SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

# ORDINANCE No. V (2A) RELATING TO

## BACHELOR OF TECHNOLOGY (B.Tech.) PROGRAMME (As per AICTE)

(Effective from the Session – 2018-19)

## General

**1.** This ordinance may be called **"Ordinance Relating to Bachelor of Technology (B.Tech)"** Programme**.**

**2.** It shall come enforced with immediate effect from session 2018-19.

**3.** This supersedes the previous Ordinance relating to Bachelor of Technology (B.Tech) Programme ordinance no. [V (2A)].

**4.** The degree "Bachelor of Technology" acronym as B.Tech shall be of four years (eight semesters) in the branches of Engineering prevalent in the institute at a point of time based on Choice Based Credit System (CBCS) as per AICTE guidelines.

## CHAPTER – 1

## 1.1 Introduction

Chhatrapati Shahuji Subharti Institute of Technology and Engineering is a constituent Institute of Swami Vivekanand Subharti University, Meerut has been established in 2005 with the vision we make every decision to support the career and personal development of our learners. Our curriculum, teaching and services demonstrate that we value the diverse profiles of our learners. The University boasts of highly qualified, dedicated and competent faculty from all walks of life, world class infrastructure, fully equipped Laboratories with latest state-of-the-art equipment and a huge library with recent knowledge resources including e-resources. Swami Vivekanand Subharti University providing a safe and healthy working environment for teaching and non-teaching employees, students, and visitors etc.

## 1.2 Vision

To become a dynamic, demand driven, quality conscious, efficient and innovative institute capable of becoming active partner in the techno-economic growth of the Nation and to provide world class technological education and research inputs to the society.

## 1.3 Mission

Strive to create centre of excellence in specialized areas of technology and enable its academic beneficiaries to become competent professionals capable of providing sustainable solutions to challenging problems of the society and industry.

## 1.4 Programme Educational Objectives (PEOs):

The Programme Educational Objectives of B.Tech. programmes are:

**PEO1.** To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms

**PEO2.** To prepare graduates who will contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise

**PEO3.** To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills

**PEO4.** To prepare graduates who will thrive to pursue life-long learning to fulfill their goals

## 1.5 Programme Outcomes (POs):

Engineering programmes are designed to prepare graduates to attain the following program outcomes:

**PO1**. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

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

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

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

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

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

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

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

**PO**10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

**PO12. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# CHAPTER-2

## Eligibility for Admission

**2.1** (i) An applicant is eligible for admission in the 1 Year of the B.Tech. programme provided that, he/she should be at least 17 years on 31 December of the year of admission. The upper age limit for taking admission in Under Graduate programme will be 30 years. (as per SVSU Letter No. U-07/SVSU/2016/374 dated 16.08.2016 )

An applicant should have passed intermediate examination or an equivalent examination from any recognized board/university with Physics, Mathematics as compulsory subjects, Chemistry/Bio-technology/Computer Science/Biology as one of the optional subjects.
The admission shall be considered purely on the basis of merit in the University entrance test and counseling conducted by the university. The applicant who have 45 % of marks (40 % for SC/ST) [as per AICTE norms*] or more in the above mentioned three subjects and not less than 45 % marks (40 % for SC/ST) in the optional subjects will be considered for direct admission against seats, which might not have been filled up through the examination and counseling.

The applicant who has obtained a two/three year Engineering Diploma with Minimum (45 %) aggregate marks from a recognized Institute/University will be considered eligible for direct admission in the second year of the B.Tech programmes.

The applicant having a three year B.Sc. degree with Mathematics with a minimum of 40 % marks in aggregate from a recognized university will be considered eligible for direct admission in the second year of the B.Tech programmes. Provided that the students belonging to B.Sc. Stream, shall clear the subjects Engineering Graphics/Engineering Drawing and Engineering Mechanics of the First Year Engineering Programme along with the Second year subjects.

Provided that the students belonging to B.Sc. Stream shall be considered only after filling the supernumerary seats in this category with students belonging to the Diploma Stream.

