	1.	Environm	ental Modeling				
Course Rationa	le anabla tha students to	loom the e	nvinonmontol modelin				
Course Objectiv		learn the e	Course Outcomes	ig.			
<ul> <li>Unders basic to</li> <li>Unders approad</li> <li>Unders polluta</li> <li>Becom applica enviror making</li> </ul>	tand the idea, methodo ools of environmental r stand the different ches, their scope and li stand the fate and tra nts e aware of a wide tions of modell mental management &	ology and modeling modeling mitations insport of range of ling in the decision	<ul> <li>Understand and balance in systems</li> <li>Assess pollutant equations</li> <li>Calculate the s scale in sheared</li> <li>Estimate the f coagulation processor</li> </ul>	l apply the van t transport ize of the reactors fractal din cess.	he concep rious t using ma e Kolmog mension o	ts of mass engineered ss transport orov micro of flocs in	
Course Content	t						
<ul> <li>Part A:</li> <li>Models: Population, Physical, Mathematical and Management model, mechanism of pollutant fate in the environment; Mathematical Modeling: Introduction; Data management system &amp; mathematical models in real life, mathematics of mass transport; Air Quality Modeling: Mathematical models for air quality control and their application;</li> </ul>							
<b>Part B:</b> Ground Water Hydrodynamic Watershed mod Introduction to	<b>Part B:</b> Ground Water Modeling: Introduction to existing ground water models; Surface Water Modeling: Hydrodynamic modeling of rivers, modeling of water quality in estuaries, lakes and reservoirs; Watershed modeling: Introduction to existing watershed models; Modeling of Wastewater Treatment: Introduction to existing models of wastewater treatment.						

- 1. Environmental Transport Processes by Bruce E. Logan, 2nd Ed., Wiley, 2012.
- 2. Diffusion: Mass transfer in fluid systems by E.L. Cussler, 3rd Ed., Cambridge Uni. Press, 2007.
- 3. Introduction to chemical transport in the environment by John S. Gulliver, Cambridge UniversityPress,2007.
- 4. Environmental Engineering: A Design Approach by Sincero and Gregoria, PHI Learning, 2009.

Department	Course No	Course T	Title	Course Type	Credit Hours	Total Contact Hours	
СЕ	CE	Transportation Eng	gineering	Sessional	1.50	3.00	
	4252	Sessional II					
Course Ration	ale						
The course w	ill demonstr	ate road traffic studie	es based on coll	leting field d	lata and in	this process	
students will 1	earn to orga	anize and conduct a tr	affic survey wor	rk and also l	earn to desig	gn rigid and	
flexible highw	ay and airfie	eld pavements.					
Course Object	ive		Course Outcom	nes			
• To learn a	bout design	of rigid and flexible	• The students will have acquired knowledge on				
highway a	nd airfield p	avements.	the design	various types	of pavement	ts.	
• To get k	nowledge of	on design of traffic	• The studen	nts will have	acquired kn	owledge on	
capacity an	nd studies.		the design of	of traffic capa	acity and stu	dies.	
Course Conter	ıt						
Design of ri	gid and fl	exible highway and	airfield pavem	nents; geome	etric design	: Roadway	
intersections, o	capacity calc	culations; traffic studie	s and design.				
Text Books an	d/or Referen	nce Materials					
1. Kadiya	ali. L. R. "T	raffic Engineering and	Transport Plann	ing", Khanna	Publishers,	Delhi,	
2013.							
2. Indian	Roads Co	ongress (IRC) Specif	fications: Guide	lines and S	pecial Publ	ications on	
Traffic Planning and Management.							
3. Salter. R.I&HounsellN.B,"Highway Traffic Analysis&design", Macmillan PressLtd.1996.					d.1996.		
4. Lab M	lanual of Tra	ansportation Engineeri	ng Sessional II E	By Dept. of C	E, LU.		

Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours
СЕ	CE 4253	Highway Drainag	e and Airports	Theory	2.00	2.00
Course Rationa	le					
In this course,	students wil	l learn drainage sys	tems of highways a	nd airports	as well a	s design of
airport and its r	elated issues	in the airport area.				
Course Objecti	ve		Course Outcomes			
• To expose	the students t	o planning, design,	• After completi	ng the cou	rse, the st	tudents will
constructio	n and maint	enance of Airports	have the ability	y to plan ar	nd design v	various civil
and Highway Drainage. Engineering aspects of Ai			Airports ar	nd Highway		
		Drainage.				
Course Content						
Part A:						
Highway drain	age and drain	nage structures, Eva	luation and strength	ening of pa	avements;	importance,
advantages and	l trends in ai	r transportation; pla	nning and design of	f airports;	aircraft ch	aracteristics
related to airpor	rt design;					
Part B:						
Types and elem	nents of airpo	rt planning studies;	airport configuration	; geometric	e design of	the landing
area; Terminal	area: heliport	s; design of airport	pavements; lighting,	marketing	and signin	g of airport;
Airport drainag	je.					
Text Books and	l/or Referenc	e Materials				
1. Khanna	ı S K, Arora N	I G&Jain S.S, "Airpo	rt Planning & Design	", Nemchan	d&Brother	s, Roorkee,
2012.						
2. Bindra	S P, "A Cour	se in Docks and Har	bour Engineering", I	DhanpatRai	and Sons,	New
Delhi, 2	Delhi, 2013					
3. Rangw	ala, "Harbor	Engineering", Charo	tar Publishing House	e, 2013.		
L						

