# ***Preface***

Sylhet Engineering College is established to conduct B.Sc in engineering degree in Bangladesh. Administrative activities controlled by Directorate of Technical Education (DTE), under Technical and Madrasha Education Division (TMED), Ministry of Education.

This College is affiliated with the Shahjalal University of Science and Technology under the Faculty of School of Applied Sciences and Technology for certification four (04) years B.Sc. (Engg.) degree. Its academic journey has launched in 2007 with one department by 60 students. In the 2014-2015 Session, the College added another feather in its cap 'Civil Engineering' (CE) Department under the same University since then. In the 2015-2016 Session, the College added another department Electrical and Electronic Engineering (EEE). The College now belongs to three departments:

- Computer Science and Engineering (CSE)
- Civil Engineering (CE)
- Electrical and Electronics Engineering (EEE)

The College has 01 administrative building, 03 academic buildings, 01 Library buildings. 03 residential halls provide students' accommodation, one is for female students and another two are for male's students. There are also a Mosque and a residential building for the principal. The institute has three residential buildings for teachers and staff. Also, the institute has a modern computer lab with fast-paced Internet access, and modern learning facilities, including sophisticated Labs/Workshops.

# PART A

**Title of the Program**

B.Sc. in Civil Engineering

**Name of the University**

Sylhet Engineering College, Sylhet

## 1. Vision of the University

To develop the potentiality of human resource by ensuring quality education (such as innovative approach, analytical thinking power as well as enrich visionary leadership) to meet the demands of future.

## 2. Mission of the University

- To strive to provide excellent educational opportunities that is responsive to the needs of our students.
- To work locally but think globally.
- To study the human psychology and meet the needs of future.
- To enhance sector-based research keeping up norms, values and customs.
- To see, feel, imagine and turn it into a real picture.

***Name of the Department*** : Department of Civil Engineering
***Name of the Program*** : B. Sc. in Civil Engineering

## *Overview of the Civil Engineering*

The Civil Engineering study programs emphasize basic knowledge as well as applications. It incorporates the current frontiers of technologies as well as the learning of efficient and versatile algorithms and methodologies. The department also stress properly synthesizing technology, planning and management in civil engineering systems, keeping in view the impact on environment and in the changing of social and economic conditions of the country.

Civil Engineering is one of the oldest professions and largest fields of modern engineering that better serves our daily life. The work of a civil engineer includes the design, construction, and management of: buildings, high-rise towers and skyscrapers; bridges; tunnels; water and wastewater treatment plants; airports and harbour; transportation systems; dams and retaining structures, to name a few. Recognizing this responsibility, the Civil engineering program at Sylhet Engineering College (SEC) provides a well-rounded quality and challenging education with a solid theoretical background, training in the latest design methods, and proficiency in technological applications.

***Major Divisions***

Education on Civil Engineering are provided under Six major sub-discipline areas –

- Environmental Engineering,
- Geotechnical Engineering,
- Structural Engineering and
- Transportation Engineering
- Water Resource Engineering
- Geo-Environment Engineering.

### *Vision of the Department*

To produce Civil Engineers having technical competence, professional and leadership qualities for the contribution towards socio-economic development at national and global levels.

### *Mission of the Department*

| | |
|---|---|
| **M1** | To provide need-based curriculum for producing competent and professional Civil Engineers. |
| **M2** | To impart knowledge that leads to better professional skill and leadership quality among the graduates. |
| **M3** | To encourage students to pursue higher education and participate in competitive exams and various career development courses to excel the national and global levels. |
| **M4** | To promote research and consultancy on contemporary issues for fulfilling the academic and socio-economic needs. |
| **M5** | To offer different programs that enable students to become an entrepreneur and expert who can contribute to make the world sustainable. |
| **M6** | To motivate the students towards developing moral and ethical values. |

## 3. Program Education Objectives

The Civil Engineering undergraduate program is designed to prepare students for continued learning and successful careers in industry, government, academia, and consulting. Our graduates are expected to be:

| | |
|---|---|
| **PEO1** | Knowledgeable and technically competent in civil engineering discipline in line with the industry requirement. |
| **PEO2** | Capable to design, investigate and solve civil engineering problems innovatively, creatively using modern tools through sustainable approach. |
| **PEO3** | Able to achieve professional and leadership qualities to work in a team, organization and society with ethical values. |
| **PEO4** | Able to communicate and manage projects successfully and to recognize the need of lifelong learning for successful career advancement. |

## 4. Program Learning Outcome (PLO)

The B.Sc. in Civil program learning outcomes (PLOs) are aligned with ABET Engineering Accreditation Commission (EAC) outcomes. These are stated as:

| | |
|---|---|
| **PLO1** | **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. |
| **PLO2** | **Problem analysis:** Identify, analyze, formulate complex civil engineering problems, and reach substantiated conclusions using first principles of mathematics, the natural sciences and engineering sciences. |
| **PLO3** | **Design/development of solutions:** Design solutions for complex civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns. |
| **PLO4** | **Investigation:** Conduct investigations of real-life problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions. |
| **PLO5** | **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to civil engineering activities with an understanding of limitations. |
| **PLO6** | **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional civil engineering practice. |
| **PLO7** | **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge for sustainable development. |
| **PLO8** | **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and the norms of the engineering practice. |
| **PLO9** | **Individual work and teamwork:** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings. |
| **PLO10** | **Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions. |
| **PLO11** | **Project management and finance:** Demonstrate knowledge and understanding of the Civil engineering Branches (structures, geotechnical, transportation, environment, water resource, surveying-materials-construction) and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments. |
| **PLO12** | **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change. |

## 5. PEO to Mission Statement Mapping

| M/PEO | PEO1 | PEO2 | PEO3 | PEO4 |
|---|---|---|---|---|
| **M1** | √ | √ | √ | - |
| **M2** | √ | - | √ | - |
| **M3** | √ | √ | - | √ |
| **M4** | - | √ | √ | - |
| **M5** | - | √ | √ | √ |
| **M6** | - | - | √ | √ |

## 6. Mapping of POs to PEOs

| PEO/ PO | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 | PLO11 | PLO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PEO1** | √ | √ | √ | - | √ | - | - | - | - | √ | - | - |
| **PEO2** | - | √ | √ | √ | √ | - | √ | - | - | - | - | - |
| **PEO3** | - | - | - | - | - | √ | - | √ | √ | √ | √ | - |
| **PEO4** | - | - | - | - | - | - | - | - | - | √ | √ | √ |

# PART B

## 7. Scheme of the Program

### Basic Science

| SL. | Course Code | Course Name | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|
| | | | | T | P | |
| 1 | PHY 0533 1103 | Physics I (Physical Optics, heat, waves and oscillation | 1-I | 3 | | 3 |
| 2 | CHE 0531 1101 | Chemistry I | 1-I | 2 | | 2 |
| 3 | PHY 0533 1201 | Physics II (Structure of matter, Electricity and Magnetism and Modern physics) | 1-II | 3 | | 3 |
| 4 | CHE 0531 1203 | Chemistry II | 1-II | 2 | | 2 |
| 5 | PHY 0533 1102 | Physics Sessional | 1-I | | 3 | 1.5 |
| 6 | CHE 0531 1204 | Chemistry Sessional | 1-II | | 3 | 1.5 |
| Total | | | | | | **13** |

### Mathematics:

| SL. | Course Code | Course Name | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|
| | | | | T | P | |
| 1 | MAT 0541 1103 | Differential Calculus, Integral Calculus and Matrices | 1-I | 3 | | 3 |
| 2 | MAT 0541 1203 | Differential Equations and Statistics | 1-II | 3 | | 3 |
| 3 | MAT 0541 2103 | Vector Analysis, Laplace Transforms, Fourier Analysis & Harmonic Functions | 2-I | 3 | | 3 |
| 4 | MAT 0541 2205 | Applied Mathematics for Engineers | 2-II | 3 | | 3 |
| Total | | | | | | **12** |

### General Education:

| SL. | Course Code | Course Name | Level-Term | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|
| | | | | T | P | |
| 1 | HUM 0231 1101 | English 1 | 1-I | 2 | | 2 |
| 2 | SSS 0312 1100 | History of the emergence of Independent Bangladesh | 1-I | 3 | | 3 |
| 3 | HUM 0314 1103 | Sociology | 1-I | 2 | | 2 |
| 4 | HUM 0311 1205 | Economics | 1-II | 2 | | 2 |
| 5 | HUM 0411 2105 | Accounting | 2-II | 2 | | 2 |
| 6 | HUM 0231 1202 | Communication in English (Practice) | 1-II | | 3 | 1.5 |
| Total | | | | | | **12.5** |

**Interdisciplinary**

| SL. | Course Code | Course Name | Level | Cr. Hr. | | Ct. Hr. |
|---|---|---|---|---|---|---|
| | | | | T | P | |
| 1 | EEE 0713 1211 | Basic Electrical Technology | 1-II | 2 | | 2 |
| 2 | ME 0715 2102 | Carpentry Shop, Machine shop and Welding shop Sessional | 2-I | | 3 | 1.5 |
| 3 | CSE 0011 2113 | Introduction to computer language | 2-I | 2 | | 2 |
| 4 | CSE 0011 2214 | Engineering Computation with computer programming Sessional | 2-II | | 3 | 1.5 |
| 5 | CE 0732 4287 | Urban and Regional Planning | 4-II | 2 | | 2 |
| Total | | | | | | **9** |

**Basic Engineering:**

| SL. | Course Code | Course Name | Level-Term | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|
| | | | | T | P | |
| 1 | CE 0731 1121 | Surveying | 1-I | 3 | | 3 |
| 2 | CE 0715 1231 | Engineering Mechanics | 1-I | 3 | | 3 |
| 3 | CE 0732 2131 | Mechanics of Solids I | 2-I | 3 | | 3 |
| 4 | CE 0732 2133 | Engineering Materials | 2-I | 3 | | 3 |
| 5 | CE 0541 2135 | Numerical Analysis | 2-I | 2 | | 2 |
| 6 | CE 0732 2231 | Mechanics of Solids II | 2-II | 3 | | 3 |
| 7 | CE 0732 2235 | Fluid Mechanics | 2-II | 3 | | 3 |
| 8 | CE 0532 2237 | Geology and Geomorphology | 2-II | 2 | | 2 |
| 9 | CE 0532 3233 | Fundamental of Earthquake Engineering | 3-II | 2 | | 2 |
| 10 | CE 0732 1132 | Civil Engineering Drawing | 1-I | | 3 | 1.5 |
| 11 | CE 0732 1234 | Computer Aided Drawing | 1-II | | 3 | 1.5 |
| 12 | CE 0732 2124 | Details of Construction | 2-I | | 3 | 1.5 |
| 13 | CE 0731 1222 | Practical Surveying (Field work) | 1-II | | 3 | 1.5 |
| 14 | CE 0732 2136 | Mechanics of Solids Sessional | 2-I | | 3 | 1.5 |
| 15 | CE 0732 2138 | Engineering Materials Sessional | 2-I | | 3 | 1.5 |
| 16 | CE 0732 2228 | Quantity Surveying | 2-II | | 3 | 1.5 |
| 17 | CE 0532 2226 | Remote Sensing and GIS | 2-II | | 3 | 1.5 |
| 18 | CE 0732 2236 | Fluid Mechanics Sessional | 2-II | | 3 | 1.5 |
| 19 | CE 0732 3122 | Architectural, Engineering and Planning Appreciation | 3-I | | 3 | 1.5 |
| Total | | | | | | **39** |

**Civil Engineering Practice**

| SL. | Course Code | Course Name | Level | Cr. Hr. | | Ct. Hr. |
|---|---|---|---|---|---|---|
| | | | | T | P | |
| 1 | IPE 0715 4121 | Management for Engineers | 4-I | 3 | | 3 |
| 2 | CE 0732 4223 | Professional practice, communication & Ethics | 4-II | 3 | | 3 |
| Total | | | | | | **6** |

**Structural Engineering**

| SL. | Course Code | Course Name | Mode | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|---|
| | | | | | T | P | |
| 1 | CE 0732 3141 | Structural Analysis I | c | 3-I | 3 | | 3 |
| 2 | CE 0732 3145 | Reinforced Concrete Design I | c | 3-I | 3 | | 3 |
| 3 | CE 0732 3243 | Structural Analysis II | c | 3-II | 2 | | 2 |
| 4 | CE 0732 3247 | Reinforced Concrete Design II | c | 3-II | 3 | | 3 |
| 5 | CE 0732 4141 | Structural Analysis III | c | 4-I | 2 | | 2 |
| 6 | CE 0732 3249 | Steel Structure | c | 3-II | 3 | | 3 |
| 7 | CE 0732 4249 | Introduction to steel concrete composite structures | o | 4-II | 2 | | 2 |
| 8 | CE 0732 4245 | Reinforced Concrete Design III | o | 4-II | 2 | | 2 |
| 9 | CE 0732 4247 | Pre-stressed Concrete | o | 4-II | 2 | | 2 |
| 10 | CE 0732 4249 | Dynamics of Structures | o | 4-II | | 3 | 1.5 |
| 11 | CE 0732 3242 | Structural Analysis and Design Sessional I | c | 3-II | | | 1.5 |
| 12 | CE 0732 4144 | Structural Analysis and Design Sessional II | c | 4-I | | 3 | 1.5 |
| 13 | CE 0732 4146 | Reinforced Concrete Design Sessional | c | 4-I | | 3 | 1.5 |
| 14 | CE 0732 4246 | Structural Analysis & Design Sessional III | o | 4-II | | 3 | 1.5 |
| Minimum requirement | | | | | | | **20.5** |

**Environmental Engineering**

| SL. | Course Code | Course Name | Mode | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|---|
| | | | | | T | P | |
| 1 | CE 0732 3181 | Environmental Engineering I | c | 3-I | 3 | | 3 |
| 3 | CE 0732 4183 | Environmental Engineering II | c | 4-I | 3 | | 3 |
| 4 | CE 0732 4281 | Environmental Engineering III | o | 4-II | 2 | | 2 |
| 5 | CE 0732 4283 | Environmental Engineering IV | o | 4-II | 2 | | 2 |
| 6 | CE 0732 4285 | Environmental Engineering V | o | 4-II | 2 | | 2 |
| 7 | CE 0732 3182 | Environmental Engineering Sessional I | c | 3-I | | 3 | 1.5 |
| 8 | CE 0732 4282 | Environmental Engineering Sessional II | o | 4-II | | 3 | 1.5 |
| Minimum requirement | | | | | | | **7.5** |

**Geotechnical Engineering**

| SL. | Course Code | Course Name | Mode | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|---|
| | | | | | T | P | |
| 1 | CE 0732 3151 | Geotechnical Engineering I | c | 3-I | 3 | | 3 |
| 2 | CE 0732 3253 | Geotechnical Engineering II | c | 3-II | 3 | | 3 |
| 3 | CE 0732 4155 | Geotechnical Engineering III | c | 4-I | 2 | | 2 |
| 4 | CE 0732 4251 | Geotechnical Engineering IV | o | 4-II | 2 | | 2 |
| 5 | CE 0732 4253 | Geotechnical Engineering V | o | 4-II | 2 | | 2 |
| 6 | CE 0732 3152 | Geotechnical Engineering sessional I | c | 3-I | | 3 | 1.5 |
| 7 | CE 0732 4252 | Geotechnical Engineering sessional II | o | 4-II | | 3 | 1.5 |
| Minimum requirement | | | | | | | **9.5** |

**Transportation Engineering**

| SL. | Course Code | Course Name | Mode | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|---|
| | | | | | T | P | |
| 1 | CE 0732 3261 | Transportation Engineering I | c | 3-II | 3 | | 3 |
| 2 | CE 0732 4163 | Transportation Engineering II | c | 4-I | 3 | | 3 |
| 3 | CE 0732 4261 | Transportation Engineering III | o | 4-II | 2 | | 2 |
| 4 | CE 0732 4263 | Transportation Engineering IV | o | 4-II | 2 | | 2 |
| 5 | CE 0732 4265 | Transportation Engineering V | o | 4-II | 2 | | 2 |
| 6 | CE 0732 3262 | Transportation Engineering sessional I | c | 3-II | | 3 | 1.5 |
| 7 | CE 0732 4262 | Transportation Engineering sessional II | o | 4-II | | 3 | 1.5 |
| Minimum requirement | | | | | | | **7.5** |

**Water Resource Engineering**

| SL. | Course Code | Course Name | Mode | Level | Contact Hr. | | Credit Hr. |
|---|---|---|---|---|---|---|---|
| | | | | | T | P | |
| 1 | CE 0532 2223 | Hydrology, | c | 2-II | 2 | | 2 |
| 2 | CE 0732 3171 | Open channel flow | c | 3-I | 3 | | 3 |
| 3 | CE 0732 4271 | Hydraulics and Hydraulic Structures | o | 4-II | 2 | | 2 |
| 4 | CE 0732 4173 | Irrigation and Flood Control | c | 4-I | 2 | | 2 |
| 5 | CE 0732 4275 | Groundwater Engineering | o | 4-II | 2 | | 2 |
| 6 | CE 0732 4273 | River Engineering | o | 4-II | 2 | | 2 |
| 7 | CE 0732 4277 | Coastal Engineering | o | 4-II | 2 | | 2 |
| 8 | CE 0732 3172 | Open Channel Flow Sessional | c | 3-I | | 3 | 1.5 |
| 9 | CE 0732 4272 | Water Resources Engineering Sessional | o | 4-II | | 3 | 1.5 |
| Minimum requirement | | | | | | | **8.5** |

**Summary of the Course Requirement**

| SL. | Courses | Requirements | Total Credits to be offered |
|---|---|---|---|
| 1 | Basic Science | 13 | 13 |
| 2 | Mathematics | 12 | 12 |
| 3 | General Education | 12.5 | 12.5 |
| 4 | Interdisciplinary | 8.5 | 9 |
| 5 | Basic Engineering | 37.5 | 39 |
| 6 | Civil Engineering Practice | 6 | 6 |
| 7 | Structural Engineering | 20.5 | 30.5 |
| 8 | Environmental Engineering | 7.5 | 17 |
| 9 | Geotechnical Engineering | 9.5 | 15 |
| 10 | Transportation engineering | 7.5 | 15 |
| 11 | Water Resource Engineering | 8.5 | 18 |
| | Total | **143** | |
| | Undergraduate Thesis | 4.5 | |
| | Project and Seminar | 1.5 | |
| | Major specialization ( 2 theory & 1 Lab) | 5.5 | |
| | Minor specialization ( 2 theory & 1 Lab) | 5.5 | |
| | Semester Final Viva ( 4*0.5) | 2 | |
| | Total | **162** | |

Undergraduate students of the Department of Civil Engineering have to follow a particular course schedule which is given in this chapter according to semester wise distribution of the course:

**First Year:** *Semester 1*

| SL. No. | Course Code | Course Title | Contact Hrs./Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0731 1121 | Surveying | 3 | | 3 |
| 2 | MAT 0541 1103 | Differential Calculus, Integral Calculus and Matrices | 3 | | 3 |
| 3 | CHE 0531 1101 | Chemistry I | 2 | | 2 |
| 4 | PHY 0533 1103 | Physics I | 3 | | 3 |
| 5 | HUM 0231 1101 | English I | 2 | | 2 |
| 6 | SSS 0312 1100 | History of the emergence of Independent Bangladesh | 3 | | 3 |
| 7 | HUM 0314 1103 | Sociology | 2 | | 2 |
| 8 | CE 0732 1132 | Civil Engineering Drawing | | 3 | 1.5 |
| 9 | PHY 0533 1102 | Physics Sessional | | 3 | 1.5 |
| **Total** | | | | | **21.0** |

*N.B.: SSS 0312 1100 Course is mandatory to fulfill the requirement of completing Bachelor's degree in Engineering.

**First Year:** *Semester I1*

| SL. No. | Course Code | Course Title | Contact Hrs/Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0715 1231 | Engineering Mechanics | 3 | | 3 |
| 2 | PHY 0533 1201 | Physics II | 3 | | 3 |
| 3 | CHE 0531 1203 | Chemistry II | 2 | | 2 |
| 4 | MAT 0541 1203 | Differential Equations and Statistics | 3 | | 3 |
| 5 | EEE 0713 1211 | Basic Electrical Technology | 2 | | 2 |
| 6 | HUM 0311 1205 | Economics | 2 | | 2 |
| 7 | CE 0732 1234 | Computer Aided Drawing | | 3 | 1.5 |
| 8 | CHE 0531 1204 | Chemistry Sessional | | 3 | 1.5 |
| 9 | HUM 0231 1202 | Communication in English (Practice) | | 3 | 1.5 |
| 10 | CE 0731 1222 | Practical Surveying (Field work) | | 15 days | 1.5 |
| 11 | CE 0732 1220 | Semester Final Viva I | | | 0.5 |
| **Total** | | | | | **21.5** |

**Second Year:** *Semester 1*

| SL. No. | Course Code | Course Title | Contact Hrs/Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0732 2131 | Mechanics of Solids I | 3 | | 3 |
| 2 | CE 0732 2133 | Engineering Materials | 3 | | 3 |
| 3 | CE 0541 2135 | Numerical Analysis | 2 | | 2 |
| 4 | MAT 0541 2103 | Vector Analysis, Laplace Transforms, Fourier Analysis & Harmonic Functions | 3 | | 3 |
| 5 | CSE 0011 2113 | Introduction to Computer Language | 2 | | 2 |
| 6 | HUM 0411 2105 | Accounting | 2 | | 2 |
| 7 | CE 0732 2124 | Details of Construction | | 3 | 1.5 |
| 8 | CE 0732 2136 | Mechanics of Solids Sessional | | 3 | 1.5 |
| 9 | CE 0732 2138 | Engineering Materials Sessional | | 3 | 1.5 |
| 10 | ME 0715 2102 | Carpentry Shop, Machine shop and Welding shop Sessional | | 3 | 1.5 |
| **Total** | | | | | **21.0** |

**Second Year:** *Semester 1I*

| SL. No. | Course Code | Course Title | Contact Hrs./Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0732 2231 | Mechanics of Solids II | 3 | | 3 |
| 2 | CE 0732 2235 | Fluid Mechanics | 3 | | 3 |
| 3 | CE 0532 2223 | Hydrology | 2 | | 2 |
| 4 | CE 0532 2237 | Engineering Geology & Geomorphology | 2 | | 2 |
| 5 | MAT 0541 2205 | Applied Mathematics for Engineers | 3 | | 3 |
| 6 | CE 0532 2226 | Remote Sensing and GIS | | 3 | 1.5 |
| 7 | CE 0732 2236 | Fluid Mechanics Sessional | | 3 | 1.5 |
| 8 | CE 0732 2228 | Quantity Surveying | | 3 | 1.5 |
| 9 | CSE 0011 2214 | Engineering Computation with Computer Programming Sessional | | 3 | 1.5 |
| 10 | CE 0732 2220 | Semester Final Viva II | | | 0.5 |
| **Total** | | | | | **19.5** |

**Third Year:** *Semester 1*

| SL. No. | Course Code | Course Title | Contact Hrs/Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0732 3141 | Structural Analysis I | 3 | | 3 |
| 2 | CE 0732 3145 | Reinforced Concrete Design I | 3 | | 3 |
| 3 | CE 0732 3181 | Environmental Engineering I | 3 | | 3 |
| 4 | CE 0732 3151 | Geotechnical Engineering I | 3 | | 3 |
| 5 | CE 0732 3171 | Open Channel Flow | 3 | | 3 |
| 6 | CE 0732 3122 | Architectural, Engineering and Planning Appreciation | | 3 | 1.5 |
| 7 | CE 0732 3182 | Environmental Engineering Sessional I | | 3 | 1.5 |
| 8 | CE 0732 3152 | Geotechnical Engineering Sessional I | | 3 | 1.5 |
| 9 | CE 0732 3172 | Open Channel Flow Sessional | | 3 | 1.5 |
| **Total** | | | | | **21.0** |

**Third Year:** *Semester 1I*

| SL. No. | Course Code | Course Title | Contact Hrs/Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0732 3243 | Structural Analysis II | 2 | | 2 |
| 2 | CE 0732 3247 | Reinforced Concrete Design II | 3 | | 3 |
| 3 | CE 0732 3253 | Geotechnical Engineering II | 3 | | 3 |
| 4 | CE 0732 3249 | Steel Structure | 3 | | 3 |
| 5 | CE 0532 3233 | Fundamental of Earthquake Engineering | 2 | | 2 |
| 6 | CE 0732 3261 | Transportation Engineering I | 3 | | 3 |
| 7 | CE 0732 3242 | Structural Analysis and Design Sessional I | | 3 | 1.5 |
| 8 | CE 0732 3262 | Transportation Engineering Sessional I | | 3 | 1.5 |
| 9 | CE 0732 3232 | Project and Seminar | | 3 | 1.5 |
| 10 | CE 0732 3220 | Semester Final Viva III | | | 0.5 |
| **Total** | | | | | **21.0** |

**Fourth Year:** *Semester 1*

| SL. No. | Course Code | Course Title | Contact Hrs/Week | | Credit |
|---|---|---|---|---|---|
| | | | T | P | |
| 1 | CE 0732 4141 | Structural Analysis III | 2 | | 2 |
| 2 | IPE 0715 4121 | Management for Engineers | 3 | | 3 |
| 3 | CE 0732 4183 | Environmental Engineering II | 3 | | 3 |
| 4 | CE 0732 4163 | Transportation Engineering II | 3 | | 3 |
| 5 | CE 0732 4173 | Irrigation and Flood Control | 2 | | 2 |
| 6 | CE 0732 4155 | Geotechnical Engineering III | 2 | | 2 |
| 7 | CE 0732 4144 | Structural Analysis and Design Sessional II | | 3 | 1.5 |
| 8 | CE 0732 4146 | Reinforced Concrete Design Sessional | | 3 | 1.5 |
| 9 | CE 0732 4130 | Project / Thesis | | 3 | 1.5 |
| **Total** | | | | | **19.5** |

**Fourth Year:** *Semester I1*

| SL. No. | Course Code | Course Title | Contact Hrs/Week | | Credit | Selection |
|---|---|---|---|---|---|---|
| | | | T | P | | |
| **For All Specialization** | | | | | | |
| 1 | CE 0732 4230 | Project / Thesis | 6 | | 3 | Compulsory |
| 2 | CE 0732 4223 | Professional Practices and Communication | 3 | | 3 | Any One |
| | CE 0732 4225 | Socio-economic Aspects of Development Projects | | | | |
| 3 | CE 0732 4220 | Semester final viva IV | | | 0.5 | Compulsory |
| **Specialization: Structure** | | | | | | |
| 4 / 5/6/ 7 | CE 0732 4243 | Introduction to steel concrete composite structures | 2 *2 | | | |
| | CE 0732 4245 | Reinforced Concrete Design III | | | 2*2 | Any Two |
| | CE 0732 4247 | Pre-stressed Concrete | | | | |
| | CE 0732 4249 | Dynamics of Structures | | | | |
| 8 | CE 0732 4246 | Structural Analysis & Design Sessional III | | 3 | 1.5 | Optional |
| **Specialization: Environment** | | | | | | |
| 4 / 5/6/ 7 | CE 0732 4281 | Environmental Engineering III | 2 *2 | | 2 *2 | Any Two |
| | CE 0732 4283 | Environmental Engineering IV | | | | |
| | CE 0732 4285 | Environmental Engineering V | | | | |
| | CE 0732 4287 | Urban and Regional Planning | | | | |
| 8 | CE 0732 4282 | Environmental Engineering Sessional II | | 3 | 1.5 | Optional |
| **Specialization: Geotechnical** | | | | | | |
| 4 / 5 | CE 0732 4251 | Geotechnical Engineering IV | 2*2 | | 2*2 | Any two |
| | CE 0732 4253 | Geotechnical Engineering V | | | | |
| 6 | CE 0732 4252 | Geotechnical Engineering Sessional II | | 3 | 1.5 | Optional |
| **Specialization: Transportation** | | | | | | |
| 4 / 5/6/ 7 | CE 0732 4261 | Transportation Engineering III | 2 *2 | | 2 *2 | Any Two |
| | CE 0732 4263 | Transportation Engineering IV | | | | |
| | CE 0732 4265 | Transportation Engineering V | | | | |
| 8 | CE 0732 4262 | Transportation Engineering Sessional II | | 3 | 1.5 | Optional |

| Specialization: Water Resources | | | | | | |
|---|---|---|---|---|---|---|
| 4 / 5/6/ 7 | CE 0732 4271 | Hydraulics and Hydraulics Structure | 2 *2 | | 2 *2 | Any Two |
| | CE 0732 4275 | Groundwater Engineering | | | | |
| | CE 0732 4273 | River Engineering | | | | |
| | CE 0732 4277 | Coastal Engineering | | | | |
| 8 | CE 0732 4272 | Water Resources Engineering Sessional | | 3 | 1.5 | Optional |
| **Total** | | | | | **17.5** | |

Student should take two theory courses and one sessional course from his /her thesis related field (major specialization).
Student should take **Two** theory courses and **one** Sessional course from other specialization field (minor).
*NB: Every student should have to complete **162.0** credits for obtaining the B.Sc. Engineering degree in Civil Engineering.*

All students should finish all offered laboratories/Sessional/training courses.

| **Semester** | **Hours/Week** | | **Credits** | **Pre-requisite** |
|---|---|---|---|---|
| | **Theory** | **Sessional** | | |
| **First Year:** *Semester I* | 18 | 6 | 21 | |
| **First Year:** *Semester II* | 15 | 12 | 21.5 | |
| **Second Year:** *Semester I* | 15 | 12 | 21 | |
| **Second Year:** *Semester II* | 13 | 12 | 19.5 | |
| **Third Year:** *Semester I* | 15 | 12 | 21 | |
| **Third Year:** *Semester II* | 16 | 9 | 21 | |
| **Fourth Year:** *Semester I* | 15 | 9 | 19.5 | |
| **Fourth Year:** *Semester II* | 11 | 12 | 17.5 | |
| *Total=* | ***118*** | ***84*** | ***162*** | |

# PART C

## 4. Course Description

### *4.1 First Year: Semester 1*

#### *4.1.1 CE 0731 1121*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0731 1121<br>**COURSE TITLE:** Surveying | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **EXAM HOURS:** 3.00 | |

| **Rationale** |
|---|
| Surveying plays a vital role in the field of Geodesy, Photogrammetry, Cartography, GIS, Digital Mapping, Cadastral Surveying, etc. The planning and design of all Civil Engineering projects such as the construction of highways, bridges, tunnels, dams, state boundaries, coastlines, navigable streams, etc. are based upon surveying measurements. Thus, surveying is a basic requirement for all Engineering projects |

| **Objective** |
|---|
| • To conceptualize the basic principle of surveying and aquatint the students with modern surveying tools/instruments necessary for engineering practice<br>• To introduce various methods of Plane Surveying (chain surveying, traverse surveying, tacheometry or stadia surveying, plane table surveying, etc.) to determine the topography, prepare a map<br>• Accumulate basis ideas for calculating areas and volumes (cutting and filling) to minimize project cost by different methods<br>• To introduce the geometry and methods for setting out of curves in route alignment<br>• To facilitate necessary knowledge about photogrammetry surveying and its application in the practical field. |

**Course Content**

Reconnaissance survey; linear measurements; traverse survey; triangulation, leveling and contouring; calculation of areas and volumes; problems on heights and distances; curves and curve ranging, transition curve, vertical curves; tachometry: introduction, principles and problems on tachometry; astronomical surveying: definition, instruments, astronomical corrections, systems of time; photogrammetry: introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale; project surveying; errors in surveying; remote sensing; introduction to geographic information system (GIS) and global positioning system (GPS).