**6 Subject to moderation in accordance with the guidelines of AICTE**

**2.2** The B.Tech. programme is available in the following discipline:

(i) Computer Science & Engineering

(ii) Information Technology

(iii) Electrical & Electronics Engineering

(iv) Electronics & Communication Engineering

(v) Mechanical Engineering

(vi) Civil Engineering

(vii) Food Technology

**2.3** Selected candidates shall be allocated a discipline from those listed in clause 2.2 on the basis of merit, choice and counseling.

**2.4** Request for change in discipline may be considered on the basis of merit in the entrance examination provided that the seat remains vacant after the last date for admission in B.Tech. programme.

**2.5** After 2nd Semester, a student can apply for change of branch which shall be considered on the following grounds:

1. Availabilities of seats in branch as per sanctioned intake by AICTE.

**(**ii) The students should have passed 1st and 2nd Semester examination without any carry over paper.

1. The branch from which the students will be shifted must not fall below 75 % of its sanctioned intake.

**2.6** The change of discipline shall be allowed only once during the programme.

# CHAPTER-3

## Teaching Course

**3.1** The programme will be of four years duration, divided in to eight semesters.

**3.2** The duration of the B. Tech. programme for the candidates admitted in semester I will be four academic years (eight semesters).

**3.3** The duration of the B. Tech. programme for the candidates admitted in semester III (lateral entry) will be three academic years (six semesters).

**3.4** Annual academic calendar shall be published by the University.

**3.5** There shall be normally 14 weeks of teaching in every semester.

**3.6** Study & evaluation scheme is enclosed as an Annexure A1-A7.

# CHAPTER-4

## Curriculum/Structure

**4.1** The programme shall be spread over four academic years, spread over eight semesters comprising actual teaching for a minimum of 90 days in each semester.

**4.2** The programme focuses on the following aspects:

- Competency
- Entrepreneurship
- Skill Enhancement
- Value Added Courses
- Extracurricular activities

### 4.3 Choice Based Credit System (CBCS) :

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising Professional/Program Core Courses (PCC), Professional/Program Elective Courses (PEC), Engineering Science Courses (ESC), Basic Sciences Courses (BSC), Humanities and Social Sciences including Management Courses (HSMC) Mandatory Courses (MC) and Open Elective Courses (OEC). The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student"s performance in examinations, the UGC has formulated the guidelines to be followed.

#### 4.3.1 Structure of Undergraduate programs

The four year B. Tech. programme compromise of courses divided in seven distinct areas, namely: Professional/Program Core Courses (PCC), Professional/Program Elective Courses (PEC), Engineering Science Courses (ESC), Basic Sciences Courses (BSC), Humanities and Social

Sciences including Management Courses (HSMC) Mandatory Courses (MC) and Open Elective Courses (OEC). All the courses offered in first year B. Tech. programs are categorized as „Common Courses" for all the academic programs. Credits assigned and curricular components of the B. Tech. curriculum are given in Annexure A1-A7.

**Professional/Program Core Courses (PCC)**

The departmental core consists of courses considered essential for a chosen Engineering/Science discipline including, Engineering design, Seminar, Industrial Training and Project (PRO).

**Professional/Program Elective Courses (PEC)**

The students are required to complete a specific number of elective courses. Every department offers a wide variety of elective courses to students providing them opportunity to discover their academic interest and enhancing their engagement in learning process.

**Open Elective Courses (OEC)**

The Open Electives courses are offered by different academic departments to the students of all disciplines. A wide range of elective courses is available with each branch. When a student opts elective courses offered in his/her program it will be termed as OE.

**Humanities and Social Sciences including Management Courses (HSMC)**

The Humanities, Social Sciences and Management Courses consist of courses considered essential for a B.Tech. program to inculcate the essence of technical writing, communication skills, economics and analysis, management and professional ethics & human values.

**Basic Sciences Courses (BSC)**

The Applied Sciences and Mathematics Courses consist of courses considered essential for a B.Tech. program to build the foundation for learning of engineering core courses.