CE         CE 4251         Traffic Planning and Management         Theory         2.00         2.00           Course Rationale         The course introduces the students to the use of simple methods in averting traffic congestion in urban areas and provides students with opportunities to develop basic skills with respect to traffic control and management for planning urban transport.           Course Objective         Course Outcomes           •         The students will know how to analyze traffic problems and plan for traffic systems.           •         The students will understand the control and uses of intersections, signals and parking arrangements.           •         The students will develop innovative traffic management Systems.           •         The students will develop innovative traffic managements; city road and street networks; grade separation and interchanges, pedestrian and bicycle facilities.           Part A:         Thet musportation planning process; traffic management concepts; traffic actident investigations; city road and street networks; grade separation and interchanges, pedestrian and bicycle facilities.           Part B:         The transportation projects; elements of traffic flow.           Text Books and/or Reference Materials         I. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013           2.         Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.           3.         Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand & Bros	Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours		
Course Rationale         The course introduces the students to the use of simple methods in averting traffic congestion in urban areas and provides students with opportunities to develop basic skills with respect to traffic control and management for planning urban transport.         Course Objective       Course Outcomes         • To know traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning.       • The students will know how to analyze traffic problems and plan for traffic systems.         • The students will understand the control and uses of intersections, signals and parking arrangements.       • The students will develop innovative traffic management Systems.         Course Content       Part A:         The transportation planning process; traffic management concepts; traffic accident investigations; city road and street networks; grade separation and interchanges, pedestrian and bicycle facilities.         Part B:       The urban bypass; environmental aspects of highway, traffic and transportation projects; elements of traffic flow.         Text Books and/or Reference Materials       1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013         2. Salter. R.I and Hounsell N.B. "Highway Traffic Analysis and design", Macmillan Press Ltd. 1996.       3. Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand & Bros         4. Principles of Railway Engineering by RangwalaCharotar Publishing House, India       5. Highway Engineering by Raul. H. Wright, Karen Dixon John Wiley & Sons, Inc. Transportation Engineering & Planning by C.S. Papa	СЕ	CE 4251	Traffic Planning a	nd Management	Theory	2.00	2.00		
The course introduces the students to the use of simple methods in averting traffic congestion in urban areas and provides students with opportunities to develop basic skills with respect to traffic control and management for planning urban transport.         Course Objective         • To know traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic safety with integrated approach in traffic integrated approach in traffic so intersections, signals and parking arrangements.       • The students will understand the control and uses of intersections, signals and parking arrangements.         • The students will develop innovative traffic management concepts; traffic accident investigations; city road and street networks; grade separation and interchanges, pedestrian and bicycle facilities.         Part A:         The urban bypass; environmental aspects of highway, traffic and transportation projects; elements of traffic flow.         Text Books and/or Reference Materials         1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013         2. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd. 1996.         3. Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand & Bros         4. Principles of Railway Engineering we Planning by C.S. Papacostas, P.D. Prevedouros         6. Transportation Engineering A Planning by C.S. Papacostas, P.D. Prevedouros         7. Transportation Engineering - An Introduction. 3rd ed., By C. Khisty and B. Lall, Prentice-Hall Inc.         7. Transportation Engineer	Course Rationa	le							
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<ol> <li>Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand &amp; Bros</li> <li>Principles of Railway Engineering by RangwalaCharotar Publishing House, India</li> <li>Highway Engineering by Paul H. Wright, Karen Dixon John Wiley &amp; Sons, Inc.Transportation Engineering &amp; Planning by C.S. Papacostas, P.D. Prevedouros</li> <li>Transportation Engineering – An Introduction. 3<sup>rd</sup> ed., By C. Khisty and B. Lall, Prentice- Hall Inc.</li> <li>Transportation Engineering, 7<sup>th</sup> edition. By: J. Banks, McGraw-Hill, New York, 2001.</li> <li>AASHTO Guide for Design of Payement Structures AASHTO 1997</li> </ol>	2. Sa Lto	lter. R.I and 1 1.1996.	Hounsell N.B, "High	way Traffic Analysis	s and desig	n", Macmi	llan Press		
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<ol> <li>Transportation Engineering – An Introduction. 3<sup>rd</sup> ed., By C. Khisty and B. Lall, Prentice-Hall Inc.</li> <li>Transportation Engineering, 7<sup>th</sup> edition. By: J. Banks, McGraw-Hill, New York, 2001.</li> <li>AASHTO Guide for Design of Payement Structures AASHTO 1997</li> </ol>	5. Hig	ghway Engino Transportati	on Engineering & Pl	right, Karen Dixon Jo anning by C S Par	ohn Wiley	& Sons, D Prevedo	ouros		
<ol> <li>Transportation Engineering, 7<sup>th</sup> edition. By: J. Banks, McGraw-Hill, New York, 2001.</li> <li>AASHTO Guide for Design of Pavement Structures AASHTO 1997</li> </ol>	6. Tra Ha	ansportation I 11 Inc.	Engineering – An Int	roduction. 3 <sup>rd</sup> ed., By	y C. Khisty	and B. La	ll, Prentice-		
	7. Tra 8. AA	ansportation H ASHTO Guide	Engineering, 7 <sup>th</sup> editi e for Design of Pave	on. By: J. Banks, Mc ment Structures, AA	Graw-Hill, SHTO, 199	New Yor 97	k, 2001.		

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 4241	Earth Retainin	g Structures	Theory	2.00	2.00	
Course Rationale	Course Rationale						
retaining structures.							
Course Objective			Course Outcomes Students will be able to				
<ul> <li>To impart knowledge about the various earth pressure concepts</li> <li>To analyses the stability of various earth retaining structures under loads</li> <li>To learn the geotechnical design of retaining structure for the stability and internal stability and internal</li></ul>					ressures asso y appropria olication onsidering b	ociated with te type of oth external	
Course Content							

### Part A:

Lateral Earth Pressure: at rest, Rankine's and coulomb's active and passive earth states, Cullman's graphical solution and the Earthquake effect on active and passive states. the different types of Retaining Walls Proportioning the retaining walls and determining the Lateral earth pressure on Retaining walls. Perform the Stability checks: overturning, sliding, bearing capacity, and settlement. Design the Cantilever retaining walls. Provision of joints in retaining wall construction, the drainage of walls from backfills.