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Interpret the basic principle of surveying and use of modern surveying tools/instruments in different civil engineering projects |
| **CLO2** | Identify the suitable surveying method for field data collection (chain surveying, traverse surveying, tacheometry or stadia surveying, plane table surveying, etc.) and apply them in the practical field to determine the topography, prepare a map |
| **CLO3** | Apply the knowledge for calculating earthwork for different civil engineering projects (cutting and filling) to minimize project cost by different methods |
| **CLO4** | Understand the basic theory of curve and set out curve for route project |

**Mapping** of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | √ | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | | √ | | √ | | | | | | √ | | √ |
| **CLO4** | √ | | | | | | √ | | | | | |

**Reference Books:**

(List of reference books may vary depending upon the choice of course teachers and time)


1. Aziz, M.A., M. Shajahan, M. (1965), A textbook of surveying. *Hafiz Book Center*.
2. Kahmen, H., Faig, W. (1988), Surveying, *Walter de Gruyter & Co.* ASIN: B01K91A8NS
3. Punmia, B. C., Jain, A. K., Jain, A. K. (2016), Surveying - Vol. 1. *Laxmi Publications*. ISBN-13: 978-8170088530
4. Punmia, B. C., Jain, A. K., Jain, A. K. (2016), Surveying - Vol. 2. *Laxmi Publications*. ISBN-13: 978-8170088837
5. Roy. S. K. (2011), Fundamental of Surveying, *Prentice-Hall of India Pvt. Ltd.* ISBN-13: 978-8120341982
6. Ghilani, C.D., Wolf, P.R. (2012), Elementary Surveying: An Introduction to geomatics. 13th Ed., *Prentice Hall*, ISBN-13: 978-0-13-255434-3


### *4.1.2 MAT 0541 1103*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** MAT 0541 1103<br>**COURSE TITLE:** Differential Calculus, Integral Calculus and Matrices | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| Mathematics is the language of science which develops thinking and critical problem solving skills. Differential calculus deals with the calculation of instantaneous rate of change and integral calculus deals with finding out the limit of a summation of the infinitely many small factors. The calculus has wide applications in science, engineering, economics, finance, statistics etc. The content of the course comprises functions, limits, continuity, derivatives, tangent and normal, different theorems such as Rolle's, Mean value, Taylor's, Leibnitz's and Euler's theorem etc, indefinite and definite integrals and their applications in real life situations. |

| **Objective** |
|---|
| • Know the basic concept of function and its applications to real – life problems.<br>• Explore the concepts, properties, and aspects of the differential and integral calculus of single variable functions.<br>• Learn the concepts of limits, continuity and derivative.<br>• Learn to finding out the derivative of different type of functions applying the formulae of derivatives.<br>• Know the application of derivatives to solve maximum and minimum value problems.<br>• Study various types of integrations for different cases.<br>• Apply the techniques of integration to solve the real-life oriented problems such as length, areas and volumes etc.<br>• Apply matrix algebra to solve system of linear equation for making the complex civil engineering |

problems easier.

**Course Contents: Differential Calculus:** Limit, Continuity and differentiability. n-th derivatives of standard functions. Leibnitz theorem. Rolle 's Theorem, Mean value theorem. Expansion in finite and infinite forms. Indeterminate form. Partial differentiation. Euler's theorem. Tangent and Normal. Sub tangent and subnormal in partial and polar co-ordinates. Maxima and minima of functions of single variables. Curvature.
**Integral Calculus:** Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals. Improper integrals. Beta function. Gama function. Multiple integrals. Area, Volume of solids of revolution.
**Matrices:** Definition of matrix. Algebra of matrices. Multiplication of matrices. Transpose of a matrix and inverse of matrix. Rank and elementary transformation of matrices. Solution of system of linear equations. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of matrix. Characteristic subspace of matrix.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the fundamental ideas and principles as well as geometrical meaning of differential and integral calculus of single valued functions. |
| **CLO2** | Evaluate limits, derivatives, limits in indeterminate forms and apply the derivatives to analyze and sketch the graph of various types of functions. |
| **CLO3** | Find maxima and minima, critical points and inflection points of functions. |
| **CLO4** | Know standard indefinite integrals and evaluate integrals by substitution, by partial fractions and by parts |
| **CLO5** | Understand the concept of definite integral and evaluating definite integrals including the evaluation of improper integrals. |
| **CLO6** | Calculate the area of regions in the plane, the volume and surface area of solids of revolution. |
| **CLO7** | Solve system of linear equations which will help to make the complex civil engineering problems easier. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| PLO/ CLO | PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 | PLO 9 | PLO 10 | PLO 11 | PLO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLO1 | ✓ | ✓ | | | | | | | | | | ✓ |
| CLO2 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |
| CLO3 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |
| CLO4 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |
| CLO5 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |
| CLO6 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |
| CLO7 | ✓ | ✓ | | ✓ | | | | | | | | ✓ |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)


1. Thomas Finney*: Calculus and Analytic Geometry.*
2. Das and Mukherjee: *Differential Calculus*
3. Das and Mukherjee: *Integral Calculus*
4. Md. Abdur Rahaman *: Linear algebra*

### *4.1.3 CHE 0531 1101*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CHE 0531 1101<br>**COURSE TITLE:** Chemistry I | |
|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| In order to present the content of chemistry set in a current and relevant context for engineers the graduates will be acquainted with the basic facts of chemistry. As this is the central science, the student will able to understand the new developments and breakthroughs efficiently in engineering and technology. The introduction of the latest (R & D oriented) topics will make the engineering student upgraded with the new technologies. In addition to this a conscious effort to foster attitudes of lifelong learning and appreciation for chemistry as a core of knowledge. |

| **Objective** |
|---|
| • To relate concepts learned in physical science and engineering field to real world situations.<br>• To appreciate the need and importance of engineering chemistry for industrial and domestic use.<br>• To impart basic knowledge related to material selection and the techniques for material analysis.<br>• To apply the fundamentals of cement and water properties in civil engineering.<br>• To evaluate the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and the need for sustainable development. |

**Course Contents:**

**Atomic structure and quantum theory:** Atomic spectrum of hydrogen and the Bohr's theory, Quantum numbers, Concept of energy levels and atomic orbitals, Heisenberg's uncertainty principle, Schrodinger's wave equation;

**Electronic configurations and properties of molecules:** Electronic configurations and properties of atoms, Chemical bond, valence bond theory, molecular orbital theory, shape of molecules, bond length, bond energy;

**The periodic table:** Development of the periodic table, Electron arrangements and the periodic table, Noble gases with properties and uses, Chemical properties of s-block, p-block, d-block and f-block elements, Chemistry of halogen, alkali metals, alkaline earth metals, non-metals and heavy metals;

**Chemical formulas and equations:** Types of formulas, Percent composition from formula, Formulas from experiment, Formulas of ionic compounds, Names of compounds, Writing and balancing chemical equations, Limiting reactant and percentage of yield, Concept of mole.

**Different types of solutions**: Normal solution, Molar solution, Molal solution, Percent solution, Mole fraction, Raoult's law, Properties of dilute solution;

**Acids and bases:** Theories and modern concepts of acids and bases, Dissociation constant, Strength, pH, Buffer solution etc.

**Thermochemistry and electrochemistry:** Introduction, voltaic cells, electrolytic cells;

**Chemical and ionic equilibrium:** Reversible and irreversible reactions, Law of mass action and equilibrium constant, Kc and Kp, Le Chatelier's Principle, Application of chemical equilibrium.

**Chemistry of water and cement:** Physical and chemical properties of water, Chemistry of water pollution, Silicates and limes.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO 1** | Describe elements, atomic models, orbit and orbitals, electron distribution and energy level, hydrogen spectral series etc. |
| **CLO 2** | Apply different principles to determine the electronic configuration for any atom or ion. |
| **CLO 3** | Explain the development of the periodic table, analyze and compare periodic trends in physical and chemical properties of elements in the periodic table. |
| **CLO 4** | Calculate the percent composition of a compound and derive empirical formulas from experimental data. |
| **CLO 5** | Demonstrate the concept and use of different concentration unit, limiting reactant and percentage of yield. |
| **CLO 6** | Implement the modern concepts of acids and bases to identify their strength and explain acidic and basic properties of species. |
| **CLO 7** | Predict the chemical properties of cement and water. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| PLO/ CLO | PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 | PLO 9 | PLO 10 | PLO 11 | PLO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO 1** | ✔ | ✔ | | | | | | | | | | ✔ |
| **CLO 2** | ✔ | | | | | | | | | | | |
| **CLO 3** | ✔ | ✔ | | | | | | | | | | |
| **CLO 4** | ✔ | ✔ | | | ✔ | | | | | | | |
| **CLO 5** | ✔ | ✔ | | ✔ | | | | | | ✔ | | |
| **CLO 6** | ✔ | ✔ | ✔ | | | ✔ | | | | | | |
| **CLO 7** | ✔ | ✔ | ✔ | | | | ✔ | | | | | |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)


1. General Chemistry; Author: Raymond Chang.
2. Essentials of Physical Chemistry; Author: B.S. Bahl and Arun Bahl.
3. Introduction to Modern Inorganic Chemistry; Author: Dr. R.D. Madan.
4. Organic Chemistry; Author: R. T. Morrison and R. N. Boyd.


### *4.1.4 PHY 0533 1103*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: PHY 0533 1103**<br>**COURSE TITLE:** Physics I | |
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| In this course, Students will be able to gather knowledge of thermal properties of materials and apply the knowledge in different thermal situations. This course will also provide basic knowledge on wave and oscillations. Physical optics will covered by this course through which students will be familiar with interference, Bi-prism and diffraction. |

| **Objective** |
|---|
| • To learn about thermometer and its construction.<br>• To learn basic principles of thermodynamics.<br>• To know wave behaviour and Lissajous figure.<br>• To learn physical optics and problem solving technique. |

**Course Contents:**

**Physical Optics:** Theories of light: Huygen's principle and construction. Interference of light: Young;s double slit experiment, Fresnel bi-prism, Newton's rings, interferometers.

**Diffraction of light:** Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings, polarization, production and analysis of polarized light, optical activity, optics of crystals.

**Heat and Thermodynamics:** Temperature, zeroth law of thermodynamics. Thermometers: constant volume, platinum resistance, thermocouple. First law of thermodynamics and its application, molar specific heats of gases, isothermal and adiabatic relations, work done by a gas. Kinetic theory of gases: explanation of gas laws, kinetic interpretation of temperature, equipartition of energy and calculation of ratio of specific heats, mean free path, Vander Waals equation of state, second law of thermodynamics: reversible and irreversible processes, Carnot cycle, efficiency, Carnot's theorem, entropy.

**Waves and Oscillations:** Simple harmonic motion, damped simple harmonic oscillations, forced oscillations, resonance, vibrations of membranes and columns. Combination and composition of simple harmonic motions, Lissajous figures. Transverse and longitudinal nature of waves, travelling and standing waves, intensity of a wave, energy calculation of progressive and stationary waves, phase velocity, group velocity. Sound waves: velocity of longitudinal wave in a gaseous medium. Doppler Effect. Architectural acoustics: Sabine's formula, requisites of a good auditorium.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Explain thermometer, kinetic theory of gases, mean free path, Brownian motion, van der walls equation and related problems. |
| **CLO2** | Learn basic law of thermodynamics and solve related problems. |
| **CLO3** | Understand and use simple harmonics motion. |
| **CLO4** | Learn wave behaviour and calculate wave properties for different situations. |
| **CLO5** | Know physical optics and related problems. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | | √ | | √ | | √ | | | |
| **CLO2** | √ | √ | | | | | √ | | | | | |
| **CLO3** | √ | √ | | √ | | | | | | | | |
| **CLO4** | | √ | | √ | | | √ | | √ | | | |
| **CLO5** | | √ | | √ | | | | | √ | | | |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)

1. Physics for Engineers . Dr.Giasuddin Ahmed
2. Halliday, D. and Resnick, R: physics (Vol.I and Vol II)

### *4.1.5 HUM 0231 1101*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: HUM 0231 1101**<br>**COURSE TITLE:** English I | |
|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| This course is expected to develop two basic skills i.e. reading and writing. A variety of reading strategies and texts will be used to effectively develop first year students' academic reading skills thereby facilitating their future study. Also, the course focuses on developing the writing skills of students by familiarizing them with grammar rules, providing them with practice and enabling them to demonstrate the accurate use of grammar in their writing. |

| **Objective** |
|---|
| • To enable students to write with accuracy<br>• To facilitate effective and comprehensible writing<br>• To raise awareness of common errors that occur in writing<br>• To develop student's ability to understand write-ups on issues of general concern<br>• To improve the vocabulary of learners for effective communication. |

**Course Content**

English phonetics: the places and manners of articulation of the English sounds; Vocabulary; English grammar; construction of sentences, some grammatical problem; Comprehension; Paragraph writing; Précis writing; Amplification; Report writing; Business communication and tenders; Short stories written by some well-known classic writers.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand grammar rules |
| **CLO2** | Produce grammatically correct meaningful sentences |
| **CLO3** | Express oneself correctly by using appropriate words, phrases, sentences or ideas |
| **CLO4** | Think critically (reflect on a text, grasp abstract ideas and interpret them effectively arrive at well-reasoned conclusions and solutions). |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | | | | | | | | | | | |
| **CLO3** | | | | | | | | √ | | | | |
| **CLO4** | √ | | | | | | √ | | | | | |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)

1. College Writings with Readings, John Langan, Sixth Edition
2. High School English Grammar and Composition by Wren and Martin
3. Friend's Language by Prof Md. Ataul Haque, Prof Jahurul Isam, Dr. Binoy Barman
4. Professional English by Dr. Islam and Md. Hashanat

5. Learning English The Easy Way by Sadruddin Ahmed
6. Take-off: Technical English for Engineering Course Book with Audio CDs, David Morgan, Nicholas Regan, 2008.
7. English for Engineering Students

### *4.1.6 SSS 0312 1100*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** SSS 0312 1100<br>**COURSE TITLE: History of the Emergence of Independent Bangladesh** | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours: 3**.00 | |

| **Rationale** |
|---|
| This course deals with the following interrelated themes and topics that are essential to understand the emergence of Bangladesh. These themes include land and people, politics, economy, governance, society, religion and culture, global connections as well as the basic topics on the freedom struggle and War of Liberation. Issues under each of the broad themes will be discussed from the perspective of historical evolution and contemporary significance. |

| **Objective** |
|---|
| The course aims to offer insight into the historical changes, the long struggle for freedom and above all the War of Independence led by the Father of the Nation Bangabandu Sheikh Mujibur Rahman that have shaped today's Bangladesh. |

**Course Content**

**Description of the country and its people (**Impact of Geographical features, Ethnic composition of Bangladesh, Development of Bengali Language and its impact, Cultural syncretism and religious tolerance, Distinctive identity of Bangladesh in the context of undivided Bangladesh), **Proposal for undivided sovereign Bengal, the partition of the Subcontinent, 1947 and Foreshadowing Bangladesh (**Rise of communalism under the colonial rule, Lahore Resolution 1940, The proposal of Suhrawardi and Sarat Bose for undivided Bengal : consequences, The creation of Pakistan 1947 , Foundation of Awami Muslim League and Foreshadowing Bangladesh), **Pakistan: Structure of the state and disparity (**Central and provincial structure, Influence of Military and Civil bureaucracy, Economic , social and cultural disparity)
**Language Movement and quest for Bengali identity (**Misrule by Muslim League and Struggle for democratic politics, The Language Movement: context, phases and International Recognition of Bengali Language, United front of Haque – Vasani – Suhrawardi: election of 1954, consequences), **Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971) ((**Definition of military rules and its characteristics, Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, Islamisation), Fall of Ayub Khan and Yahia Khan's rule )), **Rise of nationalism and the Movement for self-determination (**Resistance against cultural aggression and resurgence of Bengali culture, Sheikh Mujibur Rahman and the 6 points movement, Reactions : Importance and significance, The Agortola Case 1968), **The mass- upsurge of 1969 and 11 point movement (**Background, Programme, Significance), **Election of 1970 and its Inpact (**Legal Framework Order (LFO), Programe of different political parties, Election result and centres refusal to comply), **Non-cooperation Movement and 7th March Speech, 1971 (**The non-cooperation movement, Speech of 7th March : Background of the speech, major characteristics of the speech, impact of this speech, International recognition of 7th March Speech as part of world heritage), **Declaration of Independence of Bangladesh (**Operation Searchlight , Declaration of Independence of Bangladesh by Bangobondhu, Beginning of the Liberation War of Bangladesh), **The war of Liberation 1971 (**Genocide, repression of women, refugees, Formation of Bangladesh government and proclamation of Independence, The spontaneous early resistance and subsequent organized resistance (Mukti Fouz, Mukti Bahini, guerillas

and the frontal warfare), Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion), Contribution of students, women and the masses (Peoples war) and different political parties , The role of Great powers and the United Nations in the Liberation war, The contribution of India in the Liberation War, The Anti-liberation activities of the occupation army, the Peace Committee, Al-Badar, Al- Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators , killing of the intellectuals, Trial of Bangabandhu and reaction of the World Community, Formation of joint command and the Victory, The overall contribution of Bangabandhu in the Independence struggle), **The Bangabandhu Regime 1972-1975 (**Homecoming; Speech of 10 January, Making of the constitution, Reconstruction of the war-ravaged country, Foreign Policy of Bangabandhu; Bangabandhu's First Speech in the United Nations, The murder of Bangabandhu and his family and the ideological turn-around).

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Have a broader understanding and further curiosity of the rich history, culture and heritage of the country. |
| **CLO2** | They should also be able to appreciate the importance and relevance of history as a bridge between the past, present and the future. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | √ | | | | | √ | |
| **CLO2** | | | √ | | | √ | | | | | | |

REFERENCE BOOKS:
(List of reference books may vary depending upon the choice of course teachers and time)


1. Ahmed, Salahuddin and Bazlul Mobin Chowdhury (eds.), *Bangladesh: National Culture and Heritage: An Introductory Reader* (Dhaka: Independent University Bangladesh, 2004)
2. Harun-or-Roshid, *The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics, 1906-1947* (Dhaka : The University Press Limited, 2012)
3. Jahan Rounaq, *Pakistan: Failure in National Integration,(Dhaka :* The University Press Limited, 1977)
4. Maniruzzaman Talukder, *Radical Politics and the Emergence of Bangladesh, (Dhaka :* Mowla,Brothers, 2003)
5. Muhith, A M A, *History of Bangladesh: A Subcontinental Civilization*, (Dhaka: UPL, 2016)
6. Samad Abdus, *History of Liberation War of Bangladesh*, (Dhaka : Aparajeyo Bangla Prakashani, 2019)
7. Milton Kumar Dev, Md. Abdus Samad, *History of Bangladesh* (Dhaka : Biswabidyalya Prokasoni, 2014)
8. Schendel, Willem van : *A History of Bangladesh* (Cambridge: Cambridge University Press, 2009)
9. শেখ মুজিবুর রহমান : *অসমাপ্ত আত্মজীবনী*, *(*ঢাকা : দি ইউনিভার্সিটি প্রেসলিমিটেড, ২০১২)
10. নীহাররঞ্জনরায় : *বাঙালীর ইতিহাস*, *(*কলকাতা : দে' জ পাবলিশিং, ১৪০২ সাল)
11. সালাহ্ উদ্দিন আহমেদ ও অন্যান্য (সম্পাদিত), *বাংলাদেশের মুক্তি সংগ্রামের ইতিহাস* ১৯৪৭-১৯৭১, (ঢাকা : আগামী প্রকাশনী, ২০০২)
12. আবুল মাল আবদুল মুহিত : *বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব*, *(ঢাকা :* সাহিত্য প্রকাশ, ২০০০)
13. সিরাজুল ইসলাম (সম্পাদিত), *বাংলাদেশের ইতিহাস* ১৭০৪-১৯৭১, ৩ খন্ড, (ঢাকা : এশিয়াটিক সোসাইটি অব বাংলাদেশ, ১৯৯২)
14. হারুন-অর-রশিদ : *বঙ্গীয় মুসলিম লীগ পাকিস্তান আন্দোলন বাঙালির রাষ্ট্রভাবনা ও বঙ্গবন্ধু*, (ঢাকা : অন্য প্রকাশন, ২০১৮)
15. হাসান হাফিজুর রহমান : *বাংলাদেশের স্বাধীনতাযুদ্ধ দলিলপত্র,* (m¤ûvw`Z), (ঢাকা: MYপ্রজাতন্ত্রী বাংলাদেশ সরকার, ১৯৮৫)
16. সৈয়দ আনোয়ার হোসেন : *বাংলাদেশের স্বাধীনতাযুদ্ধে পরাশক্তির ভূমিকা*, (ঢাকা : ডানা প্রকাশনী, ১৯৮২)
17. মুনতাসীর মামুন ও অন্যান্য, *স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস*, (ঢাকা: সুবর্ণ, ২০১৭)
18. আবু মো দেলোয়ার হোসেন, *স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস*, (ঢাকা : বিশ্ববিদ্যালয় প্রকাশনী, ২০১৪)

**19.** আশফাক হোসেন, *স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস*, (ঢাকা: প্রতিশূণ্য প্রকাশন, ২০১৯)
20. আবু মো দেলোয়ার হোসেন, *বাংলাদেশের ইতিহাস*, ১৯০৫-১৯৭১,
21. আশফাক হোসেন : *বাংলাদেশের মুক্তিযুদ্ধ ও জাতিসংঘ*, (ঢাকা: বাংলা একাডেমি, ২০০৩)
22. আবু মো. দেলোয়ার হোসেন, ড. মোহাম্মদ সেলিম (সম্পাদনা) : *বাংলাদেশ ও বহির্বিশ্ব*, (ঢাকা : বাংলাদেশ ইতিহাস সমিতি, ২০১৫)
23. আশফাক হোসেন, *বাংলাদেশের মুক্তিযুদ্ধ ও ইন্দ্রিরা গান্ধী* (ঢাকা : সুবর্ণ প্রকাশনী, ২০১৭)

### *4.1.7 HUM 0314 1103*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** HUM 0314 1103<br>**COURSE TITLE: Sociology** | |
|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| This course provides students with an understanding of the societal processes and systems that affects the practice of engineers. The course examines different social systems, culture, power and civilization that are effective in designing, planning working, and implementation in different level of construction. in engineering sciences. |

| **Objective** |
|---|
| • To help the students develop understanding the need for social science knowledge in the practice field of engineers.<br>• To make them able to examine how to utilize the formal and informal systems of the society in human function.<br>• To make them understand about organizational culture and its impact on productivity<br>• To assist them develop different frameworks and strategies to assess and address different social issues in the planned change. |

**Course Content**

Scope, some Basic Concepts. Social evolution and techniques of production. culture and civilization. Social structure of Bangladesh. Population and world resources. Oriental and Occidental societies, Industrial revolution. Family urbanization and industrialization, Urban Ecology, Co-operative and Socialist movements. Rural Sociology.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the society and culture |
| **CLO2** | Identify the dimensions of human development, cognitive setting and their needs at different levels. |
| **CLO3** | Develop understanding about human psychology and behavior |
| **CLO4** | Demonstrate an ability to design environment friendly policy and its implementation |
| **CLO5** | Understand the need of community participation for successful implementation of the industrial project |
| **CLO6** | Evaluate the programs for future improvement |
| **CLO7** | Apply professional norms and ethics in service delivery systems |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | | | | √ | | | | | | | | |
| **CLO4** | | | | | | √ | | | | | | |
| **CLO5** | | | | | | | √ | | | | | |
| **CLO6** | | | | | √ | | | | | | | |
| **CLO7** | | | | | √ | | | | | | | |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)


1. Khan. F. R. (2000). Principles of Sociology. Shirin Publication.
2. Maciver, R. M. and Page, C. H. (2001). Society: An introductory Analysis. New Delhi: Macmillan.
3. Richard, T. Schaefler, R. and Lamm, P. (1995). Sociology. USA: MeGrew Hill Inc.
4. Kalat, J. W. (2016). *Introduction to psychology*. Nelson Education.
5. Morgan, C. T., King, R. A., Weisz, J. R., & Schopler, J. (2006). Introduction to Psychology (7th eds.). New Delhi: Tata Mac-Graw Hill Publishing Co. Ltd.


### *4.1.8 CE 0732 1132*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 1132<br>**COURSE TITLE: Civil Engineering Drawing** | |
|---|---|
| **CREDIT: 1**.0 (Sessional) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course will provide the students with the basics of Engineering drawing mainly visualization, design hypothesis, standards & conventions of drawing, the tools of drawing, and the utilize of Drawings in designing applications. Engineering drawing is the graphical dialect to precise considerations, thoughts, and ideas. The expression by drawing is precise, exact, and brief. This information is fundamental for understanding the detailed description of a building/any other structures. |

| **Objective** |
|---|
| • Getting ideas about the fundamentals of Engineering drawing<br>• To develop skills in using effectively the drawing tools<br>• Helping the students to develop ability in drawing orthographic and isometric views and projections of an object/structure<br>• To improve imagination power |

**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.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the basic types of plane geometry |
| **CLO2** | Visualize and draw multi-views and projection |
| **CLO3** | Interpret the drafting to some extent |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | √ | | √ |
| **CLO2** | | | | | | √ | | √ | | | | |
| **CLO3** | | | | | | | | √ | | | | √ |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)


1. Latifee, E.R. (2005). Beginner's guide to Engineering Drawing. *E.R. Latifee.* ISBN: 984-32-2711-5.
2. Singh, G. and Subash, C. (1997). Civil Engineering Drawing. *Standard publishers distributors.* ISBN: 81-86308-38-5


### *4.1.9 PHY 0533 1102*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** PHY 0533 1102<br>**COURSE TITLE: Physics Sessional** | |
| **CREDIT: 1**.5 (Theory) | **SEMESTER OFFERED:** 1st Year 1st Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| In this course students will perform some laboratory experiments that will help to visualize some fundamental concepts of physics. |

| **Objective** |
|---|
| To enable the students to carry out some fundamental experiments for finding out the numerical values of some physical parameters based on various laws, principles and theorem of physics |

**Course contents:**

1. Determination of the value of 'g' gravity by using compound pendulum.
2. Determination of the spring constant and effective mass of a spiral spring.
3. Determination of the focal length of a convex lens.
4. Determination of the mechanical equivalent of heat by electrical method.
5. Determination of the velocity of sound by water tube and tuning fork.
6. Calculation of the Planck's constant using LED.
7. Determination of angle of rotation of a sugar solution using half-shade Polari meter
8. Determination of specific heat of a liquid by the method of cooling.
9. Comparison of e.m.f of two cells by potentiometer.
10. Determination of Frequency of tuning fork by Melde's apparatus.

11. Determination of refractive index of a prism.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Measure gravity by using compound pendulum. |
| **CLO2** | Measure spring constant and effective mass of a spiral spring |
| **CLO3** | Determine of the velocity of sound by water tube and tuning fork |
| **CLO4** | Calculate Planck's constant using LED. |
| **CLO5** | Calculate of angle of rotation of a sugar solution using half-shade Polari meter |
| **CLO6** | Determine of refractive index of a prism. |
| **CLO7** | Calculate the focal length of a convex lens. |
| **CLO8** | Measure the mechanical equivalent of heat by electrical method. |
| **CLO9** | Calculate specific heat of a liquid by the method of cooling. |
| **CLO10** | Compare of e.m.f of two cells by potentiometer. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| **CLO/PLO** | **PLO1** | **PLO2** | **PLO3** | **PLO4** | **PLO5** | PLO6 | **PLO7** | **PLO8** | **PLO9** | **PLO10** | **PLO11** | **PLO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | | | √ | | | √ | √ | √ |
| **CLO2** | √ | | √ | | | | √ | | | √ | √ | √ |
| **CLO3** | √ | | √ | √ | | | √ | | | √ | √ | √ |
| **CLO4** | √ | √ | √ | | | | √ | | | √ | √ | √ |
| **CLO5** | √ | | √ | | | √ | √ | | | √ | √ | √ |
| **CLO6** | √ | √ | | √ | | | √ | | | √ | √ | √ |
| **CLO7** | √ | | | √ | | | √ | | | √ | √ | √ |
| **CLO8** | √ | √ | | √ | | | √ | | | √ | √ | √ |
| **CLO9** | √ | | | | | | √ | | | √ | √ | √ |
| **CLO10** | √ | | | √ | | | √ | | | √ | √ | √ |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)

1. Halliday, D. and Resnick, R: physics (Vol.I and Vol II)
2. Physics for Engineers .Dr. Giasuddin Ahmed

### *4.1 First Year: Semester II*

#### *4.2.1 CE 0715 1231*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0715 1231<br>**COURSE TITLE: Engineering Mechanics** | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| These course facilities for gathering the basic knowledge about the effects of force on solid mass and to develop student's ability to visualize the distribution of forces on a solid body. This knowledge is a prerequisite for many engineering courses offered in the subsequent semesters that capture the detailed analysis and design of engineering structures or structural components. |

| **Objective** |
|---|
| • To have an idea about rigid body mechanics. Equivalent force systems: concepts of moment, couple, resultant. Equilibrium: free-body diagram; equations of equilibrium. Structural analysis: trusses by method of sections and method of integration<br>• To facilitate necessary knowledge of the center of gravity, center of mass, center of volume and the centroid<br>• To develop skills to determine the location of the center of gravity and centroid for a system of discrete particles and a body of arbitrary shape<br>• To develop the ability for determining the moment of inertia for areas and masses of different geometric configurations. |

**Course Content**

Introduction to SI Units, resultants and components of forces, coplanar concurrent forces, moments and parallel coplanar forces, non-concurrent non-parallel coplanar forces, maximum and minimum forces; non-coplanar forces, centroids, moment of inertia of areas and masses.

Friction, flexible cords, graphical methods, plane motion, force systems that produce rectilinear motion, work, kinetic energy; power, impulse and momentum, analyses of two-dimensional frames and trusses, virtual work principle for rigid bodies.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Draw complete free-body diagrams and write appropriate equilibrium equations from the free-body diagram, including the support reactions on a structure |
| **CLO2** | Analyze various statically determinate systems such as beams, and trusses |
| **CLO3** | Locate the centroid of an area, center of mass, center of volume effectively |
| **CLO4** | Calculate the moment of inertia of areas and masses for different geometric configurations |
| **CLO5** | Relate and apply fundamental sciences for learning the essential engineering concepts and theories of different branches. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |
| **CLO5** | √ | | | | | | | | | | | |

REFERENCE BOOKS:
(List of reference books may vary depending upon the choice of course teachers and time)


1. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, *Oxford University Press*, 2011
2. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II – Dynamics, 9th Ed, *Tata McGraw Hill*, 2011.
3. H. Shames, Engineering Mechanics: Statics and dynamics, 4th Ed, PHI, 2002.
4. J. L. Meriam and L. G. Kraige , Engineering Mechanics, Vol I – Statics, Vol II –Dynamics, 6th Ed, *John Wiley*, 2008.
5. R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, *Pearson Press*, 2006.
6. R.S. Khurmi, Engineering Mechanics, S.Chand and Co., 2001
7. V.M. Faires and S.D. Chambers, Analytic Mechanics, 3rd Ed, *The Macmillan Company*, 2001.


### *4.2.2 PHY 0533 1201*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: PHY 0533 1201**<br>**COURSE TITLE: Physics II** | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| In this course, Students will be able to gather knowledge of electrical properties of materials and apply the knowledge to find the situations of some basic problems. The basic concept regarding electric field, electric potential and dielectric and their application on several theories will enhance the ability to understands the application. students will be introduced to the aspect of magnetic properties and able to use them for problem solving.<br>This course will also provide basic knowledge of different crystal structure, their production, activity and uses in modern technology.<br>The concept of modern physics will provide fundamental information regarding relativity and application based on special theory of relativity. This course will also give some knowledge on nuclear physics and its applications. |

| **Objective** |
|---|
| • To learn about electric charge and its applications.<br>• To learn basic principles of magnetism.<br>• To know special theory of relativity and its applications.<br>• To learn mechanics and problem solving technique. |

**Course Content:**

**Electricity & Magnetism**: electric charge and Coulomb's law, Electric field, concept of electric flux and the Gauss's law-some applications of Gauss's law, Gauss's law in vector form, Electric potential, relation between electric field and electric potential, capacitance and dielectrics, gradient, Laplace's and Poisson's equations, Current, Current density, relativity, the magnetic field, Ampere's law, Biot-Savart law and their applications, Laws of electromagnetic induction-
Maxwell's equation.

**Modern physics**: Galilean relativity and Einstein's special theory of relativity; Lorentz transformation equations, Length contraction, Time dilation and mass-energy relation, photoelectric effect, Compton effect; De Broglie matter waves and its success in explaining Bohr's theory, Pauli's exclusion principle, Constituent of atomic nucleus, Nuclear binding energy, different types of radioactivity, radioactive decay law; Nuclear reactions, nuclear fission, nuclear fusion, atomic power plant.