**Engineering Science Courses (ESC)**

The students are required to complete a minimum number of Allied engineering courses (majority of them taught as common courses) offered by engineering departments other than his/her parent department. These courses expose the student with wide spectrum knowledge of allied engineering domain connected to the main engineering stream of the course of study of the students of concerned departments.

**Mandatory Courses (MC)**

The mandatory courses considered essential for a B.Tech. programme to inculcate the essence of Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Knowledge Tradition etc.

**4.4 Induction Program**

Three weeks duration Induction program for students to be offered right at the start of the first year. These activities are listed under following 7 heads:

1 Physical and Health
2 Culture
3 Literature and Media
4 Social Service
5 Self development
6 Nature and Environment
7 Innovation

**4.5** The academic calendar shall be as follows:-

| | |
|---|---|
| **I , III , V, VII Semester (Odd)** | Session - 1st Aug. to 30th Nov<br>Exam - 1st Dec. to 20th Dec. |
| **II, IV, VI, VIII Semester (Even)** | Session - 1st Jan. to 10th May<br>Exam - 1st May to 20th May |

# CHAPTER-5

## Attendance

**5.1** The students are expected to attend all the classes and should not have less than 75 % attendance in theory as well as in practical classes, wherever held, to become eligible to appear for the university examination. Short fall in attendance can, however be condoned in deserving cases to the extent of 10 % by the Principal. If the short fall is more than 10 % but not more than 15 %, the Principal may recommend deserving cases to the Vice Chancellor for condo-nation. The order of the Vice Chancellor in this regard shall be final.

# CHAPTER-6

**Examination**

All Courses offered by SITE will have an evaluation system within two components as:

1. Continuous Comprehensive Assessment (CCA) accounting for 30% of the final grade that a student gets in a course, and

2. End-Semester Examination (ESE) accounting for the remaining 70% of the final grade that the student gets in a course.

**A student will have to pass both the components i.e. CCA and ESE separately to become eligible to be declared successful in a course.**

## 6.1 Continuous Comprehensive Assessment (CCA)

**Award of Sessional Marks:**

Sessional marks for theory subjects and practicals and shall be awarded as per the breakup of sessional marks given below:-

\endash **Theory Subjects :**

(a) Class test will comprise two mid-term test of equal weightage. - **20 Marks**

(b) Marks for regular class attendance - **10 Marks**

**2. Practical :**

(a) Two–mid-term viva-voce test of equal weightage. - **5 Marks**

1. Teacher"s assessment (including 5 marks for regular attendance) based on lab record attendance - **10 Marks**

**5.** Make-up test may be held for those students who fail to appear in any one of the mid-term class test due to genuine unavoidable reasons, provided prior permission was consented from the Principal.

**6.** A maximum of 10 marks in each subject shall be awarded for attending classes theory/practical) as per the following norms:

| | | |
|---|---|---|
| 85 % or more attendance | 2. | 10 Marks |
| 80 % or more but less than 85 % attendance | 3. | 09 Marks |
| 75 % or more but less than 80 % attendance | 4. | 08 Marks |
| 70 % or more but less than 75 % attendance | 5. | 07 Marks |
| 65 % or more but less than 70 % attendance | 6. | 06 Marks |
| 60 % or more but less than 65 % attendance | 7. | 05 Marks |
| 51 % or more but less than 60 % attendance | 8. | 04 Marks |
| 50 % attendance | 9. | 01 Marks |
| Less than 50 % attendance | 10. | 0 Marks |

6.2 **Award of General Proficiency Marks:**

The marks in General Proficiency shall be awarded on the following basis:-

(i) Co-curricular & Extra-curricular activities (games, sports, cultural and literary activities etc.) **50%**

(ii) Discipline inside and outside the college campus (including 10 marks for regular attendance) **50%**

6.3 The marks for seminar, industrial training and educational tour shall be awarded on the following basis:

(i) Write-up/Report 50%

(ii) Presentation 50%

### 6.4 END SEMESTER EXAMINATION (ESE)

The remaining 70% of the final grade of the student in a course will be assessed on the basis of an end semester examination (ESE) that will be for three hours duration and will cover the entire syllabus of the course. The question papers for the ESE will be got set by the Controller of Examinations (COE) of the Swami Vivekanand Subharti University (SVSU) by a selected faculty panel.