# Part B:

The different Types of Sheet Piles and the construction methods. Design the Cantilever sheet piles in sandy and clayey soil. Design the Anchored sheet piles: Free Earth Support in sandy and clayey soil as well as Fixed Earth Support in sandy and clayey soil Understand the different types of Anchors: tie back and concrete plates, their Placement and their Ultimate resistance. the types of braced cuts, precise the Lateral earth pressure in sand, soft and hard clay as well as layered soil. Design the struts and whales.

- 1. Earth pressure and earth retaining structures by Clayton, Milititski and Woods, Taylor & Francis Group, London.
- 2. Principles of Geotechnical Engineering by Braja M. Das, Thomson
- 3. Soil Mechanics and Foundation Engineering by Dr. K. R. Arora, Standard Publisher Dist.
- 4. J. E. Bowels, "Foundation Analysis and Design", McGraw Hill. Companies, Inc. 6 th Ed. 2001.

Department	Course No	Cours	e Title	Course Type	Credit Hours	Total Contact Hours		
CE	CE 4245	Soil- water	interaction	Theory	2.00	2.00		
Course Rationa	le							
The proposed introduces mu discussed to ex urbanization.	course is a tidisciplinary emplify the i	blend of geotechn problem domains mportance of this su	nical engineering an to the undergradua bject in the current	nd environ ate student age of rapio	mental co s. Case h d industria	istories and listories are lization and		
Course Objecti	ve		Course Outcomes					
<ul> <li>To introduce basic concept of geo- environmental engineering</li> <li>To introduce soil-water and soil-structure phenomena in geo-environmental point of view.</li> <li>To introduce different contaminants transport methods and their modeling techniques.</li> <li>To introduce various contaminated land management techniques.</li> <li>An understanding of soil mineralogy and s behavior.</li> <li>An understanding of the core ideas and concept of geo-environmental engineering would developed.</li> <li>Contaminant migration models for different geo-environmental profiles would be possible develop.</li> <li>Different management techniques.</li> </ul>					gy and soil nd concepts would be or different possible to would be recovery of			
Course Content	-							
Part A: Soil mineralog interaction and unsaturated soi Part B: Importance of retention curve and its implicat	y characteri concepts of l; unsaturated s s; water flov ions; Factors	zation and its sign double layer; force soil in geo-environn w in saturated and u effecting retention a	nificance in determ as of interaction bet mental problems; me nsaturated zone; So and transport of conta	asurement il-water-con uminants.	behavior; particles. ( of soil suc ntaminant	; soil-water Concepts of ction; water interactions		
Text Books and	Text Books and/or Reference Materials							
<ul> <li>Rowe R.K. Publication</li> <li>Reddi L.N. Marcel Del</li> </ul>	, "Geotechnic s, London, 20 and Inyang, 1 ker Inc. New	al and Geoenvironm 000. H. I., "Geoenvironm York, 2000.	ental Engineering Ha	andbook" k rinciples an	Kluwer Aca d Applicat	ademic ions"		

Department	Course No	Course	Course Title		Credit Hours	Total Contact Hours	
CE	CE 4242	Geotechnical Engine II	ering Sessional	Sessional	1.50	3.00	
Course Rationale							
This course has stability of slop	This course has designed to understand geotechnical design concept of foundation, retaining wall, stability of slope and uses of geotechnical software to solve related problem.						
Course Objecti	ve		Course Outcome	s			
<ul> <li>At the end of the course student attains adequate knowledge in geotechnical design of various foundation types and uses of geotechnical software to solve related problems.</li> <li>Students will know the techniques of us geotechnical engineering software as well hands on calculation to solve foundation related problems.</li> </ul>					es of using as well as ation related slope.		
Course Conten	t						
Hands on calcu slope, techniqu	llationon ge les of soil in	otechnical analysis and approvement, and uses	d design of founda of analysis softwar	tions, retainir e in geotechr	ng walls, st nical engine	tability of eering.	
Text Books and	d/or Referen	nce Materials					
1.Foundation I 2. Foundation I 3. Principles of	Design & Co Engineering Geotechnio	onstruction by W.C. To by Ralph B. Peck Han cal Engineering by B.M	engMcGraw-Hill E nson, Thornburn W ⁄I. Das, Thomson I	Book Compan /iley Eastern Brooks/Cole	Limited, D	Dhaka.	