**Structure Matter**: States of matter: solid, liquid and gas. Classification of solids: amorphous, crystalline, ceramics and polymers. Atomic arrangement in solids. Different types of bonds in solids: metallic, Vander Waals, covalent and ionic bond, packing in solids, interatomic distances and forces of equilibrium, x-ray diffraction; Bragg's law. Plasticity and elasticity. Distinction between metal, insulator and semi-conductor.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Learn electric charge and its behavior. |
| **CLO2** | Know magnetic fields and its applications. |
| **CLO3** | Understand relativity and concepts regarding with this field. |
| **CLO4** | Learn nuclear physics and its applications. |
| **CLO5** | Explain motion and problems related with it. |
| **CLO6** | Learn basic quantum mechanics. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| **CLO/PLO** | **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** | PLO 6 | **PLO 7** | **PLO 8** | **PLO 9** | **PLO10** | **PLO11** | **PLO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | ✓ | ✓ | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ |
| **CLO2** | ✓ | | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ |
| **CLO3** | ✓ | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | ✓ |
| **CLO4** | ✓ | ✓ | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ |
| **CLO5** | ✓ | | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ |
| **CLO6** | ✓ | ✓ | | ✓ | | | ✓ | | | ✓ | ✓ | ✓ |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)

1.Halliday, D. and Resnick, R: physics (Vol.I and Vol II)
2. Physics for Engineers .Dr.Giasuddinahmed

### *4.2.3 CHE 0531 1203*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CHE 0531 1203<br>**COURSE TITLE: Chemistry II** | |
|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| In order to acquaint the students to engineering solutions the graduates with basic concepts of chemistry will be capable usually they face during course of their study in the industrial sector. As this is a support course taken usually in the first year, it will be helpful to apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation. By gaining the knowledge on existing and future upcoming materials, this course will provide an insight into latest topics to pursue further research on modern technologies. |

| **Objective** |
|---|
| • To analyze the need, design and perform a set of experiments.<br>• To execute the basic knowledge of polymer reinforced composites, paints, varnishes, thermochemistry and electrochemistry in engineering arena.<br>• To explain the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.<br>• To illustrate the chemistry of environmental pollution, reaction kinetics, colloid and colloidal solutions. |

**Course Contents:**

Reaction's kinetics: Rate of chemical reactions; order and molecularity of reactions, different types of rate expressions, methods of determining rate and order, effect of temperature on reaction rate and energy of activation.

Colloid and colloidal solution: Classification, preparation, purification, properties, protective action and application of colloids.

Chemical corrosion: Introduction to chemical corrosion, corrosion of metals and alloys in dry and wet environments, mechanism of corrosion, atmospheric and soil corrosion and their protective measures.

Chemistry of environmental pollution: Environment and its characteristics, chemistry of toxic metal and non-metal pollutants, analytical techniques used in the determination of pollutants, chemical concept of DO, BOD, COD and threshold odor number, chemistry involved in water treatment plants, quality of industrial waste water.

Polymers: Chemistry of polymerization, different types of polymers and their properties, polymer degradation, elastomers and composite materials.

Paints and varnishes: Introduction to paints and varnishes, pretreatment of the surface, metallic, non-metallic and organic protective coating, types of paints and their uses.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO 1** | Deduce the basic concept of kinetics of chemical reactions. |
| **CLO 2** | Identify various colloid and colloidal solutions. |
| **CLO 3** | Explain the properties of various chemical corrosion. |
| **CLO 4** | Understand the chemistry of environmental pollution in terms of civil engineering. |
| **CLO 5** | Predict the applications of polymers, paints and varnishes in the construction industry. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | ✓ | ✓ | | | | | | | | | | |
| **CLO2** | ✓ | ✓ | | | | | | | | | | |
| **CLO3** | ✓ | ✓ | | | | | | | | | | |
| **CLO4** | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | | ✓ | |
| **CLO5** | ✓ | ✓ | | ✓ | | | | | | | | ✓ |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)

1. General Chemistry; Author: Darrell. D. Ebbing.
2. Physical Chemistry; Author: Arun Bhal and G.D.Tuli.
3. Inorganic Chemistry; Author: S. Z. Haider.
4. Polymer Science; Author: V R Gowariker, N V Viswanathan, Jaydev Sreedhar.
5. Environmental Chemistry; Author: A. K. Dee.

### *4.2.4 MAT 0541 1203*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: MAT 0541 1203**<br>**COURSE TITLE: Differential Equations and Statistics** | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| Differential equation defines a relationship between a function and derivatives. Differential equation used to calculate the movement or flow of electricity, motion of an object,<br>to or from like a pendulum, to explain thermodynamics concepts. Differential equation has remarkable ability to predict future earth and world around us. They can describe exponential growth and decay. This course provides introduction to ordinary and partial differential equation with applications. Topics include classification of what is meant by the solution of a differential equation, first-order equations for which exact solutions are obtainable and higher order differential equation. . Statistics is the idea that we can learn about the properties of large sets of objects or events by studying the characteristics of a smaller number of similar object and events. The two major areas of statistics are known as descriptive statistics, which describes the properties of sample and population data, and inferential statistics, which uses those properties to test hypotheses and draw conclusion. Descriptive statistics include mean, variance, skewness and kurtosis. Inferential statistics include linear regression analysis, analysis of variance and hypothesis testing. Probability is the chance or possibility of an outcome that deals with the results of random events. |

| **Objective** |
|---|
| • Learn techniques and method to solve first order differential equations and its application.<br>• Acquire the concept of ordinary differential equation and how to formulate them from engineering related problems.<br>• Provide the knowledge on fundamental concepts of statistical methods.<br>• Acquaint students with the basic tools of exploratory data analysis.<br>• Facilitate necessary knowledge about bivariate data analysis.<br>• Make students to understand the basic concepts of probability and probability distribution. |

**Contents:**

**Differential Equations and Statistics**

**Ordinary Differential Equation**: Formation of differential equations; Solution of first order differential equations by various methods; Solution of differential equation of first order but higher degrees; Solution of general linear equations of second and higher orders with constant co-efficient; Solution of Euler's homogeneous linear differential equations.

**Partial Differential Equation**: Introduction, Linear and non-linear first order differential equations; Standard forms; Linear equations of higher order; Equations of the second order with variable coefficients.

**Statistics**: Measures of central tendency and standard deviation; Moments, Skewness and Kurtosis; Elementary probability theory and discontinuous probability distribution; Continuous probability distributions, e.g. normal and exponential.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Identify types of first order and higher order linear differential equation and learn how to solve it. |
| **CLO2** | Solve various types partial differential equation. |
| **CLO3** | Explain basic concepts of statistics and describe various statistical tools |
| **CLO4** | Construct frequency distribution and present data graphically. |
| **CLO5** | Compute and interpret different measures of central tendency, dispersion, and shape characteristics. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| PLO/ CLO | PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 | PLO 9 | PLO 10 | PLO 11 | PLO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLO 1 | ✓ | ✓ | | ✓ | | | | | | ✓ | | |
| CLO 2 | ✓ | ✓ | | ✓ | | | | | | ✓ | | |
| CLO 3 | ✓ | ✓ | | ✓ | | | | | | ✓ | | |
| CLO 4 | ✓ | ✓ | | ✓ | | | | | | ✓ | | |
| CLO 5 | ✓ | ✓ | | ✓ | | | | | | ✓ | | |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)


1. Abu Yousuf : Differential Equation
2. Ross,S.: Introduction to differential equations
3. Richard Bronson: Differential Equations
4. Schaum's Outline Series : Probability and Statistics.

### *4.2.5 EEE 0713 1211*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** EEE 0713 1211<br>**COURSE TITLE: Basic Electrical Technology** | |
|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| Electrical services are a vital component in any building, so it is necessary for civil engineers to understand the basic principle of services design. This Course content includes the concepts of wiring system design, various lighting schemes, design of substation layout of equipment and design of security systems. This course will help students of architecture to trouble shoot a design problem on a single/multi-storied building/structure. |

| **Objective** |
|---|
| • To train and equip civil engineers with appropriate knowledge and skills required for the lighting design, power supply design and their installations.<br>• To familiarize the students with electrical design process.<br>• To provide enough knowledge to the students of architecture so that they can interpret various components of the service design of the building. |

**Course Content**

Electrical units and standards, Electrical network and circuit solution series, parallel and mesh current methods. Instantaneous current, voltage and power, effective current and voltage, average power. Sinusoidal single phase RLC circuits: phasor algebra, balanced three phase circuits. Electrical wiring for residential and commercial loads. Introduction to transformers and induction motors.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the electric circuit analysis methods and the working principles of transformer and induction motors and their performance evaluation. |
| **CLO2** | **Analyze** complex electrical networks using node and mesh analysis. |
| **CLO3** | **Apply** phasor algebra to solve sinusoidal single-phase and balanced three-phase circuits. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)

1. Electrical Wiring Estimating and Costing by S.L. Uppal and G.C. Garg

### *4.2.6 HUM 0311 1205*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: HUM 0311 1205**<br>**COURSE TITLE:** Economics | |
|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| An economics course can teach you the fundamentals needed to decipher graphs and other important financial data, as well as the tools to develop a successful business strategy. Economics can be broken down into microeconomics, which examines individual decisions, and macroeconomics, which is concerned with the economy as a whole. Both types of economics utilize historical trends and current conditions to inform business decision-making and make predictions of how markets will behave in the future. Economists provide information and forecasting to inform decisions within companies and governments. |

| **Objective** |
|---|
| • To provides an introduction to the main ideas and concepts involved in modern economics and attempts to provide students with an understanding of how the economy works, what type of problems economists attempt to solve, and how they set about trying to solve them. |

**Course Content**

Definition of economics. Economics and Engineering. Principles of Economics. Micro economics: The theory of demand and supply and their elasticity's. Price determination. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curve technique. Marginal analysis. Optimization. Market. Production, Production function, types of productivity. Rational region of production of an engineering firm. The short run and the long run. Fixed cost and variable cost. Internal and external economics and diseconomies.
Macro-economic: savings, investment. National income analysis. Inflation. Monetary policy, fiscal policy and trade policy with reference to Bangladesh. Planning in Bangladesh.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the analysis of individual decision-making agents, the behaviour of firms and industries in the economy |
| **CLO2** | Understand the concept of elasticity quantitatively and qualitatively in economic analysis and know differences between different types of markets |
| **CLO3** | Explain macroeconomic concepts and use simple economic models to interpret the behaviour of key macroeconomic variables |
| **CLO4** | Understand monetary and fiscal policy and Government budget; |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | | | | | | | | | | | |
| **CLO3** | | | | | | | | | | | √ | |
| **CLO4** | | | | | | | | | | | √ | |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)


1. Arnold, R. A. (2014): Economics, South Western Publishing Company, Eleventh Edition
2. Bangladesh Economic Review relevant issues.
3. Mankiw, N. G. (2012): Principles of Economics, Thomson South Western Publishing, Sixth Edition
4. Samuelson, P. A. and Nordhaus,W. D. (2009): Economics, McGraw-Hill USA, Nineteenth Edition.
5. Todaro, M. P. and Smith,S. C. (2012): Economics of Development in the Third World, Longman, Eleventh Edition.


### *4.2.7 CE 0732 1234*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 1234<br>**COURSE TITLE:** Computer Aided Drawing | |
|---|---|
| **CREDIT: 1**.5 (Sessional) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course will familiarize the students with the building plan and its different components as well. They will also understand different environmental control elements. This practical drawing will help the students to understand the plan of structure designed by an Architect for structural design purposes. This understanding is essential for the execution of the structural design. |

| **Objective** |
|---|
| • Help students to conceptualize the complete building drawing and Computer applications<br>• To facilitate necessary knowledge about drawing of different environmental control elements<br>• Acquaint students with the AutoCAD. |

**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 of multi-storied buildings; reinforcement details of beams, slabs, stairs etc. Plan and section of septic tank, Detailed drawings of roof trusses, Plans, elevations and sections of culverts, bridges and other hydraulic structures, Building services drawings.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Use** computer and modern engineering software for civil engineering drawing. |
| **CLO2** | **Draw** plan and elevation of different civil engineering structures. |
| **CLO3** | **Prepare** sectional drawing of civil engineering structural elements with reinforcement detailing. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | √ | | | | | | | |
| **CLO2** | √ | | | | √ | | | | | | | |
| **CLO3** | | | | √ | √ | | | | | | | |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)

1. Latifee, E.R. (2005), Beginner's guide to Engineering Drawing. *E.R. Latifee*. ISBN: 984-32-2711-5
2. Singh, G. and Subash, C. (1997). Civil Engineering Drawing. *Standard publishers distributors.* ISBN: 81-86308-38-5
3.

### *4.2.8 CHE 0531 1204*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CHE 0531 1204<br>**COURSE TITLE:** Chemistry Sessional | |
|---|---|
| **CREDIT: 1**.5 (Sessional) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| To identify the appropriate material and production route for a specific product in the engineering field and develop experimental skills for building technical competence, this course will assist to acquaint the students with practical knowledge of the basic phenomenon of chemistry. This course will be helpful for students making them able to think critically and solve problems regarding laboratory related issues. |

| **Objective** |
|---|
| • To analyze and generate experimental skills.<br>• To learn and apply basic techniques used in chemistry laboratory for preparation, purification and identification.<br>• To interpret experimental data and draw inferences from the data. |

**Course Content**
Volumetric analysis: acid-base titration, oxidation-reduction titrations, determination of Fe, CU and Ca volumetrically, Determination of Ca and Mg in water.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Perform laboratory experiments demonstrating safe and proper use of standard chemistry glassware and equipment. |
| **CLO2** | Interpret careful recording of observations and data. |
| **CLO3** | Determine the concentration of various unknown solution using titration. |
| **CLO4** | Differentiate terms such as observation, hypothesis, data, conclusion, theory etc. |
| **CLO5** | Detect metals in various compounds. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | ✓ | ✓ | ✓ | | | | | | | | | |
| **CLO2** | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | | | |
| **CLO3** | ✓ | ✓ | ✓ | | | | | ✓ | ✓ | | | |
| **CLO4** | ✓ | ✓ | ✓ | ✓ | | | | | | | ✓ | |
| **CLO5** | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | | | ✓ |

REFERENCE BOOKS:
(List of reference books may vary depending upon the choice of course teachers and time)

2. A Text book of Quantitative Analysis; Author: A.I. Vogel.
3. Qualitative Inorganic Analysis; Author: A.I. Vogel.
4. Elementary Practical Organic Chemistry (Part 1); Author: A.I. Vogel.

### *4.2.9 HUM 0231 1202*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** HUM 0231 1202<br>**COURSE TITLE: Communication in English (Practice)** | |
|---|---|
| **CREDIT: 1**.0 (Practice) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course is designed to improve the speaking and listening skills of students in the English language. Emphasis is laid on proper pronunciation for accurate articulation and recognition of speech sounds as well as correct stress, intonation and language use in varied situations. |

| **Objective** |
|---|
| • To enable students' understanding of the variations in pronunciation<br>• To teach proper pronunciation and accurate articulation.<br>• To facilitate appropriate stress and intonation in speech.<br>• To encourage use of English effectively in everyday situations.<br>• To ensure overall improvement of oral communication through listening and speaking. |

**Course Content**
Grammar: Tense, article, preposition, subject-verb agreement, clause, conditional and sentence structure. Vocabulary building: Correct and precise diction, affixes, level of appropriateness, Colloquial and standard informal and formal.
Developing writing skill: Sentences, sentence variety, generating sentences; clarity and correctness of sentences, linking sentences to form paragraphs, writing paragraphs, essays, reports and formal & informal letters.
Listening skill and note taking: Listening to recorded text and class lectures and learning to take useful notes based on listening.
Developing speaking skill: Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the features of the target language to meet various professional and personal communication needs. |
| **CLO2** | **Analyze** the contextual texts and resources related to receptive language skills to practice oral and written communication. |
| **CLO3** | **Develop** fluent oral communication skills individually and in groups. |
| **CLO4** | **Apply** the concepts of basic linguistic commutation techniques to other related areas facilitating learning. |
| **CLO5** | **Demonstrate** various practical skills of the target language applying knowledge of the target language. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | | | | √ | √ | | |
| **CLO2** | | | | | | | | | √ | √ | | |
| **CLO3** | | | | | | | | | √ | √ | | |
| **CLO4** | | | | | | | | | √ | √ | | |
| **CLO5** | | | | | | | | | √ | √ | | |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)


1. Take-off: Technical English for Engineering Course Book with Audio CDs, David Morgan, Nicholas Regan, 2008.
2. Phonetics and Phonology, Peter Roach.
3. Communicative English for Engineers and Professionals, Nitin Bhatnagar, Mamta Bhatnagar.
4. Learning English The Easy Way by Sadruddin Ahmed.
5. Headway Advanced Student's Book with CD and workbook, Oxford University Press- John & Liz Soars.
6. Longman Guide for Writers and Readers- Longman Guide for Writers and Readers- Chris M. Anson and Robert A. Schwegler.


### *4.2.10 CE 0731 1222*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0731 1222<br>**COURSE TITLE: Practical Surveying** | |
|---|---|
| **CREDIT: 1**.5 (Field Work) | **SEMESTER OFFERED:** 1st Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| A field survey is a prerequisite task to be done before the planning and development of any civil engineering/mining project. Therefore, this course has great importance and will contribute to the development of qualified engineers. It is a fieldwork-based course through which students will learn about the tools/techniques of surveying and be able to execute the knowledge at the field level. This course will be helpful for the students to conduct the field survey and develop the skill to generate various maps and drawings relevant to engineering projects. |

| **Objective** |
|---|
| • To provide the necessary knowledge about different types of surveying, their basic principles, and fieldwork procedure, etc.<br>• Acquaint students with practical surveying tools and techniques<br>• To develop the skills for conducting survey work at field-level, and preparing maps/drawing for the respective project. |

**Course Contents:**
Chain survey, Plane table survey, Traverse survey, Leveling and contouring, Route project, Tachometry and Stadia surveying, Height and Distance problem, House setting, Curve setting, Use of Total Station and Global Position Station (GPS)

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Use** the surveying equipment's to conduct a field survey. |
| **CLO2** | **Perform** chain survey, traverse survey, tacheometry survey, total station survey, hydrographic survey. |
| **CLO3** | **Conduct** leveling, setting a layout of a building. |
| **CLO4** | **Comprehend** and **prepare** useful reports, prepare documentation, make effective presentations, give and receive clear instructions. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | √ | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | | | | | √ | | | | | √ | | |

Reference Books:
(List of reference books may vary depending upon the choice of course teachers and time)


1. A text book of surveying–M.A.Aziz & M.Shajahan, Publisher: Dhaka : Hafiz Book Center, c1965.[Reprinted 2010]
2. Surveying (Volume I, II, III), -Dr BC Punmia, Laxmi Publication, 2005
3. Surveying (Volume I, II), -SK Duggal, Tata McGraw-Hill Education, ISBN-9332901031, 9789332901032
4. Surveying & Levelling, -NN Basak, Tata McGraw-Hill Education, Oct 1, 1994
5. Surveying & Levelling, -SV Kulkarn, Pune Vidyarthi Griha Prakashan, 1988.


### *4.2.11 CE 0732 1220*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 1220<br>**COURSE TITLE: Semester Final Viva I** | |
| **CREDIT:** 0.5 (Viva) | **SEMESTER OFFERED: 1st** Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| By this course students will learn how to present themselves in an official forum for viva voce and they may be evaluated based upon the knowledge they achieved from their second year theory and laboratory course |

| **Objectives** |
|---|
| • To familiarize a viva voce exam in a formal platform with a matured attitude<br>• To express the knowledge and skills learnt from theory and laboratory courses<br>• To recap the knowledge and understandings of the taught courses at the end of the year |

**Course Content**

1st year 1st semester and 1st semester theory and sessional courses.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Examine** the necessary skills and knowledge to become a successful civil engineer |
| **CLO2** | Explain and answer the intellectual and technical questions in front of an examination board |
| **CLO3** | **Able** to apply 1st year 1st and 2nd semester knowledge in real-world scenarios to meet desired needs within socioeconomic demand and ethical values. |
| **CLO4** | **Communicate** effectively in written, oral, graphical, and mathematical formats appropriate to civil engineering and express their knowledge in a satisfactory way. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | | √ | | | | | | |
| **CLO2** | | | | | | | | √ | √ | | √ | |
| **CLO3** | | | √ | | √ | | √ | √ | | | | √ |
| **CLO4** | | | | √ | | | | | | √ | | √ |

**Reference Books:**

List of reference books for 1st year 1st semester and 1st year 2nd semester all courses provided by the course teachers.

### *4.3 Second Year: Semester I*

### *4.3.1 CE 0732 2131*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2131<br>**COURSE TITLE:** Mechanics of Solids I | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 2nd Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course will familiarize the students with the knowledge of basics of stress, strain and their application. It also gives them the knowledge of calculating the shear force and bending moment along with shear and bending stresses in determinate beams of different shapes. This knowledge is essential to solve structural engineering problems. |

| **Objective** |
|---|
| • To understand the basics and applications of stress, strain, and material properties<br>• Helping the students to develop the ability to determine stresses and stain in structures under axial loading<br>• To develop the skill of the students for finding out the shear force and bending moment along with shear and bending stresses in determinate beams of different shapes<br>• To facilitate necessary knowledge about riveted joints and welded connections and<br>• To enhance the skill of formulating and solving structural engineering problems. |

**Course Content**

Fundamental concepts of stress and strain. Mechanical properties of materials, strain energy, stresses and strains in members subjected to tension, compression, shear and temperature changes, bending moment and shear force diagrams of beams and frames, flexural and shearing stresses in beams, shear Centre, thin-walled pressure containers, rivetted and welded joints.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Recognize** basic terminologies and theories associated with solid mechanics, i.e., stress, strain, determinate-indeterminate structures, and homogeneous-composite members. |
| **CLO2** | **Analyze** statically determinate beams and frames and draw axial force, shear force, and bending moment diagrams. |
| **CLO3** | **Calculate and analyze** stresses and deformations of different members subjected to various loading conditions and temperature changes using different approaches. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |

Reference Books:

(List of reference books may vary depending upon the choice of course teachers and time)


1. Strength of Materials, Pytel, A. and Singer, F. L., 4th Edition, Harper Coollins Publisher, Singapore, 2013.
2. Mechanics of Materials, Beer, F. P., Johnston, E. R., Dewolf, J. T. and Mazurek, D. F. 5th Edition, McGraw Hill Education, USA, 2005.

3. Theory of Simple Structures, Shedd, T.C. and Vawter, J., 2nd Edition, John Wiley and Sons, New York, London, 2013.
4. Mechanics of Materials, Roy R. Craig, John Wiley & Sons. 3rd Edition, 2010.

### *4.3.2 CE 0732 2133*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2133<br>**COURSE TITLE: Engineering Materials** | |
|---|---|
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 2nd Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| Engineering materials are important both from a scientific perspective, as well as towards applications. In the race of modern science and technology, to make things stronger, cheaper, lighter, more functional, and more sustainable, the manipulation of materials, their properties and processes are key. So, materials are of the utmost importance for engineers (or other applied fields), as the usage of the appropriate materials is crucial when designing systems. This course will provide the students a comprehensive understanding of the composition, manufacturing, properties and engineering behavior of materials used in various civil engineering applications. |

| **Objective** |
|---|
| • To introduce the basic ideas about some most used construction materials, their properties, uses, availability etc.<br>• To introduce the factors for selection of the desired engineering materials<br>• To learn about the manufacturing process, quality control parameters and field test of bricks, cement and aggregates (fine and coarse)<br>• To introduce the basic theories of concrete technology and their functional use in construction works<br>• Helping the students in designing the mix ratio of concrete by different method<br>• To develop skills to identify the quality of Timber, Rubber, Plastic, Glass, Paints and Varnish for engineering construction. |

**Course Content**

Introduction: Importance and functional impact of engineering materials in the point of view of environmental engineering; Basic civil engineering materials: Properties and uses of Bricks, Cement, Aggregates, Cement and lime mortars, Concrete, Stone, Sand and Fineness modulus; Concrete; Constituent of Concrete; Properties of Concrete; Design of Concrete mix; Glass: Nature, forms and types of glasses; Timber: Nature, forms and types of timber and classification; Plastics: Fundamental characteristics, classification, some typical examples of plastics and their uses; Rubber: sources of natural rubber, chemical treatment of latex, raw materials, synthetic reactions and properties of synthetic rubber; Corrosion: Nature, Forms and types of corrosion, electrochemical mechanism and prevention of corrosion. Paints, varnishes and metallic coatings, methods used in applying coatings on metal surface; Atomic structure and bonding: Yielding, Fractures and Elasticity.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Recognize** the properties of various civil engineering materials, including brick, aggregate, sand, cement, lime, paint, plywood, plastic-wood, and timber. |

| | |
|---|---|
| **CLO2** | **Understand** the differences between cement and lime considering manufacturing process, types, and composition. |
| **CLO3** | **Understand** the types, properties, applicability, and limitations of commonly used construction materials |
| **CLO4** | **Recognize** the quality control procedures in manufacturing, transporting, and placing of Portland Cement Concrete. |
| **CLO5** | **Choose** appropriate concrete materials and perform concrete mixes to be used in the construction. |
| **CLO6** | **Understand** the micro behavior of engineering materials and evaluate causes of chemical reactions in normal dry Reinforced concrete and offshore structures. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | | √ | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |
| **CLO5** | √ | √ | | | | | | | | | | |
| **CLO5** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Fundamental of Building Construction Materials and Methods, E. Allen and J. Iano, John Wiley & Sons., NY, 2004.
2. Building Materials, S. K. Duggal, New Age International, 2009.
3. Text Book of Engineering Materials, S. Singh, Konark Publishers Pvt. Ltd.
4. Text Book of Engineering Materials, D.S.Arora, Kalyani Publishers.
5. B.C. Punmia, 'Building Construction' Laxmi Publications Pvt. Ltd.
6. Building Construction by Sushil Kumar, Standard Publishers, Delhi.
7. Concrete Technology, A. M. Neville and J. J. Brooks, 2nd Edition, Pearson Education Ltd, England, 1987,.
8. Concrete Technology: Theory and Practice, M S Shetty, Revised Edition, S. Chand Publication, 2008.
9. A textbook of Engineering Materials, M A Aziz, Trans-World Book Co., 2004.


### *4.3.3 CE 0541 2135*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0541 2135<br>**COURSE TITLE: Numerical Analysis** | |
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED: 2nd** Year 1st Semester |
| **Exam Hours:** 2.00 | |

| **Synopsis/Rationale** |
|---|
| This course introduces different computational methods to solve a mathematical problem numerically. Based on sound knowledge in computational mathematics, numerical methods will enable the students to develop the ability to solve various complicated mathematical problems associated with different branches of Civil and Environmental Engineering. |

| **Objective** |
|---|

- To acquaint the students with the basic tools and fundamental theories of Numerical Analysis
- To give an idea about the accuracy of standard numerical methods
- To facilitate necessary knowledge about different numerical methods for various mathematical operations and tasks, such as Interpolation, differentiation, Integration
- To provide the knowledge of numerical methods to solve algebraic and transcendental equations, to find the root and to solve a differential equation and to fit a curve
- Help students to familiarize themselves with the computer application of different numerical methods using MATLAB and Excel.

**Course Content**

Numerical solution of algebraic and transcendental equations; solution of systems of linear equations; linear and non-linear curve-fitting by least square regression; finite differences; divided differences; interpolation; numerical differentiation and integration; numerical solution of differential equations.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Explain the core ideas and concepts of numerical methods for solving complicated Engineering calculations approximately |
| **CLO2** | Apply various numerical methods for performing tasks, such as Interpolation, differentiation, integration |
| **CLO3** | Explore rigorous, analytic, highly numerate strategy to analyze and solve problems such as finding roots of equations, solving differential equations and curve fitting to a given data set |
| **CLO4** | Formulate methods for analyzing error induced from approximate results |
| **CLO5** | Evaluate different numerical methods using MATLAB and Excel. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | √ | | | | | |
| **CLO2** | | √ | | | | | √ | | | | | |
| **CLO3** | | √ | | | | | √ | | | | | |
| **CLO4** | | √ | | | | | √ | | | | | |
| **CLO5** | | √ | | | | | √ | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Chapra, S.C. and Canale, R.P. (6th edition), Numerical Methods for Engineers, ISBN-13: 978-0073401065
2. Bilal, M.A. and Richard, H.M (2015), Numerical Analysis for Engineers: Methods and Applications, Chapman and Hall/CRC, ISBN 9781482250350
3. Carl .E. Pearson, C.E (1986), Numerical Methods in Engineering & Science, Chapman and Hall/CRC, ISBN 9780442273446
4. S.S. Sastry, Introductory methods of numerical analysis, 4th edition, Prentice hall of India, 2007.
5. A.R. Vasishtha and V. Vasishtha, Numerical analysis, Kedar Nath Ram Nath, 2007
6. E. Ward Cheney and David R. Kincaid, Numerical Mathematics and Computing, 5th Edition, Brooks/Cole Publishers, 2004
7. R. Burden, and J. D. Faires, Numerical Analysis, PWS Kent Publishers, 1993.


### *4.3.4 MAT 0541 2103*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: MAT 0541 2103**<br>**COURSE TITLE:** Vector Analysis, Laplace Transforms, Fourier Analysis & Harmonic Functions | |
|---|---|
| **CREDIT: 3**.00 (Theory) | **SEMESTER OFFERED:** 2nd Year 1st Semester |
| **Exam Hours: 3**.00 | |

| **Rationale** |
|---|
| Vector algebra have become basic part of fundamental mathematical background required of those in engineering, sciences and allied disciplines. Introduce students to the fundamentals of vector algebra. Learn vector differentiation, Integration and some theorem of vectors .The Laplace transform reduces a linear differential equation to an algebraic equation ,which can be solved by the formal rules of algebraic equation .The Laplace transform converts a signal to a complex plane and the Fourier transform is a subset of Laplace transform .Fourier transform used in designing electric circuit ,solving differential equations ,signal processing ,signal analysis ,image processing and filtering . |

| **Objectives** |
|---|
| • Vector Analysis is a mathematical shorthand. The vector form helps to provide clearer understanding of the physical law. This makes the calculus of the vector functions the natural instrument for the physicist and engineers in solid mechanics, electromagnetism.<br>• Introduce students to the fundamentals of vector algebra. Learn vector differentiation, Integration and some theorem of vectors.<br>• Learn the concept of Fourier and Laplace transformation to solve problems related with their discipline. |

**Course Contens:**

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Resolution of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple products and multiple products. Application to geometry and mechanics. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integral. Gradient, divergence and curl of point functions. Various formulae. Gauss's theorem ,stoke's theorem, Green's theorem and their applications.

Laplace transforms: Definition of Laplace transforms, sufficient conditions for existence of Laplace transforms; inverse Laplace transforms; Laplace transforms of derivatives; the unit step function; periodic function; some special theorems on Laplace transforms; partial fraction; solutions of differential equations by Laplace transforms.

Fourier Analysis: Fourier series, convergence of Fourier series; Fourier integral; Fourier transforms and their applications.

Harmonic Functions: Definition of harmonic function; Laplace equation in Cartesian, polar, cylindrical and spherical coordinates, solutions of these equations with applications; Properties of harmonic functions.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand vector and its applications in applied sciences and engineering. |
| **CLO2** | Develops ability to solve mathematical problems involving vectors.<br>Develops ability to solve mathematical problems involving vectors. |
| **CLO3** | Competently use vector algebra as a tool in the field of applied sciences and related fields. |
| **CLO4** | Find Laplace transform of basic functions ,derivatives , antiderivatives of a function and solve initial value problem of ODE and PDE . |
| **CLO5** | Learn about Fourier series and Fourier Transform to help in the analysis of signal processing . |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| PLO/ CLO | PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 | PLO 9 | PLO 10 | PLO 11 | PLO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO 1** | √ | √ | | √ | √ | | | | | √ | | |
| **CLO 2** | √ | √ | | √ | √ | | | | | √ | | |
| **CLO 3** | √ | √ | | √ | √ | | | | | √ | | |
| **CLO 4** | √ | √ | | √ | √ | | | | | √ | | |
| **CLO 5** | √ | √ | | √ | √ | | | | | √ | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

- M. R. Spiegel: *Vector Analysis*
- Abu Yousuf *: Method of applied Mathematics*
- M. R. Spiegel *: Laplace Transform*

### *4.3.5 CSE 0011 2113*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CSE 0011 2113<br>**COURSE TITLE:** Introduction to Computer Language | |
|---|---|
| **CREDIT: 2** (Theory) | **SEMESTER OFFERED: 2nd** year 1st semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| To familiarize the student with basic concepts of computer programming and developer tools. To present the syntax and semantics of the "C" language as well as data types offered by the language. To allow the students to write their own programs using standard language infrastructure regardless of the hardware or software platform in the field of civil engineering. |

| **Objectives** |
|---|
| ● To provide students a basic understanding of computer hardware and how a computer works<br>● To make students understand the basic terminology used in computer programming<br>● To facilitate with knowledge of how to write, compile and debug programs in the C language<br>● To help students write programs involving decision structures, loops, functions, and pointers<br>● To help students develop skills on standard programming practices and how to build up their own logic and how to implement them in civil engineering field. |

**Course Content**

Computer Basics: Concept on Computer Hardware, Software and its classification, networking and Internet.