**6.5** The entire programme has to completed within a maximum of seven years from the date of original admission in the programme by those students who are admitted in the first year and within six years by those admitted directly in the Second Year, [Vide clause 2.1 (iv, v)]

## CHAPTER-7

## Paper Setting

**7.1** The work of setting the end semester examination papers and evaluation of scripts and conduct of the end semester practical examination shall be assigned to the course teachers as well as to outsiders, ordinarily in the ratio of 50:50 for internal and external valuation respectively.

## Results

**7.2** The result shall be prepared at the end of each academic year of the programme by aggregating the marks obtained in the theory and practical examinations in all the semesters of the programme till date.

(a) The minimum passing marks in each theory subject (including sessional marks) shall be 40% and 50% in aggregate. The minimum pass marks in a project/ Practical subject (including sessional marks if any), Seminars, Industrial Training and Educational Tour, Viva-Voce etc. shall be 50%.

(b) If a student obtained 40% marks in at least 50% of the papers (ignoring fractions) including project report, he/she will be provisionally promoted to the next year with carryover papers and will have to appear & obtain pass marks in carryover papers along with the subsequent regular examinations for the relevant semester.

(c) If a candidate fails in only one head/subject and having passed in all other head/subject of the given examination of the year than his/her deficiency of maximum five (05) marks may be fulfilled by grace marks after fulfilling the conditions given below:

**7.3** If a candidate fails in only one head/subject and having passed in all other heads/subjects of the given examination of a **semester*/year**, then his/her deficiency of marks may be fulfilled by grace marks under the following conditions:-

(i) Grace marks is not a matter of right of the student but is the discretion of the University.

(ii) Provided that the candidate has appeared in the main examination of the concerned programme and falls short of pass marks by not more than five (05) marks in theory paper only. Benefit of above mentioned shall not be given to the candidate who had appeared in supplementary/special examination/carry over examination.

(iii) Further, benefit of grace marks may be given only to the candidate who will pass the entire concerned examination of the **semester*/year** after awarding the grace marks and not for the purpose of promoting the student to next year with back papers or for improvement of division or percentage.

(iv) If in a head/subject of an examination passing in Theory, Practical or sessional exams separately is mandatory, then the benefit of grace marks shall be given only in Theory examination of the University examination.

(v) The award of grace marks permissible shall be on the basis of 1 grace mark for every 05 marks secured by an examinee over and above the minimum passing aggregate marks of all subjects of the year.

**7.4** Awarding of Grace Marks shall be done as given below:-

| Aggregate Marks Obtained over & above minimum passing marks | Permissible Grace Marks |
|---|---|
| 1-5 | 1 |
| 6-10 | 2 |
| 11-15 | 3 |
| 16-20 | 4 |
| 21-25 | 5 |

Total number of Grace Marks given to the student will be marked with astrick (*) at the bottom of the mark sheet.

* Grace Mark in semester examination will be considered hereinafter.

A student not covered by clause 7.2 (a) to (c) above shall have the following options to complete his/her programme -

(i) He/ she may take admission on payment of full annual programme fee and repeat the entire year of study. He /She shall be treated as a regular student. Or

(ii) He /She may pay only University exam fee for the End Semester Examination and appear in the End Semester University exams directly. He /She shall not be allowed to attend classes and the Sessional marks obtained earlier shall be retained. Or

(iii) He /She may pay half of the annual programme fee and attend classes. The sessional marks obtained by him/her earlier shall be retained. There will not be any requirement of minimum attendance for appearing in the University examination

**7.5** A student will not be promoted to the next academic year if the carryover papers are more than 50% at one point of time.