Department	Course No	Cou	rse Title	Course Type	Credit Hours	Total Contact Hours	
СЕ	CE 4243	Elementary Soil	Dynamics	Theory	2.00	2.00	
Course Rationale	L			1			
The course explain	ns dynamic be	ehavior of soil and	d its pertaining struc	tures.			
Course Objective			Course Outcomes Students will be ab	le to			
<ul> <li>To impart knowledge about various types of vibrations and vibration measuring instruments.</li> <li>To introduce the analysis and concepts of vibration response analysis.</li> <li>To enable the students to evaluate dynamic soil parameters, dynamic earth pressure, dynamic bearing capacity of soils, dynamic stiffness of pile and liquefaction characteristics of soil.</li> <li>To interpret the liquefaction characteristics of soil.</li> <li>To interpret the liquefaction characteristics of soil.</li> <li>To interpret the liquefaction characteristics of soil.</li> </ul>							
Course Content							
Part A: Fundamentals of v frequency and dam excitation to harmon and Multi degree of Part B: Stross strain behave	ibrations: Resp ping, Response nic and comple freedom system	ponse of SDOF s e of system to exci ex histories, Transn ms, Propagation of	ystems, Free vibration ting forces and groun- nissibility, Vibration m seismic waves in soil of trangth of cyclically	n, Experimenta d motions rang neasuring instru deposits - Atter	d determination ging from simulation of stree	ion of natural aple pulse like onse of 2 DOF ess waves,	
Stress-strain behavior of cyclically loaded soils, Strength of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Selection of design values. Dynamic earth pressure, Earthquake load on footing, effect of horizontal load and moment, provision of relevant standards, dynamic analysis for vertical and horizontal loads, Dynamic stiffness of single pile and pile group. Liquefaction studies in triaxial shear and oscillatory simple shear, evaluation of liquefaction potential, liquefaction analysis from standard penetration test data, Studies on shake table and field test.							
Text Books and/or Reference Materials							
<ol> <li>Vibrations of Soils and Foundations – Richart Hall and Woods</li> <li>Vibration Analysis and Foundation Dynamics, NSV KameswaraRao, Wheeler Publishing, New Delhi.</li> <li>Soil Dynamics by ShamsherPrakash, McGraw Hill Higher Education.</li> <li>Geotechnical Engineering by C. Venkatramaiah, New Age International Publishers.</li> <li>Analysis and design of Foundations for Vibrations- P J Moore 5. Fundamentals of Soil Dynamics- B M Das</li> </ol>							

Department	Course No	Course	e Title	Course Type	Credit Hours	Total Contact Hours	
CE	CE 4231	Groundwater E	ngineering	Theory	2.00	2.00	
Course Rationa	le						
The course is contaminant tra cycle, fundamen associated prob modeling of adv	designed to insport. Stud ntals of grou blems etc. T vanced grour	o introduce the ents can learn o und water flow, to his course also adwater flow and	concept of gro rigin, contribution echniques of rest builds the nece contaminant trans	ound water f on of ground ources estima ssary theoret nsport.	low hydr lwater in ation and ical back	ology and hydrologic extraction, ground for	
Course Objectiv	ve		Course Outcon	nes			
<ul> <li>To introduce the student to the attitudes of Groundwater hydrology</li> <li>To understand the techniques of development and management of groundwater</li> <li>Students will be able to understand an hydrology</li> <li>Students will be able to understand an extraction techniques</li> <li>The students will be able to understand an apply basic concepts of contamina transport</li> </ul>					rstand and roundwater understand ation and erstand and ontaminant		
Course Content							
Part A         Groundwater in hydrologic cycle and its occurrence. Groundwater movement. Groundwater and well hydraulics.         Part B         Groundwater resource evaluation. Groundwater levels and environmental influences.         Groundwater quality. Groundwater pollution and contaminant transport and modelling.         Recharge of groundwater. Saline water intrusion in coastal aquifers. Groundwater management. Groundwater resource and abstraction in Bangladesh. Different Shallow and deep wells and pumps. Ground water supply, problems and their remediation in Bangladesh. Surface water and groundwater interactions.							
Text Books and/or Reference Materials							
1. Raghunath H 2. Todd D.K., "	.M., "Groun Ground Wat	d Water Hydrolo er Hydrology", J	gy", New Age I ohn Wiley and S	ntl. (P) Ltd., 2 Sons, New Yo	New Delh ork, 2000.	ii, 2010.	