C-Language: Preliminaries, Program constructs variables and data types in C. Input and Output, Character and formatted I/O; Arithmetic Expression and Assignment statements; Loops and Nested Loops; Decision making; Arrays, Function; Arguments and local variables, calling functions and arrays, Recursion and recursive function; Structures within structure, files, file functions for sequential and Random I/O ; Pointers; Pointers and structures; Pointer and functions; Pointer and arrays; Operation and Pointer, Pointer and memory addresses; Operation on Bits; Bit Operation; Bit field; Advanced features; Standard and Library.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the basic computer system, flow diagram and the basic programming ideas with data types, operators, and expressions. |

| | |
|---|---|
| **CLO2** | **Write** the codes of the program using an array, pointers, functions, etc., for simple mathematical operations and processes. |
| **CLO3** | **Compile** the programs to solve civil engineering problems and work with the classes and objects. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | | | | √ | | | | | | | |
| **CLO3** | | √ | | | √ | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Teach Yourself C , Herbert Schildt, Third Edition, 1997.
2. Teach Yourself C++, Herbert Schildt, Third Edition, 1994.
3. The C++ Programming language, Bjarne Stroustrup, Fourth Edition, 2014.
4. C++ Primer, Stanley B. Lippman, Josse Lajoie, Barbara E. Moo, Fifth Edition.


### *4.3.6 HUM 0411 2105*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** HUM 0411 2105<br>**COURSE TITLE: Accounting** | |
| **CREDIT:** 2.00 (Theory) | **SEMESTER OFFERED:** 2nd Year 1st Semester |
| **Exam Hours:** 2.00 | |

| **Rationale** |
|---|
| This course will provide the students to accumulate and report on financial information about the performance, financial position, and cash flows of a business. |

| **Objectives** |
|---|
| • To describe the cost concepts, cost behavior, and cost accounting techniques that are applied to manufacturing and service businesses.<br>• To be capable to interpret cost accounting statements,<br>• To provide the students with the capability to apply theoretical knowledge in decision making.<br>• To be able to analyses and evaluate information for cost ascertainment, planning, control of business operations. |

**Course Content**

Principles of accounting: accounts, transaction, the accounting procedure and financial statements. Cost in general: objectives and classifications. Overhead costing. Cost sheet under job costing operating costing and process costing. Marginal costing: tools and techniques, cost-volume-profit analysis. Relevant costing: analyzing the profitability within the firm, guidelines for decision making. Long-run planning and control: capital budgeting.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the concept of bookkeeping and accounting in manufacturing and service businesses. |
| **CLO2** | **Prepare** and **preserve** accounting information related to business and development projects. |
| **CLO3** | Able to express the place and role of cost accounting in the modern economic environment. |
| **CLO4** | Recognize and apply the skills necessary for carrying out effective management decision-making and strategic management planning; |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | | | | | | √ | |
| **CLO2** | | | | | | | | | | | √ | |
| **CLO3** | | √ | | | | | | | | | √ | |
| **CLO4** | | √ | | √ | | | | | | | √ | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Cost Accounting –Volume-1 by Basu and Das;
2. Managerial Accounting by Ray H. Garrison, Eric W. Noreen
3. Advanced Financial Accounting by Richard E. Baker


### *4.3.7 CE 0732 2124*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2124<br>**COURSE TITLE: Details of Constructions** | |
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 2nd year 1st semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course will familiarize the students with the knowledge of supervising a construction project's site, ensuring expected quality and specified compliances. The students will also be introduced to construction site safety and construction laws and regulations. This knowledge is essential for the execution of any civil structure and infrastructure projects. |

| **Objective** |
|---|
| • To interpret drawing and specifications and implement them in-field<br>• To familiarize with various field tests of construction and building materials and their applications controlling construction quality<br>• To understand the procedure of checking construction formwork, steel fabrication, quality of concrete, concrete placement and curing, earth cutting and construction techniques of different types of foundation<br>• To comprehend road construction techniques and quality assurance<br>• To learn the basic concept of site safety, time and cost management of a project and to introduce with the BNBC provisions for construction |

**Course Content**

Foundations, different types of foundations, brick masonry, framed structures and bearing walls; arches and lintels, details of floors and roofs, pointing, plastering and interior finishing, scaffolding, staging, shoring and underpinning, thermal insulation and acoustics, House plumbing.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Identify** different types of civil engineering structures and their components**.** |
| **CLO2** | **Recognize** the construction procedure of different civil engineering works. |
| **CLO3** | Check construction formwork, examine steel fabrication, quality of concrete |
| **CLO4** | Synthesize the basic concept of site safety, time and cost management of a project |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | √ | | | | | √ | | | | | |
| **CLO4** | | √ | | | | | | | | √ | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. BNBC, "Bangladesh National Building Code", *Housing and Building Research Institute Dhaka, Bangladesh*, 2006.
2. Latifee, E.R.; "Engineering Materials", 2007.
3. Nilson, A.H., Darwin, D., Dolan, C.W.; "Design of Concrete Structures" *13thEd.,McGraw-Hill*, 2004.
4. P. Purushothama Raj; "Building Construction Materials and Techniques", Pearson Education India, 2016. ISBN 9789332579118
5. Edward Allen, and Joseph Iano;"Fundamentals of building construction: materials and methods Sixth edition."Publisher-Wiley, 2014, ISBN: 9781118138915
6. Branoff, Theodore J., author. "Interpreting engineering drawings Eighth edition." Eighth Edition; Publisher: Cengage Learning, 2016; ISBN: 9781133693598
7. David Kent Ballast, FAIA, "Architect's Handbook of Construction Detailing." Second Edition. John Wiley & Sons, Inc. 2009.
8. "Preparation of Construction Specifications for Civil Projects." Published by ASCE; ISBN 978-0-7844-7794-6 (ebook); 2013.


### *4.3.8 CE 0732 2136*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2136<br>**COURSE TITLE: Mechanics of Solids Sessional** | |
| **CREDIT:** 1.5 (Theory) | **SEMESTER OFFERED:** 2nd year 1st semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| This course will make the students familiar with various methods to analyze material properties through experiments which will enhance their theoretical knowledge |

| **Objective** |
|---|

- To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads
- Helping the students to develop the ability to understand the design for strength and stiffness

**Course Content**

Tension, direct shear and impact tests of mild steel specimen, compression test of timber specimen, slender column test, static bending test, hardness test of metals, helical spring tests, determination of shear Centre, load-deflection behavior of simple beam.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the fundamental behavior of different materials at different loading conditions. |
| **CLO2** | **Evaluate** the allowable loads and allowable stresses of different materials subjected to tension, compression, shear, torsion, bending, buckling, impact and combined stresses; **take decision** to select the appropriate structural materials for an engineering job/work. |
| **CLO3** | **Design** and **conduct** experiments as well as **analyze** and **interpret** data; **present** the results in a professional report form. |
| **CLO4** | **Develop** collaborative skills by working with other students in groups. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs):**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | | √ | √ | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Laboratory manual for material testing.
2. Strength of Materials, A. Pytel, F.L. Singer, Harper & Row Publishers, New York, 4th Edition, 2014
3. Mechanics of Materials, Beer, F. P., Johnston, E. R., Dewolf, J. T. and Mazurek, D. F., 5th Edition, McGraw Hill Education, USA, 2005.
4. Theory of Simple Structures, Shedd, T.C. and Vawter, J., 2nd Edition, Jhon Wiley and Sons, New York, London, 2013.
5. Mechanics of Materials, Roy R. Craig, John Wiley & Sons. 3rd Edition, 2010.


### *4.3.9 CE 0732 2138*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE**: CE 0732 2138<br>**COURSE TITLE: Engineering Material Sessional** | |
| **CREDIT:** 1.50 (Sessional) | **TERMS OFFERED:** 2nd year 1st semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| Students will determine different properties of engineering materials indicating the quality and strength of the materials |

| Objective |
|---|
| • To introduce the strength and properties of cement<br>• To analyze and classify the properties of fine and coarse aggregate<br>• To facilitate necessary knowledge about properties of bricks and timber<br>• To acquaint students with the properties of concrete. |

**Course Content**

General discussion on preparation and properties of concrete. Test for specific gravity. Unit weight, 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.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Perform** the physical tests for the different construction materials (i.e., cement, fine aggregate, coarse aggregate) and **evaluate** their engineering properties. |
| **CLO2** | **Choose** appropriate materials for a construction job. |
| **CLO3** | Control the quality of different construction materials **(Evaluate).** |
| **CLO4** | **Comprehend** and **write** effective reports; prepare documentation; **make** effective presentations; **give** clear instructions and **communicate** effectively. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | √ | | | | | √ | | | |
| **CLO2** | | | | √ | | √ | | | | | | |
| **CLO3** | | | √ | | | | | √ | | | | |
| **CLO4** | | | | | √ | | | | | √ | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Laboratory Manual, ASTM Standard requirements of specification.

### *4.3.10 ME 0715 2102*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: ME 0715 2102**<br>**COURSE TITLE:** Carpentry Shop, Machine shop and Welding shop Sessional | |
|---|---|
| **CREDIT: 1**.5 (Sessional) | **SEMESTER OFFERED:** 2nd Year 1st Semester |
| **Exam Hours: NA** | |

| Rationale |
|---|
| In order to have a balanced overall development of engineering graduates, it is necessary to integrate theory with practice. Workshop practice has been included in the curriculum to provide hands-on experience using different tools of Carpentry shop, Machinery shop and Welding shop. By studying Workshop Practice, students will learn to explain the function, use, and application of different working tools, equipment, machine tools, and the technique of construction fittings, manufacturing machinery parts from raw material. |

| **Objectives** |
|---|
| ▪ to facilitate necessary knowledge about the specification of machine tools used in Carpentry shop, Machinery shop, Welding shop and manufacturing industries;<br>▪ to develop skill in identifying the machine tool components and their respective functions, and performing various machining operations on the machine tools used in practice;<br>▪ To help students develop the ability to identify and differentiate the work holding devices used in practice to manufacture a product. |

**Course Content**

Wood working tools: Wood working machine: Band saw. scroll saw, circular saw, jointer, thickness planer, disc sander, weed lathe; Types of sawing; Common cuts in wood works; Types of joint; Defects of timber: Natural defects and artificial defects; seasoning; Preservation; Substitute of timber; Commercial forms of timber. Characteristics of good timber; Use of fastening; Shop practice: Practical job, planning and estimating of a given job.

Kinds of tools: Common bench and hand tools: Marking and layout tools, measuring tools, cutting tools, machine tools, bench work with job. Drilling, Shaper, Lathe and Milling Machines: Introduction, type, size and capacity, uses and applications.

Methods of metal joints: Riveting, grooving soldering, welding; Types of welding joints and welding Practice; of are welding and polarity: Flat, vertical, horizontal, overhead; Electric Arc welding and its machineries; Welding of different types of materials: Low carbon steel, cast iron, brass, copper, stainless steel, aluminum; Types of electrode, fluxes and their composition; Arc welding defects; Test of Arc welding: Visual, destructive and non-destructive tests.

Types of gas welding system and gas welding equipment: Gases and types of flame; welding of different types of materials; Gas welding defects; test of gas welding.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Identify** various tools used in welding, carpentry, and machine shops. |
| **CLO2** | **Describe** different types of joints in metal and wood. |
| **CLO3** | **Apply** arc and gas welding in practical engineering works. |
| **CLO4** | **Identify** defects in materials and their recovery process. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | √ | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | | | | | √ | | | | | | |
| **CLO4** | √ | | | √ | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Farm and Workshop Welding, Third Revised Edition: Everything You Need to Know to Weld, Cut, and Shape Metal (Fox Chapel Publishing) Learn and Avoid Common Mistakes with Over 400 Step-by-Step by Andrew Pearce
2. Manual of First and Second Fixing Carpentry, 3rd ed by Les Goring

### *4.4 Second Year: Semester II*

#### *4.4.1 CE 0732 2231*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2231<br>**COURSE TITLE: Mechanics of Solids II** | |
|---|---|
| **CREDIT**: 3.0 (Theory) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course will familiarize the students with the basic knowledge of torsion, transformation of stress, deflection of beams, analysis of column etc. This knowledge is essential to analyze and design various components of a structure. |
| **Objectives** |
| • To conceptualize basic theories of torsion, angle of twist, stresses in circular shafts and helical springs<br>• To provide the knowledge of stress transformation, principal plane and stress, maximum in-plane shear stress, Mohr's circle<br>• To comprehend the methods of determining deflections of beams and cantilevers under the different types of loadings using various methods, i.e., double-integration method, moment area method and conjugate beam method. |

**Course Content**

Deflection of beams: Integration and moment area methods; Torsion; Helical springs; principal stress; Mohr's Circle; Columns; Euler's formula; Intermediate column formulas; the secant formula; Flesure formula of curved beams; Truss; Joint method section method.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Distinguish** the symmetrical and unsymmetrical bending of beam members **and calculate** the principal stresses, strains and response of deformable solids using different methods. |
| **CLO2** | **Analyze** cable and cable-supported structures. |
| **CLO3** | **Understand** different types of joints, connections, and modes of failure; design the joints under concentrically and eccentrically applied load. |
| **CLO4** | **Calculate** the deflection of statically determinate beams using different methods, and **draw** the deflected shape of beams under a given loading condition. |
| **CLO5** | **Recognize** buckling, modes of buckling, slenderness ratio and **analyze** the capacity of steel column under axial compression. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |
| **CLO5** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Strength of Materials, A. Pytel, F.L. Singer, Harper & Row Publishers, New York, 4th Edition, 2014
2. Engineering Mechanics of Solids, E. P. Popov, 2nd Eidtion, Peasrson Education, India, 2015
3. Mechanics of Materials, R. C. Hibbler, Prentice Hall, 6th Edition, 2004;
4. Mechanics of Materials, J. M. Gere & B. J. Goodno 7th Edition, 2008;
5. Mechanics of Materials, P. Timoshenko, 4th Edition, PWS Pub Co., 1997.


### *4.4.2 CE 0732 2235*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2235<br>**COURSE TITLE: Fluid Mechanics** | |
|---|---|
| **CREDIT:** 3.00 (Theory) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours: 3.00** | |

| **Rationale** |
|---|
| This course will familiarize the students with the knowledge of fundamental fluid mechanics based upon a sound background in engineering mechanics. This knowledge is essential for the execution of water-related projects (such as pipe flow, sewer flow, open channel flow) and hydraulic engineering works. |

| **Objectives** |
|---|
| • To facilitate necessary knowledge about the fundamental fluid properties and accumulate basic concepts to determine the pressure exerted by a fluid (compressible and incompressible) on a submerged object, and the location and magnitude of the resultant force of the fluid on the object<br>• Understand the basic principles (such as conservation laws of<br>• mass, momentum and energy) and equation in fluid mechanics to solve fluid flow problems<br>• Help the students to develop ability in computing head loss in the pipe for laminar and turbulent flow<br>• To enhance the skill of determining the performance characteristics of fluid machinery. |

**Course Content**

Development and scope of fluid mechanics. Fluid properties. Fluid statics. Kinematics of fluid flow. Fluid flow concepts and basic equations continuity equation, Bernoulli's equation, energy equation, momentum equation and forces in fluid flow. Similitude and dimensional analysis. Steady incompressible flow in pressure conduits, laminar and turbulent flow, general equation for fluid friction. Empirical equations for pipe flow. Minor losses in pipe flow. Fluid measurement: Pitot tube, orifice, mouthpiece, nozzle, venturimeter, weir. Pipe flow problems pipes in series and parallel, branching pipes, pipe networks.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the fluid properties and calculate the hydrostatic pressure, buoyant force and check the stability of the static and buoyant bodies. |
| **CLO2** | **Calculate** and analyze flow velocity of fluid and energy loss during flow. |
| **CLO3** | **Analyze** the water distribution system through various pipe network configurations. |

| | |
|---|---|
| **CLO4** | **Solve** simple and complex flow-related problems using Dimensional and model analysis. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs):**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | | √ | | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Fluid Mechanics, with Engineering Applications, Robert Long Daugherty, Joseph B. Franzini, McGraw-Hill.
2. A Textbook of Fluid Mechanics, R.K. Rajput, S. Chand & Company Ltd. New Delhi, 1998.
3. A Textbook of Hydraulics and Fluid Mechanics, R.S. Khurmi, Chand &company Ltd. India, 1987.


### *4.4.3 CE 0532 2223*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0532 2223<br>**COURSE TITLE: Hydrology** | | |
|---|---|---|
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED: 2nd** Year 2nd Semester | |
| **Exam Hours: 2**.00 | | |

| **Rationale** |
|---|
| This course will familiarize the students with the basics of engineering hydrology which covers the Hydrological cycle, Catchment, Losses, Hydrographs, Hyetographs, Precipitation, Streamflow, Runoff, Floods, and Flood Routing. Design topics such as flood frequency analysis, peak flow estimation, design hydrograph estimation, groundwater process and modeling, and Flood control/yield hydrology are also covered in this course. Knowledge of hydrology is vital for the sustainable management of water sources. This course acquainted students with different information on hydrology which helps them to solve practical problems efficiently. |

| **Objectives** |
|---|
| • To facilitate necessary knowledge about the occurrence, circulation, distribution of water on Earth.<br>• Acquaint students with the basic knowledge of hydrological processes, hydrologic cycle on earth and earth's atmosphere and different hydrological events like Precipitation, Streamflow, Runoff, Flood, etc.<br>• Accumulate basic ideas to compare and assess (e.g. how they work, what their impediments are) several methods for determining peak flows, flood hydrographs, and flood routing which will help to solve real problems. |

**Course Content**

Hydrologic cycle. Weather and Hydrology. Precipitation, Evaporation and transpiration. Infiltration. Stream flow. Application of telemetry and remote sensing in hydrologic data acquisition. Rainfall runoff relations. Hydrographs, unit hydrographs. Hydrologic routing. Statistical methods in hydrology.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** and calculate the hydrological parameters, i.e., rainfall, evapotranspiration, streamflow, groundwater flow. |
| **CLO2** | **Develop** discharge hydrographs from catchments and the routing of flood hydrographs along stream channels and within reservoirs. |
| **CLO3** | **Analyze** design storm and flood magnitude based on a frequency analysis of historical data and demonstrate hydrologic models. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | √ | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Engineering Hydrology, K. Subramanya, 4th edition, Tata McGraw Hill Education Limited.
2. A Textbook of Hydrology, P. J. R. Reddy, 3rd edition, University Science Press.
3. Hydrology and Water Resources Engineering, S. K. Garg, 5th or later edition, KHANNA PUBLISHERS.
4. Handbook of Applied Hydrology, V. P. Singh, 2nd edition, McGraw Hill Education.


### *4.4.4 CE 0532 2237*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0532 2237<br>**COURSE TITLE: Engineering Geology and Geomorphology** | |
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course will familiarize the students with the basics of engineering geology and geomorphology in the Bangladesh context which covers the earth and its materials, the structure of these materials, natural forces acting upon them, water patterns, the assessment of landform changes, the impacts of development on the environment, the risks from surface processes, etc. As most of the civil engineering projects involve the earth and its features, the fundamental knowledge of geology and geomorphology is vital for understanding the stability of land to sustain the proposed project/structure. This course also supports students to know the water patterns and determine if a particular site is inclined to flooding. |

| **Objectives** |
|---|
| • To provide knowledge about the theory and application of engineering geology and geomorphology concerning civil and environmental engineering demand.<br>• Helping the students to develop ability in drawing, reading, and interpreting the geologic map for analysis and design purposes.<br>• Accumulate basic ideas about various rock and minerals, geology, and geomorphology of Bangladesh. |

**Course Content**

Minerals, identification of minerals, common rock forming minerals, physical properties of minerals, mineraloids rocks, types of rocks, cycle of rock change, earthquake and seismic map of Bangladesh.
Structural geology, faults, types of faults, fold and fold type, domes, basins, erosional process, quantitative analysis of erosional land forms.
Channel development, channel widening, valley shape, stream terraces, alluvial flood plains, deltas and alluvial fans, channel morphology, channel patterns and the river basin, geology and geomorphology of Bangladesh.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the formation process and mechanics of minerals, rocks, and geomorphic processes that modify the Earth's surface. |
| **CLO2** | **Interpret** geological maps, and **practice** geological concepts in an engineering context. |
| **CLO3** | **Identify** the distinctive landforms, sediments, and flow associated with a channel. |
| **CLO4** | **Apply** the knowledge and skills in geomorphology to interpret hydrologic data and **evaluate** the effects of river systems flow. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | | | √ | | | | | | | | |
| **CLO4** | √ | | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Foundations of Engineering Geology, Waltham, A. , 3rd Edition, Spon Press, 2009.
2. Foundations of Engineering Geology, Waltham, A. , 3rd Edition, Spon Press, 2009.
3. Concepts in Geomorphology, Bierman, PR., and Montgomery, DR., Key New York (NY): W.H. Freeman and Company, 2014.
4. Engineering Geology, Bell, F.G., Burlington: Elsevier, 2007.
5. Practical Engineering Geology, Hencher, S., Spon Press, London, 2012.
6. Principles of Engineering Geology, Johnson, R.B. and DeGraff, J.V., Wiley, 1st Edition, 1998.
7. Earth: An Introduction to Physical Geology, Edward J. Tarbuck, Frederick K. Lutgens and Dennis G. Tasa. 12th edition, 2017.
8. Essentials of Geology, Stephen Marshak. Fifth edition,2016.


### *4.4.5 MAT 0541 2205*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE: MAT 0541 2205**<br>**COURSE TITLE: Applied Mathematics for Engineers** | |
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| Acquire knowledge to analyze applied data in the field of engineering. |

| **Objectives** |
|---|
| • To provide knowledge of power series solution of differential equations, Fourier series, Laplace equation and Statistics in order to analyze the data: descriptive way as well as inferential way |

**Course Content**

Review of differential equations; power series solution of differential equations and their applications: Frobenius method, Legendre's polynomials, gamma function, Bessel's function; integral form of differential equation and its application to engineering problem solving.

Fourier series and its properties, application to engineering problem solving; Fourier integral; Fourier transforms and their uses in solving boundary value problems; diffusion equation, wave equation, Laplace equation and their applications.

Application of statistical methods to engineering problems: Random variables; discrete and continuous probability distributions; functions of random variables and derived distributions; expectation and moments of random variables; point estimation of distribution parameters: methods of moments and maximum likelihood, Bayesian analysis; confidence intervals; hypothesis tests; nonparametric statistical tests; simple and multiple linear regression and model selection; uncertainty and reliability analysis; project level decision making and quality control.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the properties of differential equations and Laplace transforms to formulate and solve complex engineering problems. |
| **CLO2** | **Understand** the properties of matrices, vectors, and Fourier series. |
| **CLO3** | **Formulate** and **solve** the engineering problems using matrix, vector, and Fourier series. |
| **CLO4** | Understand about the basic tools of statistics make correlation and regression between the variables. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | √ | | | | √ | √ | |
| **CLO2** | | √ | | | | | | | | | √ | |
| **CLO3** | | | | | | √ | | | | √ | | |
| **CLO4** | | | | √ | | √ | | | | | | |

**REFERENCE BOOKS**: (List of reference books may vary depending upon the choice of course teachers and time)


1. Vector Analysis, Schaum's Outline Series, M. Spiegel, S. Lipschutz and D. Spellman, 2nd edition.
2. Mathematical Methods, Volume-2, Prof. Md. Abdur Rahman
3. Linear Algebra, Prof. Md. Abdur Rahman
4. Co-ordinate Geometry with Vector Analysis, Rahman & Bhattacharjee
5. Ayres, F: Matrices
6. A G Hamilton: Linear Algebra
7. Spiegel, M. R.: Laplace Transform
8. Khanna, M. L.: Laplace Transforms
9. Khanna, M. L.: Partial Differential Equations
10. Gupta S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics, 10th ed, Sultan chand and sons, 2000

11. Hogg R V & Craig A T, Introduction to Mathematical Statistics, 5th Ed, Macmillan, London, 1995
12. DeCoursey, W J. Statistics and Probability for Engineering Applications, Newnes, Elsiver Science (USA), 2003
13. Montgomery, D C and Runger, G C. Applied Statistics and Probability for Engineers, 3rd Ed, John Wily and Sons, 2003.

### *4.4.6 CE 0532 2226*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0532 2226<br>**COURSE TITLE: Remote Sensing and GIS** | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will familiarize the students with the basics of remote sensing and GIS. This knowledge will be invariably important in analyzing remote data and to represent those data in graphical form. |

| **Objectives** |
|---|
| • To provide necessary knowledge about the fundamental of remote sensing and its relation with GIS<br>• Help the students to develop ability in analyzing spatial data, using GIS analysis tools<br>• To develop the skill of creating maps, images and applications to communicate spatial data in a meaningful way. |

**Course Content**
Introduction to remote sensing and GIS, aerial photography, digital image processing, use of arc-views.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the basics of remote sensing and GIS |
| **CLO2** | Analyze the geo-spatial data using QGIS |
| **CLO3** | Apply the knowledge of GIS to create maps and images to represent spatial data. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | | | | | | | √ | | | | | |

**REFERENCE BOOKS**: (List of reference books may vary depending upon the choice of course teachers and time)

1. Bhatta, B. (2011). Remote Sensing and GIS. *Oxford*. ISBN: 978-0198072393

### *4.4.7 CE 0732 2236*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2236<br>**COURSE TITLE: Fluid Mechanics Sessional** | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| Experiments in fluid mechanics are undoubtedly very important part of investigation. Their significance is dual such as inspirational and proving. Experiments can give an impetus to theoretical studies, modelling of flow fields and flow effects, and preparation of numerical simulations. |

| **Objectives** |
|---|
| • To introduce the experiments based on various theorem related to fluid mechanics<br>• Acquint water flow from various hydraulic weirs |

**Course Content**

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.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Perform** the physical tests for different hydraulic devices (i.e., weir, orifice, V-notch, etc.) to **determine** their capacity and efficiency. |
| **CLO2** | **Choose** an appropriate hydraulic device to meet the job/work demand. |
| **CLO3** | **Comprehend** and **write** effective reports, **prepare** documentation, **make** effective presentations, **give** and **receive** clear instructions. |

## Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | √ | | | |
| **CLO2** | | | | √ | | | | | | | | |
| **CLO3** | | | | | | | | | | √ | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


2. A textbook of Fluid Mechanics, R.K. Rajput, S. Chand &company Ltd. New Delhi, 1998.
3. A Textbook of Hydraulics and Fluid Mechanics, R.S. Khurmi, Chand &company Ltd. India, 1987.
4. Fluid Mechanics, with Engineering Applications - by Robert Long Daugherty, Joseph
5. B. Franzini, McGraw-Hill.
6. Other resources: Laboratory Manual of Fluid Mechanics Sessional, Department of Civil Engineering, SEC, Sylhet.

### *4.4.8 CE 0732 2228*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2228<br>**COURSE TITLE: Quantity Surveying** | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 2nd Year 2nd Semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will familiarize the students with the quantity take-off or bill of quantity (BoQ) of different materials, equipment, and resources for a civil engineering project. This knowledge is essential for the budget preparation, material/resource scheduling, and time and cost management of any civil structure and infrastructure projects. |

| **Objectives** |
|---|
| • To introduce relevant techniques and tools in the preparation of cost estimates and project budget as well as in the monitoring of project cost performance<br>• To enhance the skills on the direct cost and indirect cost of a project, estimate earth-work, rebar, brick, cement, sand, stone/brick-chips required for constructing a structure<br>• To develop the skill for calculating man-hour, labor cost, and material cost, and estimating the indirect cost for a project, and understanding contingency cost |

**Course Content:**

Quantity estimates of items of civil works e.g. building, bridge, truss and highway. Analysis of rates, detail estimate of all items of works of a building, use of software in quantity surveying; Specifications of materials of construction projects.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | I**nterpret** valuations, cost estimation and construction layout information |
| **CLO2** | **Calculate** the quantity of materials and labor, and cost of construction during the pre-contract stage of the construction process. |
| **CLO3** | **Select** appropriate cost assistance and cost organizing strategies and techniques to enable building work to be designed within agreed expenditure limits. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | | | √ | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Abul Faraz Khan.“Estimating”, Eight Edition; Shabdik Publisher, 2005
2. Stephen D. Schuette and Roger W. Liska.“Building Construction Estimating”; McGraw-Hill College; Har/Dis Edition, 1994; ISBN-13 : 978-0079118165
3. B.N. Dutta. “Estimating and Costing in Civil Engineering”, Ubs Publishers & Distributors Pvt. Ltd. 2017; ISSBN-13: 978-8174767707
4. Martin Brook. “Estimating and Tendering for construction work”, Routledge, 2008; ISBN-13 : 978-0750686167
5. Duncan Cartlidge. “Quantity Surveyor’s Pocket Book”, Routledge, 2nd Edition, 2012; ISBN-13: 978-0415501101

### *4.4.9 CSE 0011 2214*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CSE 0011 2214<br>**COURSE TITLE: Engineering Computation with Computer Programming Sessional** | |
|---|---|
| **CREDIT:** 1.5 | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| This course will familiarize the students with the basic knowledge of advanced computational programming tools and programming knowledge to solve the civil engineering problems such as numerical solution of the equation of motion, statistical data analysis and representation, solving problems |

| **Objectives** |
|---|
| • To describe the concepts of advanced computational programming tools<br>• To be capable to interpret numerical problems<br>• To be able to analyses and solve the civil engineering problems using programming knowledge. |

**Course Content**

Programming concepts and algorithms, Number system, internal representation of data, Elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output. Concept of Object-Oriented Programming (OOP): encapsulation, inheritance, polymorphism and abstraction. Template functions and classes. Development of programs related to Civil Engineering.

Introduction to hi-level computational programming tools; application to numerical analysis: basic matrix computation, solving systems of linear equations, non-linear equations, differential equations, interpolation and curve fitting, numerical differentiation, numerical integration; application to engineering problems: solving problems related to mechanics, numerical solution of equation of motion etc.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the use of advanced computational programming tools. |
| **CLO2** | **Solve** the numerical problems such as basic matrix computation, solving systems of linear equations, non-linear equations, differential equations, interpolation and curve fitting, numerical differentiation, numerical integration. |
| **CLO3** | **Apply** the programming knowledge to solve the civil engineering problems such as numerical solution of the equation of motion, statistical data analysis and representation, solving problems related to mechanics, hydraulics. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | √ | | | | | | | |
| **CLO2** | √ | | | | √ | | | | | | | |
| **CLO3** | | √ | | | √ | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. MATLAB Programming for Engineers, S. J. Chapman, Thomson Learning.
2. Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers, R. Pratap, Oxford University Press, USA.
3. MATLAB Programming for Numerical Analysis, C. Lopez, Apress, 1st Edition.
4. ABAQUS Software


### *4.4.11 CE 0732 2220*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 2220<br>**COURSE TITLE: Semester Final Viva II** | |
|---|---|
| **CREDIT:** 0.5 (Viva) | **SEMESTER OFFERED: 2nd** Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| By this course students will learn how to present themselves in an official forum for viva voce and they may be evaluated based upon the knowledge they achieved from their second year theory and laboratory course |

| **Objectives** |
|---|
| • To familiarize a viva voce exam in a formal platform with a matured attitude<br>• To express the knowledge and skills learnt from theory and laboratory courses<br>• To recap the knowledge and understandings of the taught courses at the end of the year |

**Course Content**

2nd year 1st semester and 2nd semester theory and sessional courses.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Examine** the necessary skills and knowledge to become a successful civil engineer |
| **CLO2** | Explain and answer the intellectual and technical questions in front of an examination board |
| **CLO3** | **Able** to apply 3rd year 1st and 2nd semester knowledge in real-world scenarios to meet desired needs within socioeconomic demand and ethical values. |
| **CLO4** | **Communicate** effectively in written, oral, graphical, and mathematical formats appropriate to civil engineering and express their knowledge in a satisfactory way. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | | √ | | | | | | |
| **CLO2** | | | | | | | | √ | √ | | √ | |
| **CLO3** | | | √ | | √ | | √ | √ | | | | √ |
| **CLO4** | | | | √ | | | | | | √ | | √ |

**REFERENCE BOOKS:** List of reference books for 2nd year 1st semester and 2nd year 2nd semester all courses provided by the course teachers.