## Evaluation under Grading Assessment

**7.6** The minimum Grade/ Grade Point required to pass each paper in a semester examination under CBCS shall be Grade D/ Grade Point 4 in each theory paper/ Practical/Project (wherever applicable) in External Examination and Internal Assessment separately.

## Calculation Criteria

**7.7** To implement the following grading system, the colleges/campuses shall use the following UGC recommended 10 point grading system:

| Marks (%) | Letter Grades | Grade Points (G) |
|---|---|---|
| 85-100 | A++ (Outstanding) | 10 |
| 75 to < 85 | A+ (Excellent) | 9 |
| 70 to <75 | A (Very Good) | 8 |
| 65 to <70 | B+ (Good) | 7 |
| 60 to <65 | B (Above Average) | 6 |
| 50 to <60 | C (Average) | 5 |
| 40 to <50 | D (Pass) | 4 |
| 0 to <40 | F (Fail) | 0 |
| | AB (Absent) | 0 |

**7.8 Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)**

$$(Si) = \sum (Ci \times Gi) / \sum Ci,$$

where Ci is the number of credits of the $i_{th}$ programme and Gi is the grade point scored by the student in the ith programme.

$$CGPA = \sum (Ci \times Si) / \sum Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts

## CHAPTER-8

## Power to Modify

**8.1** In the event of any emergent situation, if any deviation is considered necessary, the Vice-Chancellor is authorized to modify the ordinance. Subjected to subsequent ratification by the executive council.

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**Annexure-A4**

# SWAMI VIVEKANAND

# SUBHARTI UNIVERSITY, MEERUT

**EVALUATION SCHEME**

## B.TECH-I YEAR

## (Civil Engineering)

## W.E.F. SESSION 2019-20

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
Subhartipuram, NH-58 Delhi-Haridwar Bypass Road,
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www.subharti.org

**STUDY & EVALUATION SCHEME**

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**B.Tech 1st Year/ 1st Semester (Common to all branches)**
**W.E.F academic Session 2018-19**

| SEMESTER -I | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject Title | Course Type | Periods | | | CCA | | | | ESE | | Total | Credits |
| | | | | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
| 1 | BAS 101/ BAS 102 | Physics/Chemistry | BSC-1/ BSC-2 | 3 | 1 | 3 | 20 | 10 | 30 | - | 70 | - | 100 | 4 |
| 2 | BAS 103 | Mathematics I | BSC-3 | 3 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 4 |
| 3 | BEEE 101/ BCSE-102 | Electrical Engineering/ Programming For Problem Solving | ESC-1/ ESC-2 | 3 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 4 |
| 4 | BME151/ BME152 | Engineering Graphics& Design/ Workshop Practices | ESC-3/ ESC-4 | 1 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 3 |
| 5 | BAS151/ BAS152 | Physics Lab/ Chemistry Lab | BSC-1/ BSC-2 | 0 | 0 | 3 | - | - | - | 15 | - | 35 | 50 | 1.5 |
| 6 | BEEE-151/ BCSE-152 | Electrical Engineering Lab/ Programming For Problem Solving Lab | ESC-1/ ESC-2 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| **Total** | | | | | | | | | | | | | **450** | **17.5** |

| SEMESTER -II | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject Title | Course Type | Periods | | | CCA | | | | ESE | | Total | Credits |
| | | | | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
| 1 | BAS 201/ BAS 202 | Physics/Chemistry | BSC-1/ BSC-2 | 3 | 1 | 3 | 20 | 10 | 30 | - | 70 | - | 100 | 4 |
| 2 | BAS 203 | Mathematics II | BSC-4 | 3 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 4 |
| 3 | BEEE-201/ BCSE 201 | Electrical Engineering / Programming For Problem Solving | ESC-1/ ESC-2 | 3 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 4 |
| 4 | BHU-201 | Professional English | HSMC-1 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 5 | BME-251/ RWS 252 | Engineering Graphics & Design/ Workshop Practices | ESC-3/ ESC-4 | 1 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 3 |
| 6 | BAS251/ BAS252 | Physics lab/ Chemistry Lab | BSC-1/ BSC-2 | 0 | 0 | 3 | - | - | - | 15 | - | 35 | 50 | 1.5 |
| **Total** | | | | | | | | | | | | | **450** | **17.5** |