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
СЕ	CE 4237	Coastal Engineeri	ng	Theory	2.00	2.00	
Course Rationa	le						
The students will learn the basic knowledge regarding the sea water behavior in the coastal area for proper designing harbor structures.							
Course Objecti	ve		Course Outcomes				
<ul> <li>To know the Coast and coastal features</li> <li>To know the forces of waves and tides</li> <li>To know the coastal sedimentation processes.</li> <li>To know the coastal sedimentation processes.</li> </ul>						on coastal	
Course Content							
Part A: Ocean waves a	long the coas	st, wave refraction, a	and wave diffraction	, wave shoa	aling, wind	1 and wave	

generation, tides and tidal currents, sand migration, coastal erosion and erosion control, erosion around structures due to waves and currents; coastal morphology, sediment transport relationships; **Part B:** 

Behavior of submerged and floating bodies, and ship waves. tsunamis and harbor response; coastal structures; sediment properties, initiation of sediment movement, bedload and suspended load transport rates, formation of bed forms and flow resistance, erosion; general principles of wave mechanics, kinematics and dynamics; marine environment.

- Horikawa, K., Coastal Engineering, University of Tokyo press.
- Wood, M., Coastal Hydraulics: Mcmillan, Civil Engineering Hydraulics, London.

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours	
CE	CE 4235	Hydraulic Structu	ires	Theory	2.00	2.00	
Course Rationale							
This course is designed to provide fundamentals of design of hydraulic structures in civil engineering and to demonstrate the student to use various technique used in the design engineering structures.							
Course Object	ive		Course Outcomes	5			
<ul> <li>The student is exposed to different phases in Water Resources development.</li> <li>Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including management practices.</li> <li>The students will have knowledge and skills on Planning, design, operation and management of reservoir system.</li> <li>Analyze and design hydraulic structures using relevant code of practice.</li> <li>Apply the basic design principles to engineering design practice.</li> </ul>							
Course Content							
<ul> <li>Part A Theories and Principles of design of hydraulic structures, types of hydraulic structures. Theories of Seepage. Sediment Transport. Embankment, Dam, and Design of Dam. Part B Sluice gate. Spillways. Flood Control Reservoir. Energy dissipater. Diversion head work. Irrigation Structure. Cross drainage works. Regulator Design, Out falls, Gates and Cut off. Dimensional Analysis and Hydraulic Analysis.</li></ul>							
Text Books and/or Reference Materials							
<ol> <li>Punmia B.C., Irrigation &amp; water power Engineering, Laxmi Publications, 16<sup>th</sup> Edition, New Delhi, 2009</li> <li>Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009.</li> </ol>							