## *4.5 Third Year: Semester 1*

### *4.5.1 CE 0732 3141*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3141<br>**COURSE TITLE:** Structural Analysis I | |
|---|---|
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| It is the first course on structural analysis. In this course, students will learn how to analysis various structural components subjected to both static and moving loads. The analysis techniques learnt in this course will be useful in later courses where students will learn how to design different structural components. |

| **Objective** |
|---|
| • To analyze statically determinate structures such as simple beams, cantilever beams, three hinged arches or frames and trusses.<br>• To analyze statically indeterminate structures using simplified methods<br>• To analyze the application of lateral load on structures using Bangladesh National Building Codes.<br>• To analyze moving load on various types of structures |

**Course Content**

Stability and determinacy of structures, analysis of statically determinate trusses and arches, influence lines, moving loads on beams, frames and trusses, cables and cable supported structures. Wind and earthquake loads, approximate analysis of statically indeterminate structures. e.g., braced trusses, portal frames, mill bent and multi storied building frames, deflection of beams, trusses and frames by virtual work method, space trusses, analysis of statically indeterminate structures by consistent deformation.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Perform** approximate and exact analysis of statically determinate and indeterminate beams, frames, trusses, and arches under different loading conditions. |
| **CLO2** | **Construct** influence lines for statically determinate beams/girders, frames, and trusses; analyze girders, frames, and trusses under moving loads. |
| **CLO3** | **Calculate** deflection of frames and trusses by virtual work method. |
| **CLO4** | **Analyze** cables and suspension bridges. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Structural Analysis, P. Hall, 10th edition.
2. Elementary Structural Analysis, S. Utku, C.H. Norris and J.B. Wilbur, 4th edition, Tata McGraw-Hill.
3. Fundamentals of Structural Analysis, by Leet, Wang and Gilbert, 4th edition, McGraw-Hill Companies Inc., New York.
4. Basic Structural Analysis, C. S. Reddy, 3rd edition, McGraw-Hill, India.
5. Structural Analysis: In Theory and Practice, A. Williams, 1st edition, Elsevier.
6. Theory of Simple Structures, T.C. Shedd and J. Vawter, 2nd edition, John Wiley and Sons Inc., New York.


### *4.5.2 CE 0732 3145*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3145<br>**COURSE TITLE:** Design of Concrete Structures I | |
|---|---|
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| In this course students will learn to design different types of reinforced concrete slab and beam under flexural and shear loading and to develop a strong foundation and design concepts of reinforced concrete building which will be beneficial for their future development and professionalism. |

| **Objective** |
|---|
| • To gain knowledge on the basics of reinforced concrete structure.<br>• To be able to design beam, slab and web reinforcement for beam.<br>• To become aware of the proper safety and serviceability of reinforced concrete structures. |

**Course Content**

Fundamental behavior of reinforced concrete; introduction to WSD and USD methods; analysis and /design of singly reinforced, doubly reinforced and T-beams according to WSD and USD methods; diagonal tension, bond and anchorage according to WSD and USD methods, one-way slabs.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the properties of constituent materials in the Reinforced Concrete structure and their failure modes, USD & WSD method. |
| **CLO2** | **Understand** the principles of the design methodologies of Reinforced Concrete members and evaluate their suitability. |

| | |
|---|---|
| **CLO3** | **Analyze** and design different beams under various loading conditions following Ultimate Strength Design (USD) method, WSD method. |
| **CLO4** | **Analyze** and design different slabs under various loading conditions following strip method, direct design method, and equivalent frame method. |
| **CLO5** | **Calculate** deflection in Reinforced Concrete beams and slabs. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | √ | √ | | | | | | | | | |
| **CLO5** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Design of Concrete Structures, D. Darwin, C.W. Dolan and A.H. Nilson, 15th edition, McGraw Hill Companies Inc., New York.
2. Design of Concrete Structures, A.H. Nilson, D. Darwin and C.W. Dolan, 14th edition, McGraw Hill Companies Inc., New York.
3. Structural Concreter, M. N. Hassoun and A. Al-Manaseer, 6th edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
4. Design of Concrete Structures, G. Winter, C.E. O'Rourke, and A. H Nilson an, 7th edition, McGraw Hill Companies Inc., New York.
5. Design of Concrete Structures, D. Darwin and C.W. Dolan, 16th edition, McGraw Hill Companies Inc., New York.


### *4.5.3 CE 0732 3181*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3181<br>**COURSE TITLE:** Environmental Engineering-I | |
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 1st Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course provides an overview to different aspects of Environmental Engineering. The interconnectedness of the environmental system is emphasized. Students will also learn to deal with technical aspects of drinking water treatment, collection and distribution, and will pay attention to the choice of technologies and tools, ranging from low-cost to advanced options, which will be useful in in their professional life. |

| **Objective** |
|---|
| • To develop a basic understanding of environmental engineering especially on water supply engineering.<br>• To learn water quality criteria and standards, and their relation to public health, environment and |

urban water cycle
- To familiarize with drinking water supply systems, including water transport, treatment and distribution.
- To understand physical, chemical and biological phenomena, and their mutual relationships, occurring within water supply systems.
- To recognize water quality concepts and their effect on treatment process selection.

**Course Content**

Water Supply Engineering: introduction, water demands, water supply sources, ground water exploration: aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance, water demand for rural communities, shallow hand tube wells and deep-set Tara pumps for problem areas.

Surface water collection and transportation, head works, pumps and pumping machineries, water distribution system, analysis and design of distribution network, fire hydrants, water meters, leak detection, unaccounted for water.

Water quality requirements, water treatment - plain sedimentation, flocculation and settlement, filtration, disinfection, miscellaneous treatment methods, low-cost treatment methods for rural communities.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** climate change, biodiversity, solid waste management, air pollution control, environmental impact assessment, and water safety plans. |
| **CLO2** | **Select** suitable water supply sources and estimate water demand for various purposes. |
| **CLO3** | **Evaluate** the quality and requirements of water for drinking and other purposes. |
| **CLO4** | **Analyze** and design water treatment units/processes and distribution networks. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | √ | √ | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | √ | | | | | √ | | | | | | |
| **CLO4** | √ | | | √ | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Water and Environmental Engineering, M. H. Rahman and A. A. Muyeed, 1st edition, ITN, BUET.
2. Water Supply and Sanitation for rural and low-income urban communities, M. F. Ahmed and M. M. Rahman, 3rd edition, ITN, BUET.
3. Environmental Engineering, H. S. Peavy and D. R. Rowe, G. Tchobanoglous, 1st edition, McGraw Hill, India.
4. Solid and Hazardous Waste Management, M. H. Rahman and A. A. Muyeed, 1st edition, ITN, BUET.
5. Air Pollution, M. N. Rao AND H.V.N Rao, 1st edition, McGraw Hill, India.
6. Municipal Solid Waste Management, M. A. I. Chowdhury, 1st edition, University Grant Commission, Bangladesh.

### *4.5.4 CE 0732 3151*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3151<br>**COURSE TITLE: Geotechnical Engineering I** | |
|---|---|
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd year 1st semester |
| **Exam Hours: 3**.00 | |

| **Rationale** |
|---|
| This course will enable the students to understand basic geotechnical properties of soil, such as phase relationships, classification, gradation, and other index properties. The detailed analysis of engineering properties (strength parameters, consolidation, and stress) of geomaterials will provide knowledge on how to present and select strength parameters for designing a geotechnical structure. This course will also teach the effect of permeability, seepage, flow net, soil suction, and lateral earth pressure on the analysis and design of different structures, such as building, embankment, storage facilities, roads, airport. |

| **Objective** |
|---|
| • To introduce the fundamental concept of geotechnical engineering and its origin and historical development,<br>• To acquaint students with the basic formation and structure of soil, their index property and soil classification,<br>• To understand the effect of permeability, seepage, flow net, soil suction, lateral earth pressure of soil,<br>• To understand the compaction behavior, total and effective stress, and stress distribution phenomena in different soil layers,<br>• Make students understand the shear strength testing, behavior and parameters, and consolidation testing and behavior. |

**Course Content**

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

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Identify** the type of soil from their index properties. |
| **CLO2** | **Understand** permeability and seepage flows through saturated soils. |
| **CLO3** | **Distinguish** between compaction and consolidation by identifying consolidation and compactions properties. |
| **CLO4** | **Calculate** effective stress, stress distribution, lateral earth pressure, settlement, and shear strength parameters. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Principles of Geotechnical Engineering, B. M. Das and K. Sobhan, SI Edition, 9th edition, Cengage Learning.
2. Craig's Soil Mechanics, J.A. Knappett, 8th Edition, Spoon Press.
3. Soil Mechanics and Foundations, R. F. Craug, 7th Edition, Taylor & Francis.
4. Soil Mechanics and Foundations, M. Budhu, 3rd Edition, John Wiley & Sons, Inc., USA.
5. Soil Mechanics, V. N. Kaliakin, 1st edition, Elsevier Science.
6. Principles of Geotechnical Engineering, B. M. Das and K. Sobhan, SI Edition, 9th edition, Cengage Learning.


### *4.5.5 CE 0732 3171*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3171<br>**COURSE TITLE:** Open Channel Flow | |
|---|---|
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd year 1st semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course will familiarize the students with the knowledge of free-surface fluid flow or open channel flow based upon a sound background in fluid mechanics. This knowledge is essential for execution of water resources projects, hydraulic engineering works and hydraulic structures. |

| **Objectives** |
|---|
| • To introduce the basic principles and fundamental equations for open channels<br>• Familiarize with various types of flow condition in rivers and open channels and their application<br>• Understand the procedure for designing different types of open channels<br>• Accumulate basic ideas for calculating surface profile of gradually varied flow<br>• To acquaint rapidly varied flow like hydraulic jump and its application in water resource project and designing of hydraulic structures. |

**Course Content**

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. Concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow. Momentum equation and specific momentum. Hydraulic jump. Theory and analysis of gradually varied flow. Computation of flow profiles. Design of channels.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Classify** the types of flow and calculate the flow parameters of an open channel under different circumstances. |
| **CLO2** | **Compute** and draw the water surface profiles for gradually varied flow. |
| **CLO3** | **Calculate** and analyze energy dissipation parameters in rapidly varied flow and design USBR stilling basin based on different hydraulic jumps. |
| **CLO4** | **Analyze** and design erodible and non-erodible channels. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs):**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Open-Channel Hydraulics, Ven Te Chow, McGraw-Hill.
2. Open-Channel Flow, Chaudhry, M Hanif, Springer.
3. Flow in Open Channels, K. Subramanya, Third Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1997.
4. Hydraulics of Open Channel Flow, Hubert Chanson, Elsevier.
5. Flow through Open Channels, K.G. Ranga Raju, Tata McGraw-Hill Education, 1991.


### *4.5.6 CE 0732 3122*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE**: CE 0732 3122<br>**COURSE TITLE:** Architectural, Engineering and Planning Appreciation | |
|---|---|
| **CREDIT:** 1.50 (Sessional) | **TERMS OFFERED:** 3rd year 1st semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will enable the students to understand basic architectural design, structural design decision, the justifications for projects and the alternatives. This course will also ensures clarity in thoughts and actions, work is carried on smoothly without any confusion and misunderstanding |

| **Objectives** |
|---|
| To make knowledge about architectural, mechanical, urban, and regional planning, design, detailing and environmental issues in the field of civil engineering applications. |

**Course Content**

Appreciation of architecture, mechanical engineering, urban and regional planning; environmental issues, Plumbing.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Interpret** architectural, mechanical engineering, plumbing issues related to civil engineering problems. |
| CLO2 | **Prepare and deliver** professional technical observation on architectural, mechanical, urban, and regional planning and environmental issues concerned with civil engineering practice. |
| CLO3 | **Analyze, synthesize, and apply** information related to architectural, mechanical engineering, urban and regional planning, and environmental issues linked with civil engineering applications. |
| CLO4 | **Identify problems and deliver** solutions to the architect, mechanical engineer, urban and regional planner, environmental engineer, and other involved specialists. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | √ | √ | | | | | |
| **CLO2** | | | √ | | | √ | | | | | | |
| **CLO3** | | | | | | √ | | | | | | |
| **CLO4** | | | | | | | | | √ | √ | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Conceptual structural design: bridging the gap between architects and engineers by Olga Popovic Larsen, ICE Publishing, London, 2016.

### *4.5.7 CE 0732 3182*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3182<br>**COURSE TITLE:** Environmental Engineering-I Sessional | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 3rd year 1st semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will provide the students hands-on experience of determining optimum coagulant dose, solid removal efficiency through sedimentation, short-term biochemical oxygen demand (SBOD) in biodegradation process, sludge volume index (SVI), self-cleansing velocity in sewer line, bio-uptake coefficient of heavy metals, standard particulate matter (SPM) in air, basic weather forecasting parameters, dispersion coefficient of contaminants through soil and sound level of different traffic environment. This knowledge and practice are very important to safely handle many environmental engineering issues. |

| **Objectives** |
|---|
| • To understand the basic mechanisms of determination technique of different parameters widely used in water, air, soil and noise pollution events<br>• To build the students' skills for sampling, testing and/or monitoring the samples collected from the above-mentioned water, air, soil and noise sources using both manual and instrumental techniques. |

**Course Content**

Water and wastewater sampling techniques, sample preservation, physical, chemical and biological tests of water and wastewater, breakpoint chlorinating, alum coagulation, sampling and laboratory analysis of air, sampling and laboratory analysis of solid waste.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Apply** the acquired knowledge and techniques to water and air sampling and preserving the water sample. |
| **CLO2** | **Experiment** with the equipment used in water and air quality parameters tests and evaluate the obtained results with the standards. |
| **CLO3** | C**omprehend** and **write** useful reports, **communicate** through proper documentation and presentations. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | √ | | | | | √ | | | |
| **CLO2** | | | | | √ | √ | √ | | | | | |
| **CLO3** | | | | | | | | | √ | √ | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


2. Standard methods for the examination of water and wastewater, American Water Works Association (AWWA)/ American Public Health Association (APHA)/ Water Environment Federation (WEF) 20th edition.
3. Environmental Conservation Rule-1997, Bangladesh Gazette, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh.


### *4.5.8 CE 0732 3152*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3152<br>**COURSE TITLE: Geotechnical Engineering Sessional I** | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 3rd Year 1st Semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will provide the students with the hands-on experience of testing different soil in standard laboratory and field test apparatus. The students will learn the basic property, behavior and parameters of soil for applying them in designing different structures based on soil and solving geotechnical issues. |

| **Objectives** |
|---|
| • To acquaint the student with the basic concept of soil as engineering material, and the properties (physical, engineering) and methods used to characterize soil for geotechnical analysis and design<br>• To facilitate necessary knowledge about the common terminology and parameters used to characterize and classify the soil<br>• Acquint the factors affecting soil strength and stress-strain behavior, seepage and water flow through soils and their effects on soil stresses and strength<br>• Make the students understand the fundamental differences between behaviors of sands and clays<br>• To generate the skills to analyze deformation and settlement characteristics of soils, bearing capacity and slope stability concepts |

**Course Content**

Field identification tests, grain size analysis by sieve and hydrometer, specific gravity test, atterberg limits test, permeability tests, unconfined compression test, compaction test, relative density test, direct shear tests, consolidation tests.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Plan a geotechnical investigation campaign for field and laboratory testing. |
| **CLO2** | Select all necessary field and laboratory tests for a particular site following standard methodology. |
| **CLO3** | Analyze the results of a geotechnical investigation and testing program. |
| **CLO4** | Recommend geotechnical parameters for design based on the interpretation and analysis of the results of a geotechnical investigation and testing program. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | √ | | | | | √ | | | |
| **CLO2** | | √ | | √ | | | | | | | | |
| **CLO3** | | √ | | | √ | | | | | | | |
| **CLO4** | | √ | | | | | √ | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Geotechnical Engineering Investigation Handbook, R. E. Hunt, 2nd Edition, CRC Press/Taylor & Francis McGraw-Hill.
2. Manual of Soil Laboratory Testing. K. H. Head, Volume 1 and Volume 2, 2nd edition, John Wiley and Sons Inc. NewYork.


### *4.5.9 CE 0732 3172*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3172<br>**COURSE TITLE:** Open Channel Flow Sessional | |
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 3rd Year 1st Semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will provide the students with the hands-on experience of testing different characteristics of fluid flow. |

| **Objectives** |
|---|
| • To provide necessary knowledge about the characteristics of open channel flow. |

**Course Content**
Broad crested weir. Sluice gate. Venturi flume. Parshall flume. Cut throat flume. Hydraulic jump. Velocity distribution profile. Manning's roughness coefficient. Specific force and specific energy.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Perform** hands-on experiments to determine discharge using different flow measuring devices, the coefficient of roughness (Manning's n), velocity distribution for a channel, and thrust on sluice gate individually or in a group. |
| **CLO2** | **Conduct** laboratory experiments to prepare the surface profiles for gradually varied flow and classify the hydraulic jump individually or in a group |
| **CLO3** | **Comprehend** and **write** effective reports, **communicate** with proper documentation and presentation. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs):**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | √ | | | |
| **CLO2** | | | | √ | | | | | | | | |
| **CLO3** | | | | | | | | | | √ | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Open-Channel Hydraulics, Ven Te Chow, McGraw-Hill, New York.
2. Flow in Open Channels, K. Subramanya, Third Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1997.


## *4.6 Third Year: Semester II*

### *4.6.1 CE 0732 3243*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3243<br>**COURSE TITLE: Structural Analysis II** | |
| **CREDIT**: 3.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| The course provides students with the principles of elastic structural analysis and behavior of indeterminate structures. Classical and modern analysis techniques are introduced to arm the students with the necessary tools to better appreciate the real behavior of structures. |

| **Objectives** |
|---|
| • Accumulate basic ideas about the deflection of frames, trusses and beams<br>• To facilitate necessary knowledge about the elastic analysis methods (slope-deflection, moment distribution and consistent deformation) for statically indeterminate structures<br>• Acquaint the methods for analyzing the indeterminate structures to evaluate the response of structures<br>• Foster the analytical and critical thinking skill in the civil engineering field. |

**Course Content**

Analysis of statically indeterminate structures by displacement method, slope deflection, moment distribution, stiffness matrix, member stiffness, stiffness transformations, assembly of stiffness matrices and solution for beams, frames and trusses. Flexibility matrix. Influence lines for statically indeterminate beams, frames, arches and grids. Structural forms and their applications.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the degree of indeterminacy of various indeterminate structures. |
| **CLO2** | **Assemble** stiffness matrices and **develop** an algorithm for implementing the direct stiffness method in a computer. |
| **CLO3** | **Draw** the influence line of statically indeterminate beams and frames; **use** the influence line to calculate the moving load effects on structures. |
| **CLO4** | **Analyze** the statically indeterminate beams, frames, space truss subjected to different load types using different methods. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Indeterminate Structures, R. L. Jindal, 2nd edition, S. Chand.
2. Elementary Structural Analysis, C. H. Norris, J. B. Wilbur and S. Utku, 3rd edition, Mcgraw-Hill. USA.
3. Structural Analysis, A. Ghali and A. M. Neville, 6th edition, E & FN Spon/Taylor and Francis.
4. Intermediate Structural Analysis, C. K. Wang, 1st edition, McGraw-Hill.


### *4.6.2 CE 0732 3247*

| | | |
|---|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3247<br>**COURSE TITLE: Reinforced Concrete Design II** | | |
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 2nd Semester | |
| **Exam Hours:** 3.00 | | |

| **Rationale** |
|---|
| This course will familiarize the students with the analysis, design and detailing of reinforced concrete elements, such as slabs, columns, footings, stairs, and retaining walls, joint reinforcement. It also introduces them with serviceability design of the reinforced concrete structures. |

| **Objectives** |
|---|
| • To introduce the basic principles, fundamental equations and analysis of reinforced concrete elements<br>• To facilitate necessary knowledge about the theories and techniques for the analysis and design of slabs, columns, footings, stairs, and retaining walls, joint reinforcement<br>• To familiarize the procedure for detailing of RCC elements<br>• To introduce serviceability design of the reinforced concrete structures<br>• To give idea about the seismic design. |

**Course Content**

Two-way slabs, columns, footings, retaining walls, reinforced concrete floor and roof systems. Review of codes, yield line method, introduction of pre-stressed concrete. Analysis and preliminary design of pre-stressed beam section.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the behavior of slabs, columns, footings, shear walls, and deep beams in reinforced concrete structures. |
| **CLO2** | **Analyze** and **design** various types of columns, slabs, individual footings, raft foundation, pile caps, shear walls, deep beams, and retaining walls. |
| **CLO3** | **Understand** the behavior of prestressing system and **calculate** losses in prestress concrete elements. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | √ | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Structural Concrete, M. N. Hassoun and A. Al-Manaseer, 6th edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
2. Design of Concrete Structures, D. Darwin and C.W. Dolan, 16th edition, McGraw Hill Companies Inc., New York.
3. Design of Concrete Structures, A.H. Nilson, D. Darwin and C.W. Dolan, 14th edition, McGraw Hill Companies Inc., New York.


### *4.6.3 CE 0732 3253*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3253<br>**COURSE TITLE: Geotechnical Engineering II** | |
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course will allow the students to perform the subsoil investigation and determine the bearing capacity of soil for the foundation of any structure. They will get the knowledge of how to design the shallow and deep foundations. This course will facilitate them to determine the settlement and possibilities of liquefaction hazards. They also get the fundamental knowledge on analysis of the safety factor of slope. |

| **Objectives** |
|---|
| • To provide detail procedure for conducting the subsoil exploration program along with the preparation of subsoil condition report<br>• To develop skills on the methods of calculating the bearing capacity of the soil and designing different types of shallow and deep foundations<br>• Accumulate basic ideas about the theoretical concept of foundation settlement and failure and to determine settlement values for different soil profiles<br>• To facilitate necessary knowledge about the technique of assessing the vulnerability of different natural and man-made slope and soil liquefaction hazard in earthquake-prone areas. |

**Course Content**

Soil investigation techniques; settlement computation; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; design and construction of footings, rafts and piles; slope stability analyses.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Select** the suitable techniques of sub-soil investigation for different situations and their application in geotechnical fields. |
| **CLO2** | **Estimate** the settlement, distortion, and bearing capacity to design deep and shallow footings following accepted engineering practice and standards. |
| **CLO3** | **Design** a foundation and monitor the construction process. |
| **CLO4** | **Apply** knowledge of various methods and their assumptions to the stability analysis of natural and human-made slopes. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | √ | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | | √ | | | | | | | | | |
| **CLO4** | | √ | | | | | √ | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Craig's Soil Mechanics, R.F. Craig, 7th Edition, Spon Press.
2. Craig's Soil Mechanics, R.F. Craig and J. A. Knappett, 8th Edition, Spoon Press.
3. Soil Mechanics and Foundations, M. Budhu, 3rd Edition, John Wiley & Sons, Inc., USA.


### *4.6.4 CE 0732 3249*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3249<br>**COURSE TITLE: Steel Structure** | |
| **CREDIT: 3**.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours: 3**.00 | |

| **Rationale** |
|---|
| This course familiarizes students to the behavior and design of structural elements in steel structures using current codified requirements and design specifications. This course will enable the students to realize, understand and design basic elements of simple steel structures. |

| **Objectives** |
|---|
| • To introduce the properties, selection, performance and codified requirements for design of structural steel members.<br>• To introduce the design philosophies and latest code specificationsfor design of steel structures. |

- To facilitate necessary knowledge about the theories and techniques for the analysis and design of tension members, bolted and welded connections.
- To make familiar with the knowledge of analysis and design of steel beam, steel column, steel base plate and composite structures.

**Course Content**

Behavior of the structural steel members and frames, design of tension and compression members by ASD and LRFD methods, design of beams, columns and joints.

Behavioral principles and design of structural steel; design of tension members, bolted and welded connections; compression members; residual stress, local buckling, effective length; flexural members; lateral torsional buckling; design of beam-columns; connection design, moment connections, column bases; detailing of steel structures

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the plastic hinge formation and collapse mechanism of flexural members. |
| **CLO2** | **Use** AISC Steel Construction Manual for structural steel member design. |
| **CLO3** | **Analyze** and design steel beam-column members and joints for tension, compression, and flexure. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Unified Design of Steel Structures, L. F. Geschwindner, 2nd edition, J. Wiley and sons Inc., NewYork.
2. Structural Steel Design, J. C. McCormac and S. F. Csernak, 5th edition, Pearson, NewYork.
3. Design of Steel Structures: Theory and Practice, D. N. Subramanian, OXFORD UNIVERSITY PRESS, USA.
4. Steel Structures Design: ASD/LRFD, A. Williams, 1st edition, McGraw Hill Education, NewYork.
5. Steel Design, D. William, T. Segui, 5th Edition, Cengage Learning, CT, USA.


### *4.6.5 CE 0532 3233*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0532 3233<br>**COURSE TITLE:** Fundamental of Earthquake Engineering | |
| **CREDIT: 2**.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| This course familiarizes the students with fundamental knowledge of earthquake engineering. This knowledge is essential for the students to understand common natural disasters in Bangladesh and the strategy/policy/national plan of the Bangladesh government for earthquake. Also, this course will enable the students to understand the seismic behavior of structures and apply current codified requirements and design specifications for seismic-resistant buildings. |

| **Objectives** |
|---|
| • To introduce the basic knowledge, terminology, and principles of engineering seismology, and earthquake engineering.<br>• To introduce the design philosophies and code specified requirements for earthquake resistant building design.<br>• To provide the knowledge of the architectural and structural measures for reducing earthquake vulnerability and estimation of EQ induced losses. |

**Course Content**

Definition, causes and effects of earthquake, measuring earthquakes, Predicting earthquakes. Earthquake loads; Earthquake ground motion and response spectra, Earthquakes in history, Seismic status of Bangladesh, Loss estimation due to damage of buildings, loss estimation due to damage of life lines (Electric power system, water and sewerage system, telecommunication system, traffic system) Design of structures considering earthquake loads.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the basics of seismology on generation, propagation, recording, and measurement of earthquakes |
| **CLO2** | Apply building code earthquake requirements in the design of structural system |
| **CLO3** | Identify favorable and dangerous conceptual design features, learn the earthquake resistant design philosophy and its application |
| **CLO4** | Compute the probable return period of an earthquake in any area and also the probable loss due to an earthquake in terms of human casualty and injury and monetary value. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | √ | √ | | | | | | | | |
| **CLO2** | | √ | | | | | | | | | √ | √ |
| **CLO3** | | √ | √ | | | | | | | | | √ |
| **CLO4** | √ | √ | | | √ | | √ | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. American Concrete Institute, ACI Codes
2. Arthur H. Nilson, David Darwin, Charles W. Dolan (2010), Design of Concrete Structures (14th Edition). *McGraw Hill*. ISBN–007-123260-5
3. Dr. Mehedi Ahmed Ansary, Dr. Munaz Ahmed Noor (2006), Earthquake Resistant Design Manual (a publication of Bangladesh Earthquake Society), *Academic Press & Publishers Library*. ISBN- 984 08 0210 0
4. Housing and Building Research Institute, Bangladesh (2006), Bangladesh National Building Code (BNBC-2006)

### *4.6.6 CE 0732 3261*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3261<br>**COURSE TITLE: Transportation Engineering I** | |
|---|---|
| **CREDIT:** 3.0 (Theory) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** 3.00 | |

| **Rationale** |
|---|
| This course will help the students to understand the basic principles of transportation engineering and to use modern techniques for the improvement of existing transport facilities. This course will also develop student's capacity to perform traffic analysis, designing of transport system components, and to identify the more appropriate techniques for transport related problem solving. |

| **Objectives** |
|---|
| • To introduce the students to the basic tool and technique of the vast field of modern Transportation Engineering at an introductory level<br>• To familiarize with the basic principle of traffic and transportation engineering i.e. planning, design, operation, and management system<br>• To facilitate the necessary knowledge about traffic characteristics and traffic flow characteristics<br>• To develop skills for transport problem identifying, necessary data collection, data analysis and designing transport system components such as designing of roadway geometry, parking area, traffic signal, street lighting, etc.<br>• To introduce the student with the intelligent transport system. |

**Course Content**

Introduction to transportation engineering, development of transportation systems, elements of transportation system, transportation in Bangladesh, modal share, 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, traffic engineering: the road/traffic system, vehicle and traffic characteristics, traffic control devices, traffic studies, parking and roadway lighting, waterways and terminals.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the fundamentals of traffic, transportation engineering, and intelligent transportation system. |
| **CLO2** | **Select** the proper investigation technique and develop a solution for the road network-related challenges in Bangladesh. |
| **CLO3** | **Apply** analytical and mathematical knowledge to solve problems related to transportation planning, geometric design, and traffic engineering. |

Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | | √ | | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Traffic Safety, L. Evans, 6th edition, Science Serving Society.
2. Traffic Engineering and Transportation Planning, D. L. R. Kadiyali, Khanna Publisher, India.
3. Highway Engineering, P. H. Wright and K. K. Dixon, 7th edition, Wiley (India) Pvt. Limited.


### *4.6.7 CE 0732 3242*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3242<br>**COURSE TITLE: Structural Analysis and Design Sessional I** | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| The aim of this course is to provide students with a thorough understanding of the analysis and design of steel truss roof system considering wind load. This knowledge is essential for execution of engineering projects such as industrial infrastructures. |

| **Objectives** |
|---|
| • To introduce the properties, selection, performance and codified requirements of steel for structural steel members/elements<br>• To understand the design philosophies and behavior of steel structures<br>• To introduce the latest code specifications on the design of steel members<br>• To facilitate necessary knowledge about the theories and techniques for the analysis and design of industrial roof truss system<br>• To develop skills to analyze and design of welded connections<br>• To provide an educational and comprehensive experience in the design of simple steel structures (industrial roof truss system) |

**Course Content**

Analysis of steel structures e.g. truss, plate girder, design of members and joints of structures, use of software in analysis and design problems such as GRASP.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Analyze** steel trusses, plate girders, and different types of connections. |
| **CLO2** | **Design** steel trusses, plate girders, and different types of connections. |
| **CLO3** | **Evaluate** and **select** the appropriate type of joint for a structure with details. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | | | | | | | | √ | | |

**REFERENCE BOOKS**: (List of reference books may vary depending upon the choice of course teachers and time)


1. Unified Design of Steel Structures, L. F. Geschwindner, 2nd edition, J. Wiley and sons Inc., NewYork.
2. Structural Steel Design, J. C. McCormac and S. F. Csernak, 5th edition, Pearson, NewYork.
3. Design of Steel Structures: Theory and Practice, D. N. Subramanian, OXFORD UNIVERSITY PRESS, USA.
4. Steel Structures Design: ASD/LRFD, A. Williams, 1st edition, McGraw Hill Education, NewYork.
5. Steel Design, W. T. Segui, 5th edition, Cengage Learning, United States.


### *4.6.8 CE 0732 3262*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3262<br>**COURSE TITLE: Transportation Engineering Sessional I** | |
|---|---|
| **CREDIT:** 1.5 (Sessional) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** N/A | |

| **Rationale** |
|---|
| This course will provide the students with the practical experience of testing aggregate, asphalt, and soil in standard laboratory. The students will learn the basic property, behavior and ensure the quality of these materials by conducting various test. |

| **Objectives** |
|---|
| • Acquaint students with the basic concept of highway materials (soil, aggregate, and asphalt).<br>• To facilitate necessary knowledge about the common terminology and parameters used to characterize and classify the highway materials based on laboratory experiments to confirm their specifications.<br>• Helping the students to develop ability in designing the Marshal Mix design to find out optimum bitumen content.<br>• To develop skills for determining the roadway capacity of a selected segment. |

**Course Content**

Tests of bituminous materials, tests on subgrade, sub-base and base materials, bituminous mix design, roadway capacity analysis, application of analytical, simulation and statistical packages.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Perform** laboratory tests on aggregates and bituminous materials and **select** the appropriate materials for different pavement layers. |
| **CLO2** | **Perform** hands-on experiments to **design** the asphalt concrete mixture. |
| **CLO3** | **Deliver** quality reports on various construction materials and work on the quality and control of materials. |
| **CLO4** | **Perform field surveys** on road condition, traffic flow, and capacity-related parameters. |
| **CLO5** | **Perform** analytical, simulation and statistical software packages. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | √ | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | | | | | | | | √ | √ | | |
| **CLO4** | √ | √ | | | | | | | √ | | | |
| **CLO5** | | √ | | | √ | | | | √ | | | √ |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Transportation Engineering Basics, A. S. N. Murthy and H. Mohle, 2nd edition, American Society of Civil Engineers.
2. Traffic Engineering and Transportation Planning, D. L. R. Kadiyali, Khanna Publisher, India.
3. Highway Engineering and Traffic Analysis, F. L. Mannering, S. S. Washburn and Walter P. Kilareski 4th edition, Wiley.
4. A Textbook of Transportation Engineering, S. P. Chandola, 1st edition, S. Chand & Company Ltd, New Delhi.
5. Transportation Engineering- I, T. V. Mathew, Transportation Systems Engineering, Civil Engineering Department Indian Institute of Technology Bombay, Powai, India.
6. Highway Engineering, G. Singh and J. Singh, Standard Publishers Distributors, Delhi.
7. Principle of Pavement Design, E. J. Yoder and M. W. Witczak, 2nd Edition, A Wiley- Inter-science Publication, John Wiley & Sons Inc., New York.