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING**

**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**

**STUDY & EVALUATION SCHEME**

**I YEAR**

**Branch/Course: Civil Engineering/B.Tech**

| BAS-101/BAS-201 | Physics | L | T | P | 4 Credits |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | |

## Course Objective:

To equip the student with a strong understanding of the fundamentals of physics so as to enable him/her to apply it to his/her field of study. This course should enable the student to

1. Explain the behavior of the physical world around him/her.
2. Apply the concepts of physics in his/her field of study .
3. Relate the concepts of physics to the advancement of technology.
4. Understand and relate the different phenomena in the world.
5. Approach problems, predict their results in advance, and solve them in quantitative and qualitative manner.
6. Gain a broader understanding of other sciences.

## Syllabus:

**Unit-1 Electrostatics in vacuum (8 lectures)**

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

**Unit-2 Electrostatics in a linear dielectric medium (4 lectures)**

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.

**Magnetostatics(6 lectures)**

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

**Unit-3 Magnetostatics in a linear magnetic medium (3 lectures)**

Magnetization and associated bound currents; auxiliary magnetic field $\vec{H}$ ; Boundary conditions on $\vec{B}$ and $\vec{H}$. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

**Faraday's law (4 lectures)**

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

**Unit-4 Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations (5 lectures)**

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time-dependent electric field; calculating magnetic field due to changing electric fields in quasi-static approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Qualitative discussion of momentum in electromagnetic fields.

**Unit-5 Electromagnetic waves (8 lectures)**

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

**Course Outcomes:** Upon completion of the course, the student will be able to:

1. Recognize and present real life examples of the aforementioned concept and interrelate some of them.
2. Describe the link between physics and the technology.
3. Identify technological applications of some of the aforementioned concepts.
4. Describe how he/she can harness the benefits of some of the aforementioned concepts to his /her area of specialization.
5. Understand the professional and ethical responsibilities of the subject.
6. Communicate effectively while speaking, employing graphics and writing.

**Reference books:**


(i) Engineering Mechanics, 2nd ed. — MK Harbola
(ii) Introduction to Mechanics — MK Verma
(iii) An Introduction to Mechanics — D Kleppner & R Kolenkow

(iv) Principles of Mechanics — JL Synge & BA Gri *ths*
(v) Mechanics — JP Den Hartog
(vi) Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
(vii) Mechanical Vibrations — JP Den Hartog
(viii) Theory of Vibrations with Applications — WT Thomson
(ix) An Introduction to the Mechanics of Solids, 2nd ed. with SI Units — SH Crandall, NC Dahl & TJ Lardner
(x) Engineering Mechanics: Statics, 7th ed. — JL Meriam
(xi) Engineering Mechanics of Solids — EP Popov

| | | | |
|---|---|---|---|
| **BAS-151/BAS-251** | **Physics Lab** | 0L:0T:3P | 1.5 credits |

**List of Experiments**

1. To determine the wavelength of sodium light by Newton's ring experiment.

2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.

3. To determine the specific rotation of cane sugar solution using polarimeter

4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.

5. To measure attenuation in an optical fiber.

6. To determine the wavelength of He-Ne laser light using single slit diffraction.

7. To study the polarization of light using He-Ne laser light.

8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.

9. To determine the coefficient of viscosity of given liquid.

10. To determine the value of acceleration due to gravity(g) using compound pendulum.

| BAS-102/BAS-202 | Chemistry | L | T | P | 4 Credits |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | |

**Course Objectives** :To impart the knowledge of applications of chemical sciences in the field of engineering and technology.

**Syllabus:**

**Unit 1 Atomic and molecular structure (12 lectures)**

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

**Unit 2 Spectroscopic techniques and applications (8 lectures)**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

**Unit-3 Intermolecular forces and potential energy surfaces (4 lectures)**

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_3$, $H_2F$ and HCN and trajectories on these surfaces.