Department	Course No	Cours	Course Type	Credit Hours	Total Contact Hours		
CE	CE 4233	River Engineering management	Theory	2.00	2.00		
Course Ration	nale						
This course w river. The cou legislation.	ill demonstr rse also give	ate the basics of rives knowledge regar	ver morphology, ag ding river training	gradation work and	and degra water law	adation of and	
Course Object	tive		Course Outcomes	5			
<ul> <li>To underst consider a various per control, conservati</li> <li>To underst on natural engineering</li> </ul>	stand the ba river enviro oints of vie natural on, and stand water science, so og & technol	sic knowledge to nments from the w such as flood environment utilization based ocial sciences and ogy.	<ul> <li>Understand thand pattern.</li> <li>Understand degradation a work</li> <li>Understand w conflict.</li> </ul>	he behavion the river nd scourin ater diplor	or of allu aggrad ng and riv macy, wa	ivial rivers ation and ver training ter law and	
Course Conte	Course Content						
<ul> <li>Part A: Behavior of alluvial rivers. River channel pattern and fluvial processes. Aggradation and degradation, local scours, river training and bank protection works. Navigation and dredging Sediment movement in river channels, bed forms and flow regimes;</li> <li>Part B: River basin concepts Major issues in river basin management; environmental and ecological aspects; trans boundary issues, water diplomacy, water treaties, water right, water law, conflict resolution and management.</li> </ul>							
Text Books and/or Reference Materials							
<ol> <li>River Behaviour Management and Training (Vol. I &amp; II), CBI&amp;P, New Delhi.</li> <li>Irrigation &amp; Water Power Engineering- B. C. Punmia and Pande B. B. Lal.</li> </ol>							

Department	Course No	Course Title			Course Type	Credit Hours	Total Contact Hours		
CE	CE 4232	Irrigation and Flood	l Cor	ntrol	Sessional	1.50	3.00		
		Sessional							
Course Rationa	ale								
The course der	nonstrates th	e soil water relationsl	hip a	nd losses in irri	igation syste	m, require	ments of		
irrigation water	r and schedu	ling. Analysis of hydr	rolog	tic data for irrig	gation and flo	ood contro	l. Design of		
irrigation and o	lrainage cana	al network.							
Course Objecti	ve		Co	urse Outcomes					
• To know the soil properties and irrigation				Upon successful completion of this course, it is					
requirement			expected that students will be able to:						
• To know the design of irrigation and				• Design optimal water use for growing the crops					
drainage canal network				and apply me	thods for sa	wing land	from water		
logging.									
			•	Formulate in	rrigation n	etworks	across the		
country to make itself self-reliant in food					n food grain				
	production.								
Course Content									
Soil water relationship, soil properties, use of tensiometer, infiltration rate. Losses in irrigation system.									
Irrigation requirement and scheduling. Aquifer characteristics and estimation of yield from irrigation									
wells. Analysis of hydrologic data for irrigation and flood control. Design of irrigation and drainage									
canal network. Pumps in series and parallel. Pump characteristics. Flow through canal regulating									
structures.									
Text Books and/or Reference Materials									

Irrigation Engineering and Hydraulic Structures by Santosh Kumar Garg

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours
CE	CE 4234	Water Resources Engineering Sessional		Sessional	1.50	3.00
Course Rationale						
The course demonstrates the concept of designing of hydraulic structures and irrigation facility and the river training works and well design.						and the
Course Objective Course Outcomes						
<ul> <li>To know the design of hydraulic structures</li> <li>To know the design of various water well and tube-well</li> <li>The students will have acquired knowledge on the river training works and well design.</li> </ul>						edge on the on facility edge on the
Course Content						
Design of hydraulic structures; Design of irrigation facility. River training works. Groundwater resource assessment. Design of various water well and tube-well. Design for artificial recharge facility.						
Text Books and/or Reference Materials						
<ol> <li>Water Resource Planning &amp; Management by Otto J Helweg</li> <li>Water Resource Management by Larry W Mays</li> </ol>						