### *4.6.9 CE 0732 3232*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3232<br>**COURSE TITLE: Project and Seminar** | |
|---|---|
| **CREDIT:** 1.5 (Project & Seminar) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| This course will familiarize the students with the basic knowledge of developing skills of understanding basic of project developing, conducting, research developing and conducting and seminar discussion. |

| **Objectives** |
|---|
| • To expand students' understanding of the nature and purposes of a project.<br>• To facilitate students' adjustment to the challenges of project conducting.<br>• To identify practical learning skills and concepts that will promote students' academic success through seminar.<br>• To encourage students to Communicate effectively in written, oral, graphical formats appropriate to civil engineering. |

**Course Content**

Experimental and theoretical investigation of various topics in structural engineering, concrete technology, environmentalengineering, transportation engineering and geotechnical engineering individual, study of one or more topics from any of the above fields.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Examine** the impact of research in major divisions of civil engineering and finding solutions in a global, economic, environmental, and societal context. |
| **CLO2** | **Work** in groups, complete the design project, **develop** the documentation of the engineering project design. |
| **CLO3** | **Design** a real-life project system or process to meet desired needs within socioeconomic demand and ethical values. |
| **CLO4** | **Communicate** effectively in written, oral, graphical, and mathematical formats appropriate to civil engineering. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | | | | | | | | |
| **CLO2** | | | | | | | | | √ | | √ | |
| **CLO3** | | | √ | | √ | | | √ | | | | √ |
| **CLO4** | | | | √ | | | | | | √ | | √ |

**REFERENCE BOOKS:** No particular reference book for this course

### *4.6.10 CE 0732 3220*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 3220<br>**COURSE TITLE: Semester Final Viva III** | |
| **CREDIT:** 0.5 (Viva) | **SEMESTER OFFERED:** 3rd Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| This course will enable the students to review the basic of 3rd year subjects and able to demonstrate and answer questions in real life using their knowledge, skills, and creativity. |

| **Objectives** |
|---|
| • To assess student's ability to communicate with another person.<br>• To supplement the information obtained through other evaluation techniques.<br>• To use stimulation methods like role play and telephone conversation.<br>• To evaluate the student's spontaneity and mannerism.<br>• To acquire soundness of academic knowledge through various forms of question.<br>• To diagnose the student's limitation and weakness and take remedial action. |

**Course Content**

3rd year 1st semester and 2nd semester theory and sessional courses.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Examine** the necessary skills and knowledge to become a successful civil engineer |
| **CLO2** | **Work** in groups, analyze case studies, and discuss current industry trends and challenges. |
| **CLO3** | **Able** to apply 3rd year 1st and 2nd semester knowledge in real-world scenarios to meet desired needs within socioeconomic demand and ethical values. |
| **CLO4** | **Communicate** effectively in written, oral, graphical, and mathematical formats appropriate to civil engineering. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | | √ | | | | | | |
| **CLO2** | | | | | | | | | √ | | √ | |
| **CLO3** | | | √ | | √ | | √ | √ | | | | √ |
| **CLO4** | | | | √ | | | | | | √ | | √ |

**REFERENCE BOOKS:** List of reference books for 3rd year 1st semester and 2nd semester all courses.

### *4.7 Fourth Year: Semester I*

#### *4.7.1 CE 0732 4141*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4141<br>**COURSE TITLE: Structural Analysis III** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will familiarize the students with the knowledge of analyzing both structural and nonstructural problems. This knowledge is essential for computing the displacements, stresses and strains in discrete structures involving complicated geometries, loadings and material properties. |

| **Objectives** |
|---|
| • To introduce the basic principles of finite element method.<br>• Familiarize with analysis of statically determinate and indeterminate structures by finite element method. |

**Course Content**

Introduction to finite element method as applied to Civil Engineering problems. One dimensional stress deformation and time dependent flow problem. Two-dimensional plane stress and plane strain analysis of stress deformation problems.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Evaluate the concepts and methodologies of finite element method on one dimensional structures (beam, spring) to solve real world problems involving structures of different nature. |
| **CLO2** | Evaluate the concepts and methodologies of finite element method on two dimensional structures (frame, truss) to solve real world problems involving structures of different nature. |
| **CLO3** | Interpret results with manual calculation. |
| **CLO4** | Identify indeterminate structures and methods of analysis |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | √ | | | | √ | | √ | √ | √ |
| **CLO2** | | | | | | | | √ | | | √ | |
| **CLO3** | | √ | | | | √ | | √ | | | | |
| **CLO4** | √ | | | | | | | | | | √ | √ |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Finite Element Analysis - Theory and Programming, C. S. Krishnamoorthy, 2nd edition, McGraw-Hill Inc., USA.
2. The Finite Element Methods - Linear, Static and Dynamic Element Analysis, T. J. R. Hugh, 1st edition, Dover Publications, Inc.

### *4.7.2 IPE 0715 4121*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** IPE 0715 4121<br>**COURSE TITLE: Management for Engineers** | |
|---|---|
| **CREDIT: 3.0** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: 3.0** | |

| **Rationale** |
|---|
| This course will guide the students to discover new and established project management tools and techniques and help them gain an understanding of a project life cycle. Students will learn how to handle more projects with budget constraints effectively, efficiently and timely. |

| **Objectives** |
|---|
| • To facilitate necessary knowledge about project management, construction of the project, the project scope and goals, the project life-cycle<br>• To introduce the construction process, various construction contract types and project delivery methods<br>• To develop skills on Project planning and evaluation techniques by feasibility study of the project<br>• Make the students understand the problem that may arise during construction and identify project delaying factors<br>• To enhance skill on cost volume profit analysis in the areas like product planning decision, profit planning decision, pricing decision etc.<br>• Acquaint students with practical, results-driven project management toolkit for immediate use<br>• Helping them to manage multiple projects simultaneously with limited resource by knowledge of resource management. |

**Course Content**

Definition, functions, managerial skills, levels of management, organization (formal and informal), *Operations & Quality Management*, Statistical Process Control, *Management Accounting*- Financial Accounting, budgeting; **Marketing Management:** Introduction, marketing environment, marketing mix, market segmentation, positioning and targeting, product and product life cycle, advertising; **Material Management:** Introduction, overview of material flow, *Management of Independent Demand*- The concept of inventory and its management (EOQ, P system and Q system).Construction safety, construction planning and scheduling: PERT, CPM. Procurement. Project planning and evaluation, feasibility reports, payback period, internal rate of return. Benefit-cost ratio,

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the roles and responsibilities of a project planner and manager to promote and maintain good planning and control projects. |
| **CLO2** | **Choose** a project, **create** a breakdown of activities, and **produce** a plan and a **schedule** of resources requirements. |
| **CLO3** | **Recommend** proper planning and control techniques while understanding the limitations of their choice. |
| **CLO4** | **Discover** a proper decision-making process to justify alternatives for engineering economic analysis methods. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | √ | | | | √ | √ | |
| **CLO2** | √ | √ | | | | | | | | | √ | |
| **CLO3** | | | | | | √ | | | | √ | | |
| **CLO4** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Operation Research, H. A. Taha, 10th edition, Pearson.
2. Project Management for Engineering and Construction, G. D. Oberlender, 3rd edition.
3. PERT and CPM-Principles and Application, L. S Srinath, 3rd edition, Affiliated East- West Press (Pvt.) Ltd.
4. Principles of Management, G. R. Terry, 4th edition, Richard D. Irwin.
5. Critical Path Methods in Construction Practice, j. M. Antill, and R. H. Woodhead, 4th edition, Wiley, New York.
6. Construction Management Fundamentals, J. S. Clifford and M. Richard, 2nd edition, McGraw Hill, Singapore.
7. Engineering Economy, B. Leland and T. Anthony, 7th edition, McGraw-Hill, New York.
8. Engineering Economy, G. J. Thuesen and W. J. Fabrycky, 8th edition, Prentice-Hall, Eaglewood Cliffs.
9. Engineering Project Management, N. Smith, Blackwell Science, Oxford.
10. Professional Construction Management, D. S. Barrie and B. C. Paulson, 3rd edition, McGraw-Hill, New York.


### *4.7.3 CE 0732 4183*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4183<br>**COURSE TITLE: Environmental Engineering II** | |
|---|---|
| **CREDIT: 3.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: 3.0** | |

| **Rationale** |
|---|
| This course will familiarize the students with the knowledge of sanitation and solid waste management based activities related to social and national level. This knowledge is essential for the execution of proper sanitation practice projects, improved solid waste management projects and improved personal and community-level hygiene practices. This course is closely correlated with wastewater treatment, industrial wastewater treatment, and proper disposal of solid waste in nature. |

| **Objectives** |
|---|
| • To introduce waste water engineering.<br>• To facilitate necessary knowledge about sanitation and sanitation system, sanitation technology, design of latrine and septic tank in the context of Bangladesh perspective<br>• Help them conceptualize about indoor sanitation, hygienic education, communicable diseases, health and hygiene aspects of sanitation, financial and social aspects of sanitation<br>• To provide the knowledge of different kinds of solid wastes, solid waste generation, solid waste collection, transfer & transport of solid waste, recycling, treatment of solid waste, etc.<br>• Accumulate basic ideas about legal, institutional, and financial aspects of solid wastes management to build awareness about impacts on the environment and health due to solid waste mismanagement. |

**Course Content**

Wastewater Engineering: introduction, water supply, sanitation and health, estimation of wastewater, wastewater collection systems, hydraulics of sewer, design, construction and maintenance of sanitary sewer and storm drainage system, sewer appurtenances, plumbing system.

Microbiology of sewage and waste water, wastewater characteristics, preparatory, primary and secondary treatment methods and disposal, treatment and disposal of industrial effluents, sludge treatment and disposal, sanitation for low income communities, on-site sanitation systems for rural communities, low cost small bore sewerage for small townships, design and construction of septic tanks, soak wells and subsurface drain fields, rural sanitation in Bangladesh.

Sustainability of water and sanitation services, participatory development approach in water and sanitation sector, community management of water and sanitation services, introduction to environment, environmental pollution, environment protection and management.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** wastewater and sewage collection system, sanitation, health, hygiene, sustainability of water and sanitation services |
| **CLO2** | **Choose** suitable low-cost sanitation technology |
| **CLO3** | **Analyze** and design plumbing system, sewer and storm drainage system, and wastewater treatment units/processes |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | √ | | | | | |
| **CLO2** | | √ | | | | √ | | | | | | |
| **CLO3** | √ | | √ | | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Water Supply and Sanitation for rural and low-income urban communities, M. F. Ahmed and M. M. Rahman, 1st edition, ITN, BUET.
2. Environmental Engineering, H. S. Peavy and D. R. Rowe, G. Tchobanoglous, 1st edition, McGraw Hill, India.
3. Wastewater Engineering Treatment Disposal Reuse, Metkalf and Eddy, 2nd edition, McGraw-Hill.
4. Sewage Treatment for hot climate, D. Mara, 1st edition, Wiley.
5. Water and Environmental Engineering, M. H. Rahman and A. A. Muyeed, 1st edition, ITN, BUET.

### *4.7.4 CE 0732 4163*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4163<br>**COURSE TITLE: Transportation Engineering II** | |
|---|---|
| **CREDIT: 3.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: 3.0** | |

| **Rationale** |
|---|
| This course will introduce students to the basics of transportation modeling those are important for long-term transport planning and policy recommendation. This course will also develop the student capacity for scientific investigation of the road traffic accident; designing, construction and maintenance techniques of both rigid and flexible pavement. Also, This course will also develop the student capacity for scientific investigation of designing, construction and maintenance techniques of railway. |

| **Objectives** |
|---|
| • To make the students understand the basic characteristics of standard highway materials.<br>• Helping the students to develop skills in designing flexible and rigid pavement.<br>• To facilitate necessary knowledge about highway construction and maintenance.<br>• To develop the skill for scientific investigation of road traffic accidents and transport system management.<br>• To facilitate necessary knowledge about railway engineering.<br>To develop the skill for scientific investigation of railway construction, signaling, yard capacity. |

**Course Content**

Highway materials, subgrade, subbase 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's, railways: general requirements, alignment, permanent way, station and yards, signaling, points and crossings, maintenance.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the fundamentals of construction procedures and materials of various pavements. |
| **CLO2** | **Recognize** the existing technology for the operation and maintenance of railway physical infrastructure. |
| **CLO3** | **Analyze** and design the flexible and rigid pavement by different methods. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | √ | | | | | | | | |
| **CLO2** | √ | | | √ | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)

1. A Textbook of Transportation Engineering, S. P. Chandola, 1st edition, S. Chand & Company Ltd, New Delhi.

2. Transportation Engineering- I, T. V. Mathew, Transportation Systems Engineering, Civil Engineering Department Indian Institute of Technology Bombay, Powai, India.
3. Highway Engineering, G. Singh and J. Singh, Standard Publishers Distributors, Delhi.
4. Principle of Pavement Design, E. J. Yoder and M. W. Witczak, 2nd Edition, A Wiley- Inter-science Publication, John Wiley & Sons Inc., New York.

### *4.7.5 CE 0732 4173*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4173<br>**COURSE TITLE: Irrigation and Flood Control** | |
|---|---|
| **CREDIT: 2.00 (Theory)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| The aim of this course is to understand basic concepts of irrigation and water requirements for plants growth. To know the different methods of irrigation and irrigation structures including design of irrigation structures and hydraulic structures for flood protection. |

| **Objectives** |
|---|
| • Introducing the basic concepts on irrigation along with its importance, purpose and types<br>• Gives idea about water requirements of crop, design of Irrigation canal and irrigation structures<br>• Give an idea about river characteristics along with river classification and sediment discharge mechanism of a river<br>• Give brief idea on control of river, flood control and its management. |

**Course Content**

Importance of irrigation. Sources and quality of irrigation water. Soil water relationship. Consumptive use and estimation of irrigation water requirements. Methods of irrigation. Design of irrigation canal system. Irrigation structures. Irrigation pumps. Problems of irrigated land. Flood and its control.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand and determine** the water requirements of crops and choose the proper irrigation technique in the practical field. |
| **CLO2** | **Design** the pumps, wells, and canals (irrigation & drainage) for proper irrigation management. |
| **CLO3** | **Select and design** suitable river training works based on channel characteristics. |
| **CLO4** | **Recommend** the suitable measures for flood control from the engineering point of view. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | √ | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | | √ | | | | √ | | | | | |
| **CLO4** | | | √ | | | | √ | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Irrigation Engineering & Hydraulic Structures, S. K. Garg, Khanna Publishers, Delhi.
2. Irrigation and Water Resources Engineering, G. L. Asawa, New Age International Publishers.
3. Flood Control and Drainage Engineering, S. N. Ghosh, 4th edition, CRC Press.


### *4.7.6 CE 0732 4155*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4155<br>**COURSE TITLE: Geotechnical Engineering III** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will enable the students with the knowledge on how to perform geotechnical analysis and design of different structures such as sheet pile, retaining wall, machine foundation and piles subjected to lateral load. This course will also offer knowledge of different soil improvement and dewatering techniques to make them able to work in different adverse soil conditions to design a sustainable structure. |

| **Objectives** |
|---|
| 1) To introduce and design of sheet pile,<br>2) To familiarize with various types of retaining wall along with the sufficient knowledge to analyze and geotechnical design,<br>3) Accumulate design ideas on machine foundation and piles subjected to lateral load,<br>4) To introduce different soil stabilization, improvement and dewatering techniques with their application and design. |

**Course Content**

Foundation for structures subjected to lateral loads, retaining walls and abutments, operation and methods of construction, dewatering and slurry-wall construction.

Flexible earth retaining structures, sheet piles, cofferdams, caissons, machine foundations- elementary vibrations, shear modulus and elastic constants, foundation design for vibration, fundamentals of soil liquefaction.

Specifications and design of field compaction, vibroflotation, precompression, sand drain, prefabricated vertical drains, stone columns, sand compaction piles, dynamic compaction.

A brief description of soil stabilization methods, such as lime stabilization, cement stabilization, fly ash stabilization and deep mixing method along with their applications.

Foundation design due to vibration, especially from the machines. Analysis and design of pile due to lateral load using the elastic solution and Brom's method.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Design of sheet piles, machine foundations and subjected to lateral load, |
| **CLO2** | Analysis and design of retaining wall, |
| **CLO3** | Apply different soil stabilization techniques to solve soft soil issues for construction purposes, |
| **CLO4** | Apply different ground improvement methods to improve the bearing capacity, strength and stiffness of soil. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | √ | | | | | | | | √ |
| **CLO2** | √ | √ | √ | √ | | | | | | | | √ |
| **CLO3** | √ | √ | | v | | | | | | | | √ |
| **CLO4** | √ | √ | √ | √ | | | | | | | | √ |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Arora, K.R. (1987), Soil mechanics and foundation engineering. *Standard publishers distributors.* ISBN: 81-8014-028-8
2. Coduto, D.P. (2003), Geotechnical engineering-principles and practices. *Prentice hall of India private limited.* ISBN: 81-203-2137-5
3. Das, B.M. (2013), Principles of foundation engineering. *Cengage learning India private limited.* ISBN-13: 978-81-315-1878-6
4. Hausmann, M.R. (1990), Engineering Principles of Ground Modification. *McGraw Hill, NY.* ISBN-13: 978-0070272798
5. Analysis and Design of Foundations and Retaining Structures, S. Saran, IK International Publishing.
6. Foundation Engineering handbook, H. F. Winterkorn and H. Y. Fand, Galgotia.


### *4.7.7 CE 0732 4144*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4144<br>**COURSE TITLE: Structural Analysis and Design Sessional II** | |
|---|---|
| **CREDIT: 1.5 (Sessional)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| The aim of this course is to equip the students with a thorough understanding of the behavior and design of bridges. The knowledge is essential to realize and understand how different types of loads act on bridges and to analyze and design the elements accordingly. |

| **Objectives** |
|---|
| • To facilitate knowledge about different types of bridges and their distinctive features, different components of bridges<br>• To provide students understanding how different types of loads, such as truck load, impact, horizontal braking/ centrifugal forces, wind and seismic loads, act on bridges<br>• To enable students to analyses and design the main components of a chosen bridge<br>• To provide students with fundamental knowledge in a wide range of state-of-the-art practices, including code specifications, in bridge engineering. |

**Course Content**
Design of various reinforced concrete structures, e.g. bridge (slab bridge, deck girder bridge), water tanks

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Distinguish** different types of bridges; **calculate** the loads required to design the bridges; **relate** different codes related to bridges; **select** bridge types based on location. |
| **CLO2** | **Identify** different components of bridges, the present status of bridges in Bangladesh. |
| **CLO3** | **Analyze** and **design** different types of bridges. |
| **CLO4** | **Use** software to analyze and design bridges. |
| **CLO5** | **Analyze** and **design** of water tank |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | | | | √ | | | | | | | |
| **CLO5** | | | √ | | | | | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Design of Concrete Structures, D. Darwin, C.W. Dolan and A.H. Nilsson, 15th edition, McGraw Hill Companies Inc., New York.
2. Structural Concrete, M. N. Hassoun and A. Al-Manaseer, 6th edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
3. ASSHTO: Standard Specifications for Highway Bridges.
4. AASHTO LRFD Bridge Design Specifications (1998), SI Units (2nd Edition). *AASHTO – Washington DC*
5. Bridge Design Standards for Roads & Highways Department of Bangladesh (2004). *Ministry of Communications, Bangladesh*


### *4.7.8 CE 0732 4146*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4146<br>**COURSE TITLE: Reinforced Concrete Design Sessional** | |
| **CREDIT: 1.5 (Sessional)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course introduces structural design and analysis of multistoried buildings considering wind and earthquake loads. |

| **Objectives** |
|---|
| • To facilitate necessary knowledge about BNBC-2020<br>• To provide the knowledge on design and analysis of multistoried buildings<br>• Help them conceptualize the basic process in the analysis of building frames by both lateral (wind and earthquake) and vertical loads<br>• To familiarize software for design<br>• To provide supportive idea about the related power and plumbing systems. |

**Course Content**
Design of multistoried buildings considering wind and earthquake loads.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Apply** the knowledge and select appropriate structural systems following the code requirements for low- and high-rise buildings. |
| **CLO2** | **Calculate** accurate loads and their combination for a building and water reservoir design. |
| **CLO3** | **Analyze** and **design** low- and high-rise buildings manually, incorporating structural analysis and design software in the real field. |
| **CLO4** | **Analyze** and **design** a water reservoir manually and use structural analysis and design software in the real field. |

## Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS: (**List of reference books may vary depending upon the choice of course teachers and time)


1. Bangladesh National Building Code-2020 (BNBC-2020).
2. Elementary Structural Analysis and Design of Buildings, D. R. Pilla, 1st edition, CRC Press.
3. Structural design of buildings, P. Smith, 1st edition, Wiley-Blackwell.
4. Comprehensive RCC Designs, D. B.C. Punmia, A. K. Jain and A. K. Jain, 3rd edition.
5. ETABS Black Book, G. Verma, 1st edition, CADCAMCAE Works.


### *4.7.9 CE 0732 4130*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4130<br>**COURSE TITLE: Project/Thesis** | |
|---|---|
| **CREDIT: 1.5 (Thesis)** | **SEMESTER OFFERED: 4th** Year 1st Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| Thesis in undergraduate level will enable a student to learn how to conduct research by problem identification, objective determination and methodology development, conduct experiments and analysis and finally interpret the result. |

| **Objectives** |
|---|
| • Integrate science and engineering principles for analysis and solution of problems in the field of civil and environmental engineering.<br>• Formulate the thesis research project. Identify the critical research questions, and define the scope and objectives of the project. Design experiments, analysis, or observation plan.<br>• To make the students introduced with information technology resources to find background information and data pertinent to the thesis topic.<br>• Develop writing skills and presentation skills needed to effectively communicate the purpose, scope and conclusions of the project. |

**Course Content**

1st semester: With the help of the supervisor, student should approach to conduct a literature review on a particular field among Structural Engineering, Concrete Technology, Environmental Engineering, Transportation Engineering, Water Resources Engineering and Geotechnical Engineering. On the basis of reviewed literatures, selecting a topic with the methodology to conduct the study, expected expenditure and time requirement should be finalized by the end of 1st semester. The semester outcome will have to be defended through a presentation containing theoretical background, methodology, experimental plan, related expenditure, and a plan for the completion of the project/thesis at the end of the semester in a seminar organized by the Civil Engineering Department.

2nd semester: Students should conduct theoretical and/or analytical and/or experimental investigation of the selected topics in an individual or group study with the direct guidance of the supervisor appointed by the department. Students will be required to submit a thesis/project report and give a presentation of the same at the end of the work.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Identify a research hypothesis or research question, develop methodology to conduct the study, design an experiment process or system and after completion of all experiment and analysis, write the thesis |
| **CLO2** | Able to prepare research proposals for submission and presentation for various purposes |
| **CLO3** | Collect relevant data (primary or secondary) and by analyzing the collected data reach to an acceptable solution |
| **CLO4** | Understand of the research work conducted and applied it as the theoretical framework to the research process |
| **CLO5** | Prepare a supervised and defended research project as a thesis to the department. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | √ | | | | √ | | √ | √ | √ |
| **CLO2** | | | | | | | | √ | | | √ | |
| **CLO3** | | √ | | | | √ | | √ | | | | |
| **CLO4** | √ | | | | | | | | | | √ | √ |
| **CLO5** | | | | | | | | | | √ | √ | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)

No particular reference book for this course.

### *7.8 Fourth Year: Semester II*

#### *4.8.1 CE 0732 4223*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4223<br>**COURSE TITLE:** Professional Practices and Communication | |
|---|---|
| **CREDIT:** 2.0 (Theory) | **SEMESTER OFFERED:** 4th year 2nd Semester |
| **Exam Hours:** 2.00 | |

| **Rationale** |
|---|
| Communication is very important for every professional. Effective communication, both orally and in writing, using appropriate technical language and terminology is very essential for every person. analyzing and solving complex engineering problems using critical thinking and problem-solving skills necessary for every civil engineer. manage engineering projects effectively, including scheduling, budgeting, and team management. work effectively in teams and demonstrate leadership skills when necessary. |

| **Objective** |
|---|
| • To develop effective communication skills.<br>• To prepare students for professional practice.<br>• To enhance critical thinking and problem-solving skills.<br>• To provide knowledge of project management.<br>• To enhance teamwork and leadership skills.. |

**Course content:**

Project, its characteristic feature, project life cycle; type of contracts; procurement regulations and law; documents for procurement of works, goods and services and their application; contract risk and contract responsibility; insurances; tender procedure; claims, disputes and arbitration procedure; measures for reducing fiduciary risks. Introduction to communication concepts, modes of communication, methods of effective communication; writing reports; oral presentation of reports; writing proposals; preparing effective business messages; conducting meetings; strategies for effective speaking and successful inter personal communication; job application process, interviews and follow-ups; an introduction to the code of ethics for engineers.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the development of a project, its characteristic features considering project life cycle; and related code of practices. |
| **CLO2** | Apply ethical practices as an integral part of the code of conduct in professional life. |
| **CLO3** | Make distinctions between competing choices and take consequences into account when making ethical decisions. |
| **CLO4** | Apply plagiarism issues in code of conduct, research, and writing. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | √ | √ | | | | | | | | |
| **CLO2** | | | | | | | | √ | | | | |
| **CLO3** | | | | | | | √ | √ | | | | |
| **CLO4** | | | | | | √ | | √ | | √ | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Introduction to Engineering Ethics, R. Schinzinger and M. W. Martin, 3rd Edition, McGraw-Hill Higher Education.
2. Fundamentals of Ethics for Scientists and Engineers, E. G. Seebauer and R. L. Barry, 1st Edition, Oxford University Press.
3. Engineering Ethics: Cases and Concepts, R. Harris and Pritchard, 3rd Edition, Wadsworth.
4. Engineering Ethics: Balancing Cost, Schedule, and Risk; Lesson Learned from the Space Shuttle, R. L. B. Pinkus, L. J. Shuman, N. P. Hummon, and H.Wolfe, Cambridge University Press.


### *4.8.2 CE 0732 4225*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4225<br>**COURSE TITLE:** Socio-economic Aspects of Development Projects | |
|---|---|
| **CREDIT: 3.00 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 3.00** | |

| **Rationale** |
|---|
| The aim of this course is to introduce the students with the progression of social and economic development of a society. Socio-economic development is measured with indicators, such as GDP, life expectancy, literacy and levels of employment. This course will focus on these factors with some far-fetched analyses so that the students can comprehend the "cause and effect" in the underlying structure of a project. |

| **Objectives** |
|---|
| • To reduce unemployment, achieve economic stability, and increase the standard of living for all citizens.<br>• To build a highly skilled, flexible workforce |

**Course Content**

Economic and social structure, development and economic growth, socio-economic indicators, population, prosperity and poverty, employment of workforce, population displacement, rehabilitation strategy, productivity, landloss, landuse and land ownership patterns, fisheries and aquaculture, deforestation and afforestation, communication, commerce, industries and other economic benefits, water supply, sanitation, health and nutrition, inequalities in distribution of benefits and losses, socio-economic survey, case studies.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Familiarize themselves with the Socio-economic factors. |
| **CLO2** | Involve in active learning, critical thinking and independent academic works. |
| **CLO3** | Understand the basic concepts, facts and processes of social schemes. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | √ | √ | √ | √ | √ | √ | √ |
| **CLO2** | | | | | | √ | √ | √ | √ | | √ | √ |
| **CLO3** | | | | | | √ | √ | √ | | | | √ |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Managerial and Engineering Economy Taylor, G.A.
2. Engineering Economics and Cost Analysis Collier, C

### *4.8.3 CE 0732 4220*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4220<br>**COURSE TITLE: Semester Final Viva IV** | |
| **CREDIT:** 0.5 (Viva) | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours:** NA | |

| **Rationale** |
|---|
| This course will enable the students to review the basic of 4th year subjects and able to demonstrate and answer questions in real life using their knowledge, skills, and creativity. |

| **Objectives** |
|---|
| • To assess student's ability to communicate with another person.<br>• To supplement the information obtained through other evaluation techniques.<br>• To use stimulation methods like role play and telephone conversation.<br>• To evaluate the student's spontaneity and mannerism.<br>• To acquire soundness of academic knowledge through various forms of question.<br>• To diagnose the student's limitation and weakness and take remedial action. |

**Course Content**
4th year 1st semester and 2nd semester theory and sessional courses.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Examine** the necessary skills and knowledge to become a successful civil engineer |
| **CLO2** | **Work** in groups, analyze case studies, and discuss current industry trends and challenges. |
| **CLO3** | **Able** to apply 4th year 1st and 2nd semester knowledge in real-world scenarios to meet desired needs within socioeconomic demand and ethical values. |
| **CLO4** | **Communicate** effectively in written, oral, graphical, and mathematical formats appropriate to civil engineering. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | | √ | | | | | | |
| **CLO2** | | | | | | | | | √ | | √ | |
| **CLO3** | | | √ | | √ | | √ | √ | | | | √ |
| **CLO4** | | | | √ | | | | | | √ | | √ |

**REFERENCE BOOKS:** List of reference books for 4th year 1st semester and 2nd semester all courses.

### *4.8.4 CE 0732 4243*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4243<br>**COURSE TITLE:** Introduction to steel concrete composite structures | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.00** | |

| **Rationale** |
|---|
| This course familiarizes students to the behavior and design of composite structures. This course will enable the students to realize, understand and design basic elements of composite structures. |

| **Objectives** |
|---|
| • To introduce the properties, selection, performance and codified requirements for design of composite structural members.<br>• To introduce the design philosophies and latest code specifications for design of composite structures.<br>• To make familiar with the knowledge of analysis and design of steel beam, steel column, steel base plate and composite structures. |

**Course Content**

Introduction to composite structures, advantages of composite construction; behavior of different types of composite columns, axial load capacity and interaction diagram for composite columns. Composite floor system: details of composite deck and shear connectors. Elastic and plastic analysis of composite beams; design of composite beams for serviceability and strength limit states.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the fundamental concepts and principles of composite structures, specifically the steel-concrete composite structures |
| **CLO2** | **Design** composite beams, columns, and floor systems. |
| **CLO3** | **Optimize** design solution for steel-concrete composite beams and columns. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Steel Structures Design (ASD/LRFD), A. Williams, McGraw Hill.
2. Steel Design, W. T. Segui, 5th Edition, Cengage Learning.


### *4.8.5 CE 0732 4245*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4245<br>**COURSE TITLE: Design of Concrete Structures III** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will familiarize the students with the analysis, design and detailing of reinforced concrete elements, such as joists, shear wall, lift core, diaphragm. It also introduces them with serviceability design of the shear wall reinforced concrete structures. |

| **Objectives** |
|---|
| • To introduce the basic principles, fundamental equations and analysis of reinforced concrete elements<br>• To facilitate necessary knowledge about the theories and techniques for the analysis and design of joists, shear wall, lift core, diaphragm, joint reinforcement<br>• To familiarize the procedure for detailing of RCC elements |

**Course Content**

Analysis and design for torsion; design of one way and two way joist slabs with or without beam on the column line; design and detailing of lateral load resisting components: shear wall, lift cores, diaphragm etc.; design of reinforcement at joints.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Differentiate** joist slabs from other types of slabs; **design** joist slabs with or without beam on the column line. |
| **CLO2** | **Design and detail RC beam-column joints, shear wall, lift cores, and diaphragm** |
| **CLO3** | **Select** appropriate stair types for a specific job and perform analysis and design of different types of stairs. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | √ | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Design of Concrete Structures, D. Darwin and C.W. Dolan, 16th Edition, McGraw Hill Companies Inc., New York.
2. Structural Concreter, by M. N. Hassoun and A. Al-Manaseer, 6th Edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
3. Practical Design of Reinforced Concrete Buildings, S. M. Ashraf, 1st Edition CRC Press, USA.
4. The Analysis of Irregular Shaped Structures Diaphragms and Shear Walls, by R. T. Malone, R. Rice, 1st Edition, McGraw-Hill Professional, USA.


### *4.8.6 CE 0732 4247*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4247<br>**COURSE TITLE: Pre-stressed Concrete** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| In the race of modern science and technology, to make things stronger, cheaper, lighter, more functional, and more sustainable, prestressed concrete is used extensively in bridges, multistory buildings and many other important parts of modern infrastructure. This course provides students with an opportunity to enhance their skills in prestressed concrete design and applications. |

| **Objective** |
|---|
| • Make the students understand the basic principles of prestressed concrete technology, advantages and disadvantages, and their applications in civil infrastructure<br>• Acquint different concepts for determining the beam stress and compare among them<br>• To facilitate necessary knowledge about different methods of prestressing system and using advanced construction materials for posttensioning and pretensioning<br>• Helping the students to develop ability in analyzing prestressed beam section considering flexure, shear, torsion and deflection. |

**Course content:**
Prestressed concretes, materials, prestressing systems, loss of prestress, analysis of sections for flexure, shear, bond and bearing, beam deflections and cable layout, partial prestress.
Design of prestressed sections for flexure, shear, bond and bearing.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Interpret the basic principles of prestressed concrete technology and their applications in civil infrastructure |
| **CLO2** | Examine beam stresses using different concepts. |
| **CLO3** | Explain different methods of prestressing system and using advanced construction materials for post tensioning and pretensioning |
| **CLO4** | Identify design requirements and analysis prestressed beam section considering flexure, shear, bond, torsion and deflection. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | √ | | | | √ | | | | | | | |
| **CLO4** | | √ | √ | | | | | | | | | |

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**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Collins, M.P., and Mitchell, D., *Prestressed Concrete Structures*, Response Publications, 1998.
2. Lin, T.Y., and Burns, N.H., *Design of Prestressed Concrete Structures*, John Wiley and Sons, Inc., Third Edition, 1993.
3. Modern Prestressed Concrete: Design Principles and Construction Methods, 4th Edition by James R. Libby, 2012.
4. Prestressed Concrete Design, Second Edition by M.K. Hurst – 2002.
5. Reinforced and Prestressed Concrete 3rd edi. By F. K. Kong, R. H. Evans – 2013.


### *4.8.7 CE 0732 4249*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4249<br>**COURSE TITLE: Dynamics of Structures** | |
|---|---|
| **CREDIT: 2.0** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| Understanding of structural dynamics is important in the design and retrofit of structures to withstand severe dynamic loading from earthquakes, hurricanes, and strong winds, or to identify the occurrence and location of damage within an existing structure. |

| **Objectives** |
|---|
| To provide a basic knowledge over the reaction of structures due to the action of dynamic loads |

**Course Content**
Formulation of equation of motion; free vibration response, SDOF and MDOF systems, response to harmonic and impulse loading and vibration analysis by Rayleighs method.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the fundamental principles of Dynamics; identify single degrees of freedom (SDOF) and multi-degrees of freedom (MDOF) system. |
| **CLO2** | **Calculate** dynamic loads on different types of structures. |
| **CLO3** | **Formulate** equation of motion under free and forced vibration for SDOF and MDOF systems, and determine the natural frequency, formulate stiffness matrix, mass matrix. |
| **CLO4** | **Evaluate** the dynamic response of an SDOF under harmonic and impulse loading; Analyze an MDOF system under harmonic. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | √ | √ | | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Dynamics of Structures, Theory and Applications to Earthquake Engineering, A. K. Chopra, 3rd edition, Prentice-Hall.
2. Dynamics of Structures, R. W. Clough and J. Penzien, Computers & Structures, Inc..
3.


### *4.8.8 CE 0732 4246*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4246<br>**COURSE TITLE: Structural Analysis & Design Sessional III** (Computer Aided Analysis and Design of Structures) | |
|---|---|
| **CREDIT: 1.5 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course introduces structural design and analysis of low rise moment frame steel building considering wind and earthquake loads. |

| **Objectives** |
|---|
| • To facilitate necessary knowledge about BNBC-2020<br>• Help them conceptualize the basic process in the analysis of building frames by both lateral (wind and earthquake) and vertical loads<br>• To introduce software for design |

**Course Content**

Analysis and design of low rise moment frame steel building for gravity and wind loads; design of members, connections and columns bases using software application.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Apply** the knowledge and select appropriate structural systems following the code requirements for low-rise buildings. |
| **CLO2** | **Calculate** accurate loads and their combination for a building |
| **CLO3** | **Analyze** and **design** low-rise buildings using structural analysis and design software in the real field. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Unified Design of Steel Structures, L. F. Geschwindner, 2nd edition, J. Wiley and sons Inc., NewYork.
2. Structural Steel Design, J. C. McCormac and S. F. Csernak, 5th edition, Pearson, NewYork.
3. Design of Steel Structures: Theory and Practice, D. N. Subramanian, OXFORD UNIVERSITY PRESS, USA.
4. Steel Structures Design: ASD/LRFD, A. Williams, 1st edition, McGraw Hill Education, NewYork.


### *4.8.9 CE 0732 4281*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4281<br>**COURSE TITLE:** Environmental Engineering III | |
|---|---|
| **CREDIT: 2**.00 (Theory) | **SEMESTER OFFERED:** 4th year 2nd Semester |
| **Exam Hours: 2**.00 | |

| **Rationale** |
|---|
| solid waste management is to address the growing issue of waste management in our communities. The course is designed to provide students with the knowledge and skills necessary to understand the types of waste generated by human activities, the health and environmental impacts of poorly managed waste, and the various methods and technologies available for effective waste management. Solid waste management is a critical issue that affects the environment, public health, and the economy. The course aims to equip students with the ability to assess the current waste management situation in their communities and develop sustainable solutions to address waste problems. This includes strategies such as recycling, composting, waste-to-energy, and landfill management. |

| **Objectives** |
|---|
| • To provide an understanding of solid waste management<br>• To provides an introduction to various waste management technologies such as landfill design and operation, composting, incineration, and waste-to-energy.<br>• To focuses on environmental and public health issues associated with solid waste management, including air pollution, water pollution, and hazardous waste management.<br>• To emphasizes the need for sustainable waste management practices, including waste reduction, reuse, and recycling. |

**Course content:**
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 solid waste collection and disposal, hazardous waste management.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Develop a deep understanding of the principles and concepts of solid waste management, including waste generation, collection, transportation, processing, and disposal. |
| **CLO2** | Be familiarized with various waste management technologies such as landfill design and operation, composting, incineration, and waste-to-energy. |
| **CLO3** | Be aware of environmental and public health issues associated with solid waste management, including air pollution, water pollution, and hazardous waste management. |
| **CLO4** | Understand the need for sustainable waste management practices, including waste reduction, reuse, and recycling. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | | √ | | | | | |
| **CLO2** | | | √ | | | | | | | | | |
| **CLO3** | | √ | | | | | | | | | | |
| **CLO4** | | | √ | | | | √ | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Ahmed, M.F. and Rahman, M.M. (2000), Water supply and sanitation. *ITN Bangladesh*, ISBN–984-31-0936-8.
2. Metcalf & Eddy. (1972). Wastewater engineering: collection, treatment, disposal. *McGraw-Hill*.
3. Chowdhury, M.A.I. (2013). Municipal Solid Waste Management, *University Grant Commission UGC of Bangladesh, Dhaka*, ISBN: 978-984- 8910-14-5


### *4.8.10 CE 0732 4283*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4283<br>**COURSE TITLE: Environmental Engineering IV** | |
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will familiarize the students with the environmental pollution and its control technologies. Course content covers air pollution, noise pollution, thermal pollution, radioactive pollution, and advanced pollution control engineering. This knowledge is essential for the students to identify the extent of environmental pollution and formulate a sustainable engineering solution to cope with the challenges. |

| **Objectives** |
|---|
| • To provide knowledge on different environmental pollution in detail.<br>• Accumulate basic ideas about various control technologies of environmental pollution.<br>• Helping the students to develop the ability in formulating a sustainable solution to environmental pollution related problems. |

**Course Content**

Environment 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; ground-water 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 greenhouse effects, air pollution monitoring and control measures.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Identify** sources and types of pollutants and **evaluate** their effects on surface/groundwater, air and noise pollution |
| **CLO2** | **Comprehend** the methods and applications to measure or detect pollutants, economic and health hazards. |
| **CLO3** | **Apply** recommended strategies to improve or manage surface/groundwater water, air and noise pollution, moreover, to prevent hazards on human health, livestock production and economic loss. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | √ | √ | | | | | |
| **CLO2** | | | | | | √ | √ | | | | | |
| **CLO3** | | | | | | √ | √ | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Basic Environmental Engineering, R.C. Gaur, New Age International Publishers.
2. Environmental Science and Ecological Studies, S.K. Garg, KHANNA PUBLISHERS.
3. Introduction to Environmental Engineering, Davis and Cornwell, 5th edition, Science Engineering & Math.
4. Environmental Engineering, Kiely, 1st edition, McGraw-Hill College.
5. Air Pollution Control Engineering, N. D. Nevers, 3rd edition, Waveland Press, Inc.
6. Air Pollution Control Engineering, L. K. Wang, N. C. Pereira and Y. T. Hung, 1st edition, Humana Press Inc., New Jersey.


### *4.8.11 CE 0732 4285*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4285<br>**COURSE TITLE:** Environmental Engineering V | |
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will help the students to determine whether or not a project will make a negative effect on |

the surrounding environment to the point where it may become damaged and not be able to recover to a sustainable state surrounding the project. Enable the students about measuring and evaluating the impact of any proposed project and development on the environment taking consideration the social, economic, cultural, and human-based health risks and benefits.

**Objectives**

- To disclose significant environmental effects of proposed projects to
- decision-makers and the public.
- To identify ways to avoid or reduce environmental damage
- To prevent adverse environmental impacts by requiring implementation of feasible alternatives or mitigation measures.
- To disclose reason of approvals for the projects with significant environmental impacts to the public.
- To foster interagency co-ordination.
- To enhance public participation.

**Course Content**

Objectives and levels of Environmental Impact Assessment (EIA), General applicability of EIA, Current environmental rules and legislation in Bangladesh, Project screening; Initial Environmental Examinations, Methods of impact prediction and identification, EIA methodologies, Mitigation of Environmental impacts, Environmental Impact Statement case studies, Monitoring of EIA, EIA guidelines in Bangladesh, Environmental Management Plan.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the different steps, key aspects, and case studies/examples of environmental impact assessment (EIA) |
| **CLO2** | Apply current environmental rules, legislation and EIA guidelines of Bangladesh for a development project |
| **CLO3** | Evaluate the environmental impacts, mitigate the negative impacts and create Environmental Management Plan for a development project |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | | | | √ | √ | | | | | |
| **CLO2** | | | | | | √ | √ | | | | | |
| **CLO3** | | | | | | √ | √ | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Environmental Impact Assessment, L.W. Canter, 2nd edition, McGraw-Hill Science/Engineering/Math.
2. A Guide to Environmental Clearance Procedure-DoE, Ministry of Environment and Forests, Bangladesh.
3. Environmental Conservation Rule-1997, Bangladesh Gazette, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh.
4. Harvey, N and Clarke, B 2012. Environmental Impact Assessment in Practice, 1st Edition, Oxford Press.
5. Elliot, M. and Thomas, I. 2009. Environmental Impact Assessment in Australia, The Federation Press
6. Wood, C. 2003. Environmental Impact Assessment: A Comparative Review, Pearson Hall press

### *4.8.12 CE 0732 4287*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4287<br>**COURSE TITLE: Urban and Regional Planning** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| The course aims to introduce the basic theory, concept and practices in physical planning through review and examination of city and regional structures since the beginning of the earliest human settlements to the contemporary, for the students of Civil and Environmental Engineering. |

| **Objectives** |
|---|
| • To provide the knowledge on the chronological development of cities and towns since the beginning of the earliest human settlements to the contemporary megalopolises, and beyond.<br>• Helping the students to understand the social-cultural and political forces that influenced the growth of the cities throughout centuries.<br>• Help them conceptualize basic theories in physical planning in relation to the study of built environment.<br>• Foster the analytical and critical thinking in understanding various physical environments in terms of their social-cultural, environmental and technological correspondents. |

**Course Content**

Introduction to urban planning; Historical thoughts of urban planning, Urban environmental matters, Urban management and brown agenda, Evaluative image of environment of a city/town, Environmental disasters and hazards; GIS in urban environmental planning, Town and city planning, transport planning, environmental planning, Ecological planning. Urban environmental planning in Bangladesh; accelerating urbanization, selected urban planning project in Bangladesh.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | distinguish various human settlements and identify their planning process |
| **CLO2** | develop a solid conceptual framework on their origin and evolution throughout history |
| **CLO3** | relate various socio-cultural, political, environmental and technological impacts to the growth of the cities throughout the globe |
| **CLO4** | communicate concepts in urban history and theory through both verbal and written presentations |
| **CLO5** | identify the limitations of planning and land management system in Bangladesh |
| **CLO6** | apply critical thinking in a range of corresponding fields of history and theory in regional and urban planning |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | | | | | | √ | | | | | |
| **CLO3** | | | √ | | √ | | | | | | | |
| **CLO4** | | | | | | | | √ | | | | |
| **CLO5** | | √ | | | | | | | | | | |
| **CLO6** | √ | | | | | √ | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. **Doxiadis, C.A.:** Ekistics: An Introduction to the Science of Human Settlements.
2. **Gallion, A.B. & Eisner, S.:** The Urban Pattern: City Planning and Design
3. **Hall, P.;** Urban and Regional Planning (third edition); Routledge, London; 1992
4. **Christopher Alexander, Sara Ishikawa, and Murray Silverstein**; A Pattern Language: Towns, Buildings, Construction (1976)
5. **Gary Hack, et al.** (2009) Local Planning: Contemporary Principles and Practice
6. **Professor Golam Rahman** (2008), Town planning and the political culture in Bangladesh
7. **Sultana, S**.; Rural Settlements in Bangladesh: Spatial Pattern and Development; Graphosman, Dhaka; 1993


### *4.8.13 CE 0732 4282*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4282<br>**COURSE TITLE: Environmental Engineering Sessional II** | |
|---|---|
| **CREDIT: 1.5 (Sessional)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| Wastewater treatment removes contaminants and suspended solids from wastewater; this treated, potable water can then be dispatched back into the ecosystem free from man-made contaminants. Swage system and wastewater treatment protect people, as well as local ecosystems, from toxic elements found in wastewater. The course aims to introduce the basic theory, concept and design of sewage system and wastewater treatment plant to produce an environmentally-safe fluid waste stream |

| **Objectives** |
|---|
| • Helping students to introduce relevant techniques to design sewage system<br>• To gain knowledge on design of water supply<br>• To become aware of the waster water disposal and field visit<br>• To be able to design wastewater treatment plant<br>• To introduce computer application to design wastewater treatment plant |

**Course Content**

Design of water supply and sewage system, design of water and wastewater treatment plant, field visits and reporting, computer application in environmental engineering.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Analyz and design water supply and sewage system |
| **CLO2** | Identify problems and deliver solution to effect of improper disposal of wastewater to environment |
| **CLO3** | Design of water and wastewater treatment plant and construction process |
| **CLO4** | Use software to analyze and design of wastewater treatment plant |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | √ | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | √ | √ | | √ | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Wastewater Treatment: Concepts and Design Approach by G.L Karia & R.A Christian
2. Wastewater Treatment Plants: Planning, Design, and Operation, Second Edition 2nd Edition, by Syed R. Qasim
3. Sewerage: The Designing, Construction and Maintaining of Sewage Systems and Sewage Treatment Plants by Amory Prescott Howell, Roger Chambers
4. Water and Wastewater Engineering: Design Principles and Practice, Mackenzie L. Davis, Ph.D., P.E., DEE


### *4.8.14 CE 0732 4251*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4251<br>**COURSE TITLE: Geotechnical Engineering IV** | |
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| Earth retaining structures are built to retain a soil mass and create a difference in level between the ground surface located downstream and the ground surface located upstream of the structure, supported by the structure, usually to gain usable space. They are designed to provide resistance against various failure modes, including sliding, overturning, bearing and seismically induced failures. This course will allow the students to perform design of foundation of rigid and flexible earth retaining structures and construction process. |

| **Objectives** |
|---|
| • To provide detail procedure for design and detailing of earth retaining structures.<br>• Accumulate basic ideas about the theoretical concept of earth retaining structures. |

- To facilitate necessary knowledge about the construction of sheet piles, cofferdam, cassion.

**Course Content**
Foundation of structures subjected to lateral loads; rigid and flexible earth retaining structures; methods of construction: dewatering and slurry-wall construction, braced excavation, sheet piles, cofferdams, caissons.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Analyze and design foundations subjected to lateral loads. |
| **CLO2** | Select technically appropriate and cost-effective Earth Retaining Structures. |
| **CLO3** | Describe construction and inspection activities for Earth Retaining Structures. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | √ | | | | | | | | | |
| **CLO2** | | | | √ | | √ | | | | | | |
| **CLO3** | | | | | | √ | | | | | √ | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Foundation Engineering handbook, H. F. Winterkorn and H. Y. Fand, Galgotia
2. Foundation Engineering handbook, H. F. Winterkorn and H. Y. Fand, Galgotia.
3. Earth Pressure and Earth Retaining Structures, C.R. Clayton, I. Militisky, and J. Woods, "Survey university press.
4. Principles of Foundation Engineering, B. M. Das, CL Engineering.
5. Fundamentals of Geotechnical Engineering, B. M. Das, CL Engineering.
6. Analysis and Design of Foundations and Retaining Structures, S. Saran, IK International Publishing.


### *4.8.15 CE 0732 4253*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4253<br>**COURSE TITLE: Geotechnical Engineering V** | |
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| Soil Dynamics is the engineering field that deals with the response of soils subjected to time-dependent (dynamic) loads. The behavior of soil under a dynamic load is critical for any building constructed on top of the ground. This course will allow the students to perform seismic response of soil. Student also get the fundamental knowledge on, liquefaction problems, remedial measures and earthquake hazards. |

| **Objectives** |
|---|
| • to understand the fundamentals of vibrations, response of soils and foundations under dynamic loadings.<br>• to facilitate necessary knowledge on liquefaction mechanism, factors affecting liquefaction, assessment of liquefaction potential. |

**Course Content**

Elementary vibrations; dynamic properties of soil; seismic response of soils: site effects, site amplification, liquefaction problems, remedial measures and earthquake hazards.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Interpret dynamic properties of soil to conduct a systematic analysis of Foundations under vibratory loading. |
| **CLO2** | Design various geotechnical structures considering dynamic loadings. |
| **CLO3** | Estimate the seismic vulnerability of a site and suggest necessary remedial measures. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | √ | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | | | | √ | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Principles of Soil Dynamics, B. M. Das, PWS-KENT Publishing Company
2. Principles of Soil Dynamics, B. M. Das, PWS-KENT Publishing Company.
3. Geotechnical Earthquake Engineering, S. L. Kramer, Prentice Hall Inc.
4. Dynamics of Bases and Foundations, D. D. Barkan, McGraw-Hill Book Company.
5. Vibrations of Soils and Foundations, E. E. Richart, Prentice Hall Inc.
6. Soil Dynamics T. H. Wu, Allyn and Bacon Inc.


### *4.8.16 CE 0732 4252*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4252<br>**COURSE TITLE: Geotechnical Engineering Sessional II** | |
|---|---|
| **CREDIT: 1.5 (Sessional)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| This course will provide the students with the hands-on experience of software application to design foundation. The students will learn the software application to input basic property, behavior and parameters of soil for designing different structures like retaining wall, slope based on soil and solving geotechnical issues for soil improvement. |

| **Objectives** |
|---|
| • To acquaint the student with the basic concept of software application for geotechnical analysis and design<br>• To facilitate necessary knowledge about the common terminology and parameters used to improvement of soil<br>• To generate the skills to analyze deformation and settlement characteristics of soils, bearing capacity and slope stability concepts using software application. |

**Course Content**

Computer aided design of foundations, retaining walls and reinforced soils, slope stability analysis, techniques of soil improvement, use of computer application in geotechnical engineering.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Identify different parameters for geotechnical analysis and design |
| **CLO2** | Analyze and design different type of foundation, retaining wall, slope stability using software application |
| **CLO3** | Identify parameters and analyze the different techniques of soil improvement |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Geotechnical Engineering Investigation Handbook, R. E. Hunt, 2nd Edition, CRC Press/Taylor & Francis McGraw-Hill.
2. Stability Analysis of Earth Slopes by Yang H. Huang
3. Soil Strength and Slope Stability, 2nd Edition by J. Michael Duncan, Stephen G. Wright, Thomas L. Brandon
4. Earth Slope Stability Assessment: Employing Particle Swarm Optimization by Mohd Raihan Taha, Mohammad Khajehzadeh, Ahmed El-Shafie
5. Soil Improvement and Ground Modification Methods 1st Edition by Peter G. Nicholson


### *4.8.17 CE 0732 4261*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4261<br>**COURSE TITLE:** Transportation Engineering III | |
|---|---|
| **CREDIT:** 2.00 (Theory) | **SEMESTER OFFERED:** 4th year 2nd Semester |
| **Exam Hours:** 2.00 | |

| **Rationale** |
|---|
| Transport planning and traffic management is designed to address the growing need for efficient and sustainable transportation systems in urban and rural areas. The course is designed to provide students with the knowledge and skills necessary to understand the complexities of transport systems, analyze |

transportation problems, and develop solutions that improve mobility, safety, and sustainability. Transport planning and traffic management play a crucial role in shaping the way people move around and access resources in cities and towns. The course aims to equip students with the ability to design and implement effective transport policies and infrastructure that support economic growth, social equity, and environmental sustainability

**Objectives**

- To develop an understanding of the principles of transport systems, including their components, their interactions, and their implications for mobility and accessibility.
- To learn how to use various tools and techniques to identify and analyze transportation problems, including traffic congestion, safety issues, and environmental impacts.
- To learn how to develop and evaluate sustainable transport solutions that consider the social, economic, and environmental impacts of transportation.
- To learn how to design and implement transport policies and infrastructure that support sustainable and efficient transportation systems.

**Course content:**
The transportation planning process; traffic management concepts, traffic accident investigations; city road and street networks: grade separation and interchanges, pedestrian and bicycle facilities. The urban bypass, environmental aspects of highway traffic and transportation projects, elements of traffic flow.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | develop a deep understanding of the principles and components of transport systems, including their interactions, and their implications for mobility and accessibility. |
| **CLO2** | learn how to use various tools and techniques to identify and analyze transportation problems, including traffic congestion, safety issues, and environmental impacts. |
| **CLO3** | develop and evaluate sustainable transport solutions that consider the social, economic, and environmental impacts of transportation. |
| **CLO4** | design and implement transport policies and infrastructure that support sustainable and efficient transportation systems. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | | √ | | | | | | | | √ | |
| **CLO2** | | | √ | | | | | | | | √ | |
| **CLO3** | √ | √ | | | | | √ | | | | | |
| **CLO4** | | | √ | | | | √ | | | | √ | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Transportation Planning: Principles, Practices and Policies : Sarkar Prabir Kumar, Maitri Vinay, Joshi G.J, Garber, N.J. (2014). Traffic and Highway Engineering, CL Engineering. ISBN: 978-1133605157
2. Khanna, S.K. & Justo, C.E.G., "Highway Engineering", Nem Chand & Bros, 2011.
3. Hay, W.W (1965). An Introduction to Transportation Engineering.
4. Kadiyali, L.R. and Lal, N.B. (2005). Principles And Practices of Highway Engineering: (Including Expressways And Airport Engineering). Khanna Publishers. ISBN: 978-8174091659.

### *4.8.18 CE 0732 4263*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4263<br>**COURSE TITLE: Transportation Engineering IV** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will introduce students to the basics of Highway drainage, Airport. This course will also develop the student capacity for scientific investigation of the highway drainage management, designing, construction and maintenance techniques of airports. |

| **Objectives** |
|---|
| • To make the students understand the basic characteristics of highway drainage.<br>• Helping the students to develop skills in management of highway drainage.<br>• To enhance the ability for identifying and analyzing the design requirements for Airports.<br>• To facilitate necessary knowledge about airport construction and maintenance. |

**Course Content**

Highways drainage and drainage structures. Evaluation and strengthening of pavements, importance, advantages and trends in air transportation, planning and design of airports, aircraft characteristics related to airport design, types and elements of airport planning studies, airport configuration, geometric design of the landing area, Terminal area, heliports, design of airport pavements, lighting, marking and signing, Airport drainage.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** pavement planning and management techniques related to highway and airway pavements. |
| **CLO2** | **Choose** a proper drainage system for highway and airport pavements. |
| **CLO3** | **Analyze** and design the necessary structural and geometric elements of an airport, including signing, marking, and lighting. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | √ | | | | | | | | | |
| **CLO2** | | √ | | √ | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Planning and Design of Airport, R. Horronjeff, F. X. Mckelvy and W. J. Sproule, 5th Edition, Mc Graw Hill Publication.
2. Airport Engineering, N. J. Ashford and S. A. Mumayiz, 4th Edition, Mc Graw Hill Publication.

### *4.8.19 CE 0732 4265*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4265<br>**COURSE TITLE: Transportation Engineering V** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will introduce students to the basics of urban **transportation planning and management.** This course will also develop the student capacity for Urban transportation planning and analyzing traffic congestion, safety, sustainability and economic analysis of projects within metropolitan areas and suggests ways to make improvements. |

| **Objectives** |
|---|
| • To make the students understand the urban transportation planning and management.<br>• Helping the students to develop skills in management of sustainable roads<br>• To enhance the ability for identifying and analyzing traffic congestion, safety, transport project and economic analysis of transportation engineering projects. |

**Course Content**

The urban transport problems and trends; road network planning; characteristics and operation of different transit and paratransit modes, planning transit network; estimating system costs and benefits, pricing and financing, evaluation, transit users' attitude, policies and strategies for transit development in metropolitan cities; freight traffic planning and management; selected transport case studies, congestion management; safety management; environmental issues and sustainable transport.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Understand** the principles of urban transportation planning and management, including traffic congestion, safety, case studies, and sustainability. |
| **CLO2** | **Assess** transportation engineering projects through a variety of economic analysis tools. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | √ | | | | | | | | |
| **CLO2** | | √ | √ | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Urban Transport Planning, John Black, Routledge Library Editions: 5th Edition, Urban Planning.
2. Concepts in Urban Transportation Planning, M. G. Woldeamanuel, 4th Edition.

### *4.8.20 CE 0732 4262*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4262<br>**COURSE TITLE: Transportation Engineering Sessional II** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course makes the student competent to apply the knowledge acquired from the relevant theoretical course for solving real-world cases such as roadway performance analysis, geometrical and structural design of roadway and airfield. |

| **Objectives** |
|---|
| • To develop the skill for designing Flexible and Rigid pavement by AASHTO method<br>• To create the ability for designing airfield pavement by the FAA (Federal Aviation Administrator) method<br>• To develop the skill for traffic data analysis for roadway performance analysis, problem identification and finding the potential solution<br>• To learn the designing of horizontal and vertical alignment of a roadway section. |

**Course Content**
Design of rigid and flexible highway and air field pavements, geometric design, road intersections and interchanges, capacity calculations, traffic studies and design.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Design Flexible and Rigid pavement for roadway and airfield |
| **CLO2** | Analyze traffic data such as roadway capacity analysis, traffic volume calculation, speed data analysis, etc. |
| **CLO3** | Design horizontal and vertical alignment of a roadway section. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | √ | | | | | |
| **CLO2** | | √ | | √ | | | | | | | | |
| **CLO3** | √ | | | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. James H Banks, '*Introduction to transportation engineering*', Tata Mc-Graw Hill, 2004.
2. Kadiyyali L.R., 'Highway Engineering', Khanna Publishers.
3. Khanna S.K and Justo, C.E.O, 'Highway Engineering', Nem Chand and Bros.
4. L R Kadiyali., 'Traffic Engineering and Transport Planning' Khanna Publishers
5. Papacoastas and Prevendours, Transportation Engineering and Planning, Phi, New Delhi.

### *4.8.21 CE 0732 4271*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4271<br>**COURSE TITLE: Hydraulics and Hydraulic Structures** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| Students will learn about sediment hydraulics and various types of hydraulic structures along with their design procedure and design consideration using knowledge of fluid mechanics and open channel hydraulics. |

| **Objective** |
|---|
| • To provide the knowledge of sediment transport and design of channels with consideration of sediment transport<br>• To acquaint students with the various types of hydraulic structures and their components in detail, purpose and function of the structures and to select the most appropriate structure and location for a specific problem<br>• To develop understanding of the basic principles and concepts of analysis and design of hydraulic structures<br>• Foster the analytical and critical ability to study the impacts of hydraulic structure on river or canal hydraulics and morphology |

**Course content:**
Theories of Seepage; Embankment, Dam & design of Dam; Sluice gate; spillways; flood control reservoir, energy dissipater; diversion head work; irrigation structure; cross drainage works; regulator design; out falls; Gates; Cut off; Coastal structure, impact on coastal zone and force on coastal structure; Beach and port management; Sediment properties; Transport process; Along shore line sediment transport process, wind transport of sand; Management of coastal environment: Coastal water quality, Coastal water supply and sewage, Intrusion of saline water to estuary; Coast pollution; Preservation of coastal environment.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Calculate glacis height, transition length, distance of baffle pier and end sill from the foot of the glacis, design of cutoff wall depth, design of total floor length, selection of crest width |
| **CLO2** | Design of safe exit gradient, design of chute block, design of baffle pier, design of end sill, design of inverted filter and launching apron, check of floor thickness |
| **CLO3** | Calculate structural load, check factor of safety, moment distribution, design of top slab, design of bottom slab, design of abutment, foundation design for box part, check for settlement |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | √ | | √ | | | | | | √ | |
| **CLO2** | √ | √ | √ | | | | | | | | √ | |
| **CLO3** | √ | √ | √ | | √ | | | | | | √ | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)

1. Punmia, B.C., Dr. P. B. B. Lal, A. K. J., A. K. J.; "Irrigation and Water Power Engineering", *Laxmi Publications Pvt. Ltd.*, 1992.
2. Garg, S. K.; "Irrigation Engineering and Hydraulic Structures", *Khanna Publishers*, 2009.
3. M.M. Grishin, "Hydraulic Structures", Amazon Publisher
4. Sir Issac Pitman. S. Leliavsky "Irrigation and Hydraulic Design", Amazon Publisher.

### *4.8.22 CE 0732 4275*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4275<br>**COURSE TITLE: Groundwater Engineering** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| This course will give an insight to the students about the groundwater sources, movement of ground water, ground water exploration techniques, and existing challenges related to ground water extraction. This knowledge is essential for execution of ground water resources management projects including pump and water well design and construction. |

| **Objectives** |
|---|
| • To understand the basic principles and fundamental equations for ground water flow<br>• To facilitate necessary knowledge about the subsurface geology and the aquifer properties<br>• Helping the students to develop ability in designing well and pump<br>• Accumulate basic ideas about hydraulic conductivity, permeability, and flow rate of confined and unconfined aquifers<br>• Familiarize with the existing challenges associated with ground water resources and techniques for the modification of the ground water system. |

**Course Content**

Groundwater in hydrologic cycle and its occurrence. Physical properties and principles of groundwater movement. Groundwater and well hydraulics. Groundwater resource evaluation. Groundwater levels and environmental influences. Water mining and land subsidence. Groundwater pollution and contaminant transport. Recharge of groundwater. Saline water intrusion in aquifers. Groundwater management

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Apply the governing principles of ground water flow, ground water movement, and appropriate continuity principles |
| **CLO2** | Assess local subsurface geology by using the basic understanding of aquifer properties |
| **CLO3** | Estimate hydraulic conductivity, permeability, velocity of ground water at field level and flow rate of confined and unconfined aquifers |
| **CLO4** | Identify the challenges associated with ground water resources and understand the engineering techniques for the modification of the ground water system |
| **CLO5** | Design the water well (non-gravel pack and gravel pack) and water pump. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | √ | √ | | | | | | | | | | |
| **CLO3** | √ | | | √ | | | √ | | | | | |
| **CLO4** | √ | √ | | | | | √ | | | | | √ |
| **CLO5** | | | √ | | | | √ | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Todd, D. K., and Mays, L. W. (2005), Groundwater hydrology Ed (Vol. 1625), Wiley, New Jersey. ISBN-13: 978-8126530038
2. Aziz, M. A. (1975), Water Supply Engineering. Hafiz Book Center, 167
3. Ahmed, M. F., and Rahman, M. M. (2000), Water supply and sanitation: Rural and low income urban communities. ITN-Bangladesh, Centre for Water Supply and Waste Management, BUET.
4. Raghunath, H. M. (2007), Groundwater. 3rd Ed., New Age International Pvt Ltd Publishers. ISBN-13: 978-8122419047


### *4.8.23 CE 0732 4273*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4273<br>**COURSE TITLE: River Engineering** | |
|---|---|
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

**Rationale**

The course is designed to provide students with the knowledge and skills necessary to understand the principles of river engineering, the hydrological processes that influence river systems, and the various techniques and tools available for managing and designing river systems. River systems play a critical role in providing water resources, hydroelectric power, transportation, and ecological services to societies. The course aims to equip students with the ability to assess the current state of river systems, identify their problems, and develop sustainable solutions to address them. The course covers a wide range of topics, including river morphology, sediment transport, flood control, river restoration, river training, water resources management, and river modeling. By providing students with a comprehensive understanding of river engineering, they can develop the skills necessary to tackle the challenges of managing and utilizing river systems and contribute to creating a more sustainable and resilient future.