CE       CE 4255       Transport Projects and Operations       Theory       2.00       2.00         Course Rationale	Department	Course No	Cours	Course Type	Credit Hours	Total Contact Hours		
Course RationaleThe course will demonstrate the understandings of highway planning economics and financing, evaluation and analysis of transportation projects, management and implementation of transportation projects etc. The course also deal with traffic engineering administration and legislation.Course ObjectiveCourse Outcomes• To know the transportation project • To know the design of flexible and rigid pavements • To know the details about accident study and operations.• After completion of the course the students will be able to • Understand the highway need study and highway planning. • Understand the basics of transportation projects and implementation	CE	CE 4255	Transport Projects	and Operations	Theory	2.00	2.00	
The course will demonstrate the understandings of highway planning economics and financing, evaluation and analysis of transportation projects, management and implementation of transportation projects etc. The course also deal with traffic engineering administration and legislation.Course ObjectiveCourse Outcomes• To know the transportation project • To know the design of flexible and rigid pavements • To know the details about accident study and operations.• After completion of the course the students will be able to • Understand the highway need study and highway planning.• Understand the basics of transportation projects • Understand the basics of transportation projects • and implementation	Course Rationa	le						
Course ObjectiveCourse Outcomes• To know the transportation project • To know the design of flexible and rigid pavements• After completion of the course the students will be able to • Understand the highway need study and highway planning.• To know the details about accident study and operations.• Understand the highway need study and highway planning.• Understand the basics of transportation projects and implementation	The course wi evaluation and projects etc. Th	ll demonstra analysis of t e course also	the understandin ransportation project deal with traffic eng	gs of highway plan s, management and gineering administrat	nning econ implementation and leg	omics and ation of traislation.	d financing, ansportation	
<ul> <li>To know the transportation project</li> <li>To know the design of flexible and rigid pavements</li> <li>To know the details about accident study and operations.</li> <li>After completion of the course the students will be able to</li> <li>Understand the highway need study and highway planning.</li> <li>Understand the basics of transportation projects and implementation</li> </ul>	Course Objectiv	ve		Course Outcomes				
<ul> <li>Understand the process of traffic engineering administration and legislation.</li> </ul>	<ul> <li>To know th</li> <li>To know t pavements</li> <li>To know t and operati</li> </ul>	te transportat he design of he details ab ons.	ion project flexible and rigid bout accident study	<ul> <li>After completion be able to</li> <li>Understand the highway planni</li> <li>Understand the and implementa</li> <li>Understand the administration</li> </ul>	on of the connect highwaing. basics of tation. e process of and legislat	ourse the s ay need transportat of traffic tion.	students will study and tion projects engineering	

## Part A:

Highway needs study; highway planning, economics and financing; evaluation and analysis of transportation projects, management, monitoring; organization and implementation of transportation projects;

## Part B:

Selected case studies; traffic engineering administration and legislation; urban public transportation and freight movement

- 1. Highway Engineering by S.K. Khanna, C.E.G. Justo Nem Chand & Bros
- 2. Principles of Railway Engineering by RangwalaCharotar Publishing House, India
- Highway Engineering by Paul H. Wright, Karen Dixon John Wiley & Sons, Inc.Transportation Engineering & Planning by C.S. Papacostas, P.D. Prevedouros
- 4. Transportation Engineering An Introduction. 3<sup>rd</sup> ed., By C. Khisty and B. Lall, Prentice-Hall Inc.
- 5. Transportation Engineering, 7<sup>th</sup> edition. By: J. Banks, McGraw-Hill, New York, 2001.
- 6. AASHTO Guide for Design of Pavement Structures, AASHTO, 1997

Department	Course No	Course Title		Course Type	Credit Hours	Total Contact Hours		
CE	GED 1262	Computer A Engineering	ided Drawing	Sessional	1.5	3.0		
Course Rationale								
To make the st	udents skillfu	l in drafting.						
Course Object	ive		Course Outcomes					
To develop ski computer. To establish kr structural plan practical purpo	ills on drafting nowledge on d (2D and 3D) oses.	This course will make the students knowledgeable on engineering drawings. The knowledge gained on this course will support the students to prepare engineering drafting.						
Course Content								
Introduction to computer usage. Introduction to CAD packages and computer aided								
drafting: drawing editing and dimensioning of simple objects. Plan, elevations and								
sections. Plan and section.								
Text Books and/or Reference Materials								
<ol> <li>AutoCAD manual from CE, LU.</li> <li>The AutoCAD tutor for engineering graphics release 14 / by Alan J. Kalameja</li> </ol>								