**Objectives**

- To develop a deep understanding of the principles and components of river systems,
- To learn about the various techniques and tools available for managing and designing river systems, including river training, flood control, sediment management, and river restoration.
- To learn how to identify and analyze river problems, including sedimentation, channel instability, and flooding.
- To design sustainable river solutions.

**Course content:**

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.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Understand the behavior of alluvial rivers, morphological processes and sediment movement. |
| **CLO2** | Assess the channel instability and bed forms. |
| **CLO3** | Design the river training and bank protection works. |
| **CLO4** | Apply the knowledge to choose dredging techniques to maintain navigable channels. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | | | | | | | | | | | |
| **CLO2** | | √ | | √ | | | | | | | | |
| **CLO3** | | √ | √ | | | | | | | | | |
| **CLO4** | | | | √ | | | √ | | | | | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)


1. Irrigation Engineering By: N. N. Basak
2. River Mechanics By: Pierre Y. Juliyen
3. River Engineering By: Margaret S. Peterse
4. Garg, S. K.; "Irrigation Engineering and Hydraulic Structures", *Khanna Publishers*, 2009.


### *4.8.24 CE 0732 4277*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4277<br>**COURSE TITLE: Coastal Engineering** | |
| **CREDIT: 2.0 (Theory)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: 2.0** | |

| **Rationale** |
|---|
| The course is designed to provide students with the knowledge and skills necessary to understand the principles of coastal engineering. The course aims to equip students with the ability to assess the current state of coastal engineering, identify their problems, and develop sustainable solutions to address them. The course covers a wide range of topics, including river morphology, sediment transport, flood control, management, and modeling. |

| **Objectives** |
|---|
| • To develop a deep understanding of the principles and components of coastal features,<br>• To learn about the various techniques and tools available for managing tidal flow, waves, storms. |

- To learn how to identify and analyze shore protection and dredging.
- To design sustainable coastal structure.

**Course Content**

Coast and coastal features. Tides and currents. Tidal flow measurement. Waves and storm surges. Docks and harbours. Forces of waves and tides in the design of coastal and harbour structures. Coastal sedimentation processes. Deltas and estuaries. Shore protection works. Dredging and dredgers.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | **Calculate** the magnitude and direction of wave forces and carry out analysis of wave data to determine long-term design statistics. |
| **CLO2** | **Understand** the phenomena of tides, delta and estuary processes and how they influence coastal sites**.** |
| **CLO3** | **Estimate** tidal flow and sediment transportation. |
| **CLO4** | **Select** suitable structures for shore protection based on different conditions. |
| **CLO5** | **Determine** design load on the coastal structure and undertake a design of a coastal structure**.** |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | √ | | | | | | | | | | | |
| **CLO3** | √ | √ | | | | | | | | | | |
| **CLO4** | | √ | | √ | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Coastal Hydrodynamics, J. S. Mani, PHI Pvt. Ltd. New Delhi.
2. Water wave mechanics for Engineers and Scientists, R.G. Dean, and R.A. Dalrymple, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
3. Estuary and Coastline Hydrodynamics, A.T. Ippen, 1st edition, McGraw-Hill, Inc., New York.
4. Basic Coastal Engineering, 3rd edition, R.M. Sorenson, A. Wiley-Interscience Pub. New York.
5. Coastal Engineering Manual, Vol. I-VI, Coastal Engineering Research Centre, Dept. of the Army, US Army Corps of Engineers, Washington DC.


### *4.8.25 CE 0732 4272*

| | |
|---|---|
| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4272<br>**COURSE TITLE: Water Resources Engineering Sessional** | |
| **CREDIT: 1.5 (Sessional)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| proper utilization and management of water is necessary especially in the field of irrigation. Knowledge about Design of Canal with hydraulic structure and Analysis of ground water assessment and well design both in Agricultural and Civil Engineering Field |

| **Objectives** |
|---|
| • To develop understanding of the basic principles and concepts of analysis and design of hydraulic structures<br>• Foster the analytical and critical ability to study the impacts of groundwater resource.<br>• Ability to design water well. |

**Course Content**

Design of hydraulic structures, river training works. Groundwater resource assessment and water well design.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | To understand the basic principles of design, construction and operation of the hydraulic structures |
| **CLO2** | Assesses the groundwater resources and river training work. |
| **CLO3** | Design the water well and water pump. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | √ | √ | | | | | | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | √ | | | | | | | | | | | |

**REFERENCE BOOKS:** (List of reference books may vary depending upon the choice of course teachers and time)


1. Irrigation Engineering By: N. N. Basak
2. River Mechanics By: Pierre Y. Juliyen
3. River Engineering By: Margaret S. Peterse
4. Garg, S. K.; "Irrigation Engineering and Hydraulic Structures", *Khanna Publishers*, 2009.


### *4.8.26 CE 0732 4230*

| **DEGREE PROGRAM:** B.Sc. in Civil Engineering<br>**COURSE CODE:** CE 0732 4230<br>**COURSE TITLE: Project/Thesis** | |
|---|---|
| **CREDIT: 1.5 (Thesis)** | **SEMESTER OFFERED: 4th** Year 2nd Semester |
| **Exam Hours: NA** | |

| **Rationale** |
|---|
| Thesis in undergraduate level will enable a student to learn how to conduct research by problem identification, objective determination and methodology development, conduct experiments and analysis and finally interpret the result. |

| **Objectives** |
|---|
| • Integrate science and engineering principles for analysis and solution of problems in the field of civil and environmental engineering.<br>• Formulate the thesis research project. Identify the critical research questions, and define the scope and objectives of the project. Design experiments, analysis, or observation plan.<br>• To make the students introduced with information technology resources to find background information and data pertinent to the thesis topic.<br>• Develop writing skills and presentation skills needed to effectively communicate the purpose, scope and conclusions of the project. |

**Course Content**

1st semester: With the help of the supervisor, student should approach to conduct a literature review on a particular field among Structural Engineering, Concrete Technology, Environmental Engineering, Transportation Engineering, Water Resources Engineering and Geotechnical Engineering. On the basis of reviewed literatures, selecting a topic with the methodology to conduct the study, expected expenditure and time requirement should be finalized by the end of 1st semester. The semester outcome will have to be defended through a presentation containing theoretical background, methodology, experimental plan, related expenditure, and a plan for the completion of the project/thesis at the end of the semester in a seminar organized by the Civil Engineering Department.

2nd semester: Students should conduct theoretical and/or analytical and/or experimental investigation of the selected topics in an individual or group study with the direct guidance of the supervisor appointed by the department. Students will be required to submit a thesis/project report and give a presentation of the same at the end of the work.

**Course Learning Outcomes (CLOs):** On successful completion of this course, the student will be able to-

| | |
|---|---|
| **CLO1** | Identify a research hypothesis or research question, develop methodology to conduct the study, design an experiment process or system and after completion of all experiment and analysis, write the thesis |
| **CLO2** | Able to prepare research proposals for submission and presentation for various purposes |
| **CLO3** | Collect relevant data (primary or secondary) and by analyzing the collected data reach to an acceptable solution |
| **CLO4** | Understand of the research work conducted and applied it as the theoretical framework to the research process |
| **CLO5** | Prepare a supervised and defended research project as a thesis to the department. |

**Mapping of Course Learning Outcomes (CLOs) to Program Outcomes (POs)-**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | √ | | | | √ | | √ | √ | √ |
| **CLO2** | | | | | | | | √ | | | √ | |
| **CLO3** | | √ | | | | √ | | √ | | | | |
| **CLO4** | √ | | | | | | | | | | √ | √ |
| **CLO5** | | | | | | | | | | √ | √ | |

**REFERENCE BOOKS** (List of reference books may vary depending upon the choice of course teachers and time)

No particular reference book for this course.

# Academic Ordinance for Undergraduate Studies

## 1. Introduction

From The academic session 2021-2022, the Engineering College will introduce this course system for undergraduate studies. The rules and regulations for administering undergraduate curricula through the Course System will be applicable to students henceforth. This system has been introduced with an aim to create a continuous, even and consistent workload throughout the semester for the students. This curriculum does not demand the same rate of academic progress from all students for obtaining the degree.

### 1.1 The Course System

The salient features of the Course System are as follows:

- Introduction of Letter Grade and Grade Points instead of numerical grades.
- Introduction of more optional courses to enable the students to select courses according to their individual needs and preferences.
- Continuous evaluation of student's performance.
- Abolition of a pass or a fail on an annual basis.
- Providing flexibility to allow a student to progress at desired pace depending on own ability or convenience, subject to some regulations on minimum earned credits and minimum Grade Point Average (GPA) requirements.
- Student-teacher interaction and contact.

Besides the professional courses pertaining to each discipline, the undergraduate curriculum gives a strong emphasis on acquiring thorough knowledge in the basic sciences of Mathematics, Physics and Chemistry. Due importance is also given on the study of several subjects in Humanities and social Sciences.

The first two semesters of Bachelor's degree programs generally consist of courses in basic engineering and architecture (Background) subject; while the third and subsequent semesters go on to develop competence in specific disciplines.

## 2. Student Admission

Students are admitted in undergraduate curricula in the Department of Civil Engineering, Electrical and Electronic Engineering, & Computer Science and Engineering, Office serves as the Admissions Office and deals with course registration in addition to student admission.

### 2.1 Number of Semester in a Year

There will be two Semester (Semester I and Semester II) in an academic year. In addition to these two regular Semesters there may be a short Semester in the intervening period between the end of Semester II and the commencement of Semester I of the following academic session. During the short Semester, students may take additional courses to make up deficiencies in credit and GPA requirements for Bachelor's degree less time than the normal duration. Respective departments will take the decisions about courses to be offered during each short Semester depending upon the availability of course teachers and number of students willing to take a particular course.

## 3. Duration of Semesters

The duration of each of Semester and Semester II will be 18 weeks that will be used as follows:

| | |
|---|---|
| Classes | 14 weeks |
| Mid-semester break | 1 week |
| Recess before Semester Final Examination | 2 weeks |
| Semester Final Examination (approximately) | 2 weeks |
| Summer Vacation/ Winter Vacation/all Other Festivals | 7 weeks |
| **Total** | **26 weeks** |

Normally 1 week of mid-Semester break is provided after 7 weeks of classes, which is followed by another 7 weeks of classes. The duration of a short Semester will be around 8 weeks of which about 7 weeks will be spent for class lectures and one week for Semester Final Examination.

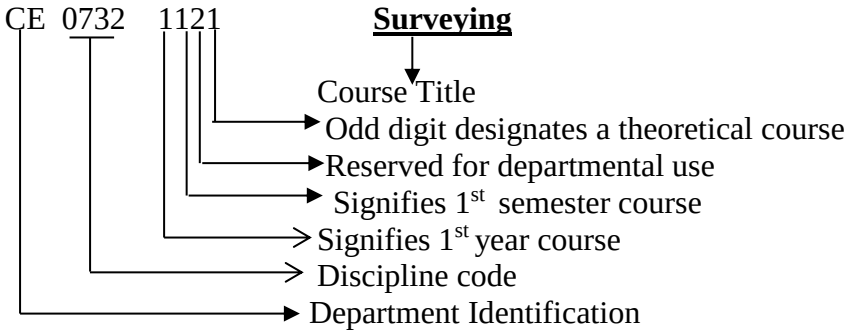
## 4. Course Pattern and Credit Structure

The Undergraduate program is covered by a set of theoretical courses along with a set of laboratory/sessional courses to support them.

### 4.1 Course Designation System

Each course is designated by a two to three letter code identifying the department offering the code followed by a three-digit number having the following interpretation:

- The first digit corresponds to the Semester in which the course is normally taken by the students.
- The second digit is reserved for departmental use. It usually identifies a specific area of study within the department.
- The last digit is an odd number for theoretical courses and an even number for sessional courses.




### 4.2 Assignment of Credits

The assignment of credits to a theoretical course follows a different rule from that of a sessional course.

- **Theoretical Courses:** One lecture per week per Semester is equivalent to one credit.
- **Sessional Courses:** Credits for sessional courses is half of the class hours per week per Semester.

Credits are also assigned to project and thesis work taken by the students. The amount of credits assigned to such work varies from one discipline to another.

### 4.3 Types of Courses

The type of courses included in the undergraduate curricula are divided into the following groups:

- Core Courses: In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete all the designated core courses of his/her discipline.
- Optional Courses: Apart from the core courses, the students can choose from a set of optional courses. A required number of optional courses from a specified group have to be chosen.

### 5. Course Offering and Instruction

The Courses to be offered in a particular semester are announced and published in the Course Catalog along with the tentative Semester Schedule before the end of the previous Semester. The courses to be offered in any Semester will be decided by the respective Board of Undergraduate Studies (BUGS). Respective departments may arrange to offer one or core courses in any Semester depending upon the number of students who dropped or failed the course in the previous Semester.

## 6. Departmental Monitoring Committee

Consistent with its resilient policy to keep pace with new developments in the field of science and technology, the Engineering College updates its course curriculum at frequent intervals (at least every three years). Such updating aims not only to include the expanding frontiers of knowledge in the various fields but also to accommodate the changing social, industrial and professional needs of the country. This can be done through the deletion and modification of some of the courses and also through the introduction of new ones.

The Board of Undergraduate Studies (BUGS) of each department forms a Departmental Monitoring Committee with three teachers of the department. This committee is in charge of monitoring and evaluation the performance of the course system within the department. In addition to other teachers of the department, the committee also may propose from time to the Board of Undergraduate Studies (BUGS) any changes or modifications requited for upgrading the undergraduate Curriculum and the Course System.

## 7. Teacher Student Interaction

The system encourages students to come in close contact with the teachers. For promotion of a high level of teacher-student interaction, each student is assigned to an Adviser and the student is free to discuss with his adviser all academic matters. Students are also encouraged to meet with other teachers any time for help and guidance in academic matters.

## 8. Student Adviser

One adviser is normally appointed for a group of students by the Board of Undergraduate Studies (BUGS) of the concerned department. The adviser each student about the courses to be taken in each semester by discussing the academic program of that particular semester with the student. However, it is also student's responsibility to keep regular contact with his/her adviser who will review and eventually approve the student's specific plan of study and monitor subsequent progress of the student. The adviser is usually in the rank of an Assistant professor or above of the concerned department.

For a student of second and subsequent Semesters, the number and nature of courses for which he/she can register is decided on the basis of academic performance during the previous

semester. The adviser may permit the student to drop one or more courses bases on previous academic performance.

## 9. Course Registration

Any student who uses classroom or laboratory facilities time is required to register formally. Upon admission to Engineering College each student is assigned to a student adviser with whose consent and advice the student can register for courses he intends to take during a given Semester.

### 9.1 Registration Procedure

At the commencement of each Semester, each student has to fill up a course registration form in consultation with and under the guidance of his/her advisor. The date, time and venue of registration are announced in advance by the registrar's Office. Much counseling and advising are accomplished at this time. It is absolutely essential that all the students be present for registration at the specified time. Late registration is, however, permitted during the first week on payment of a late registration fee.

### 9.2 Pre-conditions for Registration

For first year students, department-wise enrollment/admission is mandatory prior to registration. At the beginning of the first Semester, an orientation program is conducted for them where they are handed over with the registration package on production of the enrollment slip/proof of admission.

Any student other than freshmen having outstanding dues to the university of a hall of residence is not permitted to register. Each student must clear their dues and obtain a clearance certificate, on the production of which, he/she will be given necessary Course Registration Forms to perform course registration.

### 9.3 Limits on the Credit Hours to be taken

A student must be enrolled for at least 15 credit hours and is allowed to take a maximum of 24 credit hours. A student must enroll for the sessional courses prescribed in a particular Semester within the allowable credit hour limits. In special cases where it is not possible to allot the minimum required 15 credit hours to a student, the concerned BUGS may approve a lesser number of credit hours to suit individual requirements. Such cases are only applicable to students requiring less than 15 credit hours for graduation.

### 9.4 Registration Deadline

Each student must register for the courses to be taken before the commencement of each Semester. Late registration is permitted only during the first week of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the registrar through the concerned Head of the department and can document extenuating circumstances such as medical problems from the Concern Medical Officer of the Engineering College or some other academic commitments which prohibits enrollment prior to the last date of registration.

### 9.5 Penalty for Late Registration

Students who fail to register during the designated dates for registration are charged a late registration fee of Amount decided by the affiliating authority. This is not waived the reason behind the delay in registration.

## 9.6 Course Add/Drop

A student has some limited options to add or delete courses from the registration list. Addition of courses is allowed only within the first two weeks of a regular Semester and only during the first week of a short Semester. Dropping a course is permitted within the first four weeks of a regular Semester and two weeks of a short Semester.

Any student willing to add/ drop courses has to be done in consultation with and under the guidance of the student's respective adviser. The original copy of the Course Adjustment Form has to be submitted to the Registrar's Office, where the required number of photocopies are made for distribution to the concerned adviser, Head, Controller of Examinations and the student.

All changes must be approved by the adviser and the Head of the concerned department. The Course Adjustment Form has to be submitted after being signed by the concerned persons. The respective course teacher's consent is also required.

## 9.7 Withdrawal from a Semester

If a student is unable to complete the Semester Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree awarding department for total withdrawal from the Semester within a week after the end of the Semester Final Examination. However, he/she may choose not to withdraw any laboratory/sessional/design if the grade obtained in such a course is `D' or better. The application must be supported by medical certificate from the Concern Medical Officer of the Engineering College. The Academic Council will take the final decision about such applications.

# 10. The Grading System

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizes, class evaluation, class participation, homework assignment and a Semester final examination. The assessment in laboratory/ sessional courses is made through observation of the student at work during the class, viva-voce during laboratory hours and quizes.

Each course has a certain number of credits, which describes its corresponding weights. A letter grade with a specified number of grade points is awarded to each course for which a student is registered. A student's performance is measured both by the number of credits completed satisfactorily and by the weighted average of the grade point earned. A minimum grade point average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree.

Letter grades and corresponding grade points will be awarded in accordance to the provisions shown below.

| Grade | Grade Points | Numerical Markings |
|---|---|---|
| A+ | 4.0 | 80% and above |
| A | 3.75 | 75% to below 80% |
| A- | 3.50 | 70% to below 75% |
| B+ | 3.25 | 65% to below 70% |
| B | 3.00 | 60% to below 65% |
| B- | 2.75 | 55% to below 60% |
| C+ | 2.50 | 50% to below 55% |
| C | 2.25 | 45% to below 50% |
| C- | 2.00 | 40% to below 45% |
| F* | 0.00 | below 40% |
| I** | -- | Incomplete |
| X | -- | Continuation (For project and thesis/design courses) |
| S | -- | Satisfactory (non credit courses) |
| U | -- | Unsatisfactory (non credit courses) |
| W*** | -- | Withdrawal |

* Subject in which the student gets F grades shall not be counted towards credit hours requirements and for the calculation of Grade Point Average (GPA).

** Given only a student is unable to complete the course because of circumstances beyond his/her control, it must be made up by the close of next two semesters or the incomplete grade becomes a failure. He/ She may, however, be allowed to register without further payment of tuition fees for that course.

*** A student must withdraw officially from a course within two working weeks of the commencement of the semester or else his/her grade in that course shall be recorded as failure unless he is eligible to get a grade of I (incomplete). A student may be permitted to withdraw and change his/her course within the specified period with the approval of his/her adviser, Head of the department and the respective teacher(s) concerned.

## 11. Distribution of Marks

Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizes, home assignments, class evaluation and class performance. The rest of the marks will be allotted to the Semester Final Examination that is conducted centrally by the Engineering College. There are internal and external examiners for each course in the Semester Final Examination of three hours duration. Distribution of marks for a given course is as follows.

| | |
|---|---|
| Class Participation | 10% |
| Homework assignment and quizzes | 30% |
| Final Examination (3 hours) | 60% |
| **Total** | **100%** |

Basis for awarding marks for class participation and attendance will be as follows.

| **Attendance** | **Marks** |
|---|---|
| 90% and above | 10 |
| 85% to less than 90 % | 9 |
| 80% to less than 85 % | 8 |
| 75% to less than 80 % | 7 |
| 70% to less than 75 % | 6 |
| 65% to less than 70 % | 5 |
| 60 to less than 65 % | 4 |
| Below 60% | 0 |

The number of quizes of a course shall be n+1, where is the number of credits of the course. Evaluation of performance in quizes will be on the basis of the best n quizzes. The scheme of continuous assessment that a particular teacher wishes to follow for a course will be announced on the first day of classes.

## 12. Calculation of GPA

Grade point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/Completed by a student.

For example, if a student passes /completes n courses in a Semester having credits of $C_1$, $C_2$.....$C_n$ and his grade points in these courses are $G_1$, $G_2$..... $G_n$ respectively then.

$$\text{GPA} = \frac{\sum_{i=1}^{n} C_i * G_i}{\sum_{i=1}^{n} C_i}$$

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the Semesters passed/ Completed by a student. For example, if a student passes/completes n Semester having total credits of $TC_1$, $TC_2$, .....$TC_n$ and his GPA in these semesters are $GPA_1$, $GPA_2$, $GPA_n$ respectively then .

$$\text{CGPA} = \frac{\sum_{i=1}^{n} TC_i * GPA_i}{\sum_{i=1}^{n} TC_i}$$

## 12.1 A Numerical Example

Suppose a student has completed eleven courses in a Semester and obtained the following grades:

| **Course** | **Credits $C_i$** | **Grade** | **Grade Points, $G_i$** | **$C_i$*$G_i$** |
|---|---|---|---|---|
| CE 101 | 1.00 | A+ | 4.00 | 4.00 |
| CE 102 | 1.50 | A+ | 4.00 | 6.00 |
| CE 105 | 2.00 | A | 3.75 | 7.50 |
| CE 106 | 1.50 | B | 3.00 | 4.50 |
| CE 132 | 1.50 | A- | 3.50 | 4.50 |
| ME 101 | 1.00 | A+ | 4.00 | 4.00 |
| ME 102 | 1.50 | A | 3.75 | 5.625 |
| MATH 101 | 3.00 | A- | 3.50 | 10.50 |
| PHY 101 | 4.00 | A+ | 4.00 | 16.00 |
| PHY 102 | 1.50 | A | 3.75 | 5.625 |

| | | | | |
|---|---|---|---|---|
| SS 101 | 2.00 | A | 3.75 | 7.50 |
| **Total** | **20.50** | | | **75.75** |

**GPA = 75.75/20.50=3.70**

Suppose a student has completed four semesters and obtained the following GPA:

| Semester | Credit Hours Earned, $TC_i$ | GPA Earned, $GPA_i$ | $GPA_i*TC_i$ |
|---|---|---|---|
| I | 20.50 | 3.70 | 75.85 |
| II | 19.50 | 3.93 | 80.565 |
| III | 21.50 | 3.96 | 84.150 |
| IV | 21.50 | 4.00 | 81.00 |
| **Total** | **83.00** | | **321.565** |

**CGPA = 321.565/83=3.87**

## 13. Impacts of Grade Earned

***A student will not be allowed to take any courses of 1st year at 3rd year and 2nd year at 4th year.***

## 14. Classification of Students

At the Sylhet Engineering College (SEC), regular students are classified according to the number of credit hours completed/earned towards a degree. The following classification applies to all the students:

| Level | Credit Hours Earned | |
|---|---|---|
| | **Engineering** | **Architecture** |
| Year I<br>Year II<br>Year III<br>Year IV<br>Year V | 0 to 39<br>40 to 80<br>81 to 122.5<br>123 and above | 0 to 35<br>36 to 70<br>71 to 113<br>114 to 154<br>155 and above |

However, before the commencement of each semester all students other than freshmen are classified into the categories:

**Category 1:** This category consists of students who have passed all the courses described for the semester. A student belonging to this category will be eligible to register for all courses prescribed for the upcoming semester.

**Category 2:** This category consists of students who have earned a minimum of 15 credits but do not belong to category 1. A student belonging to this category is advised to take at least one course less since he might have to register for one or more backlog courses as prescribed by his/her adviser.

**Category 3:** This category consists of students who have failed to earn the minimum required 15 credits in the previous semester. A student belonging to this category is advised to take at least two courses less than a category 1 student subject to the constraint of registering at least 15 credits. However, he will also be required registering for backlog courses as prescribed by the adviser.

## 15. Performance Evaluation

The performance of a student will be evaluated in semesters of two indices, viz. Semester Grade Point Average and Cumulative Grade Point Average which is the grade average for all the semesters completed.

Students will be considered to be making normal progress toward a degree if their Cumulative Grade point Average (CGPA) for all work attempted is 2.20 or higher. Students who regularly maintain a semester GPA of 2.20 or better are making good progress toward the degrees and are in good standing with the university. Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when any one of the following conditions exists.

1. The semester GPA falls below 2.20.
2. The Cumulative Grade point Average (CGPA) falls below 2.20
3. The earned number of credits falls below 15 times the number of semesters attended.

All such students can make up their deficiencies in GPA and credit requirements by completing courses in the subsequent semester(s) and backlog courses, if there are any, with better grades. When the minimum GPA and credit requirements are achieved the student is again returned to good standing.

## 16. Probation and Suspension

Undergraduate students who fail to maintain the minimum rate of progress as mentioned before may be placed on academic probation. The objective of the academic probation is to remind or warn the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exists.

1. **The semester GPA below 2.20**
2. **The Cumulative Grade Point Average (CGPA) falls below 2.20**

Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the respective Dean Faculty.

The minimum period of probation is one semester, but the usual period is for one academic year. This gives the student an opportunity to improve the GPA through the completion of additional course work during the period the student is on probation. The probation may be extended for additional semesters until the students achieve an overall GPA of 2.20 or better.

An academic probation is not to be taken lightly. A student on academic probation who fails to maintain a GPA of a least 2.20 during two consecutive academic years may be suspended from the engineering college. A student who has been suspended may petition to the Head of the department, but this petition will not be considered until the student has been suspended for at least one full semester.

Petitions for reinstatement must set forth clearly the reasons for the previous unsatisfactory academic records and it must delineate the new conditions that have been created to prevent the recurrence of such work. Each such petition is considered individually on its own merits.

After consideration of the petition, and perhaps after consultation with the student, the Head of the department in some cases reinstates the student if this is the first suspension of that student. However, a second suspension from the engineering college will be regarded as final and absolute.

## 17. Measures for Helping Academically Weak Students

First, academically weak students will be identified according to the following criteria:

1. The semester GPA falls below 2.20
2. The Cumulative Grade Point Average (CGPA) falls below 2.20
3. The earned number of credits falls below 15 times the number of semesters attended.

The following provisions will be made as far as possible to help such academically weak students to enable them to complete their studies within the maximum allowable period of 7 years in Engineering.

1. All such students may be given a load of not more than four courses in the semester following the semester in which the student's GPA was below 2.20
2. Some basic and core courses maybe offered during the short Semester in order to enable academically weak students to partially make up for the reduced work load during the regular semesters.

## 18. Ruler for Special Courses

A Special course is a self-study course, but is amongst the regular courses listed in the course catalog. This type of course is offered only in exceptional cases. The following rules are applicable to all special courses:

- Whether a course is to be floated as a special course will be decided by the Head of the concerned department in consultation with the teacher/course coordinator concerned. Such a decision also has to be reported to the Academic Council.
- A special course may be offered in a particular semester only if the course is not running in that semester as a regular course.
- The special course is offered to a student in his/her last semester if it helps him/her to graduate in that semester.
- A student is allowed to register for a maximum of two courses on a self-study basis.
- A special course cannot be utilized for grade improvement purposes.
- Normally no lecture will be delivered for a special course but laboratory/design classes may be held if they form part of a course.
- The course coordinator/course teacher will assign homework; administer quizzes, and final examination for giving assessments at the end of the semester.

## 19. Ruler for Courses offered in Short Semester

- The courses to be run during the Short Semester shall be decided on the recommendations of departments on the basis of essential deficiencies to be made up by a group of students. Once floated, other students could be allowed to register in those courses subject to the capacity constraints and satisfaction of prerequisites.
- Student will be allowed to register in a maximum of two courses during the short Semester.
- A course may be given a weight of up to 6 credits in any short Semester following a graduation/final semester if he/she is short by a maximum of 6 earned credits only, on a self-study basis with no formal instruction. In a self-study course, there will be a final examination, beside the continuous assessment.
- A certain fee for each credit hour to be registered to be borne by the students who enroll during short Semester.

## 20. Minimum Earned Credit and GPA Requirement for Obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engg) will be decided by the respective BUGS. However, at least 159.5 credit hours for engineering eligible for graduation, and this must include the specified core courses.

The minimum GPA requirement for obtaining a Bachelor's degree in engineering is 2.20

A student may take additional courses with the consent of his/her Adviser in order to raise GPA, but he/she may take a maximum of 15 such additional credits in engineering beyond respective credit-hour requirements for Bachelor's degree during his/her entire period of study.

### 20.1 Application for Graduation and Award of Degree

A student who has fulfilled all the academic requirements for Bachelor's degree will have to apply to the Controller of Examinations through his/her Adviser for graduation. Provisional degree will be awarded on completion of credit and GPA requirements. Such provisional degree will be confirmed by the Academic Council.

## 21. Time Limits for Completion of Bachelor's Degree

A student must complete his/her studies within a maximum period of seven years for engineering.

## 22. Attendance, Conduct and Discipline

The engineering college has strict rules regarding the issues of attendance in class and regarding the disciplinary issues.

### 22.1 Attendance

All students are expected to attend classes regularly. The engineering college believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly, and one is required to attend at least 60% of all classes held in any course.

### 22.2 Conduct and Discipline

A student is expected conform to a high standard of discipline and conduct himself/herself, within and outside the precincts of the engineering college in a manner befitting the students of a university of national importance. He is expected to show due courtesy and consideration to the employees of the engineering college and Hostels of Residence, good neighborliness to his fellow students and the teachers of the engineering college and pay due attention and courtesy to visitors.

To safeguard its ideal of scholarship, character and personal behavior, the engineering college reserves the right to withdraw any student at any time for any reason deemed sufficient.

## 23. Absence during a Semester

A student should not be absent from quizzes, tests, etc. during the semester. Such absence will naturally lead to reduction in points/marks which count towards the final grade. Absence in the Semester Final Examination will result in an 'F' grade in the corresponding course.

A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for make-up quizes or assignments immediately upon return to classes. Such request has to be supported by medical certificate from a Concern Medical Officer. The medical certificate issued by a registered medical practitioner (with the registration number shown explicitly on the certificates) will also be acceptable only those cases where the student has valid reasons for his absence from the engineering college.

## 24. Honors

Candidates for Bachelor's degree in Engineering will be awarded the degree with honors if their Cumulative Grade Point Average (CGPA) is 3.75 or better.

## 24.1 Dean's List

As a recognition of excellent academic performance, the names of students obtaining an average GPA of 3.75 or above in two consecutive regular semesters of an academic year may be published in the Dean's List in each Department. Students who have received an 'F' grade in any course during any of the two regular semesters will not be considered for the Dear's List that year.

## 24.2 Gold Medal

Gold medal for outstanding students of the Computer Science and Engineering graduates will be presented to the student who secures the first position in the entire class and whose CGPA is above 3.75. The student must have completed his/her undergraduate coursework within four consecutive academic years and have a satisfactory attendance to his credit.