**Use of free energy in chemical equilibria (6 lectures)**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

Use of free energy considerations in metallurgy through Ellingham diagrams

**Unit-4 Periodic properties (4 Lectures)**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation

states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

**Unit-5 Stereochemistry (4 lectures)**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

**Organic reactions and synthesis of a drug molecule (4 lectures)**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

**Course Outcomes**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

**Suggested Text Books**

(i) University chemistry, by B. H. Mahan

(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane (iii)Fundamentals of Molecular Spectroscopy, by C. N. Banwell

(v) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

(vi) Physical Chemistry, by P. W. Atkins Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

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| **BAS-152/BAS-252** | **Chemistry Lab** | **0L** | **0T** | **3P** | **1.5 Credits** |

**Chemistry Laboratory**

**Choice of 10-12 experiments from the following:**

- Determination of surface tension and viscosity
- Thin layer chromatography
- Ion exchange column for removal of hardness of water
- Determination of chloride content of water
- Colligative properties using freezing point depression
- Determination of the rate constant of a reaction
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Lattice structures and packing of spheres
- Models of potential energy surfaces
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal

Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

**Laboratory Outcomes**

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

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| **BAS-103** | **Mathematics-I** | **L** | **T** | **P** | **4 Credits** |
| | | **3** | **1** | **0** | |

**Objectives:** By the end of the first year, all students will be expected to be able to recognise, even in unfamiliar circumstances, and then use the following: • applied mathematics and classical physics (mechanics & heat); • mass and energy balances; • description of fluid motion; • dynamics of steady fluid motion; • one-phase flow in pipes; • basic definitions of T, Q, W, U, H & S; • first & second laws of

thermodynamics: • heat & mass transfer rate equations; • heat & mass transfer coefficients; • 1-D heat & mass transfer problems; • heat exchangers

UNIT-1: Calculus: (6 lectures)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT- 2: Calculus: (6 lectures)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT- 3: Sequences and series: (10 lectures)

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT- 4: Multivariable Calculus (Differentiation): (8 lectures)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

UNIT- 5: Matrices (10 lectures)

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

**Course Outcomes**

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines

**Suggested Text/Reference Books**


(i) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

(ii) Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(iii) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

(iv) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

(v) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

(vi) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(vii) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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| **BEEE-101/BEEE-201** | **Basic Electrical Engineering** | **L** | **T** | **P** | **3 Credits** |
| | | **3** | **0** | **0** | |

**Objectives:** The expected student learning outcomes of this goal are to graduate engineers who have: a) the ability to apply science, engineering science, and mathematics to solve engineering problems. b) the ability to put their engineering and design skills into practice. c) the ability to use industrial-quality laboratory equipment and engineering software for analysis, testing, design, and communication. d) the ability to design systems, components, and processes that satisfy predetermined constraints. e) the ability to put engineering problems, put them in solvable form, and develop and evaluate alternative solutions

**Detailed contents :**

UNIT 1 : DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT 2: AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.

UNIT 3: Transformers (6 hours)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT 4: Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT 5: Power Converters (6 hours)

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.Components of LT

Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**Course Outcomes**

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

**Suggested Text / Reference Books**


(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering" , Tata McGraw Hill, 2010.
(ii) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(iii) L. S. Bobrow, " Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(iv) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(v) V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.


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| **BEEE-151/BEEE-251** | Electrical Engg Lab | 0L:0T:2P | 1credits |

**(ii) Basic Electrical Engineering Laboratory**

**List of experiments/demonstrations:**

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (fieldwinging - slip ring arrangement) and single-phase induction machine.

- Torque Speed Characteristic of separately excited dc motor.
- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

**Laboratory Outcomes**

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters

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| **BCSE-101/BCSE-201** | **Programming for Problem Solving** | **L** | **T** | **P** | **4 Credits** |
| | | 3 | 1 | 0 | |

**Objectives:** Students will try to learn: 1 The concept of various components. 2 The concepts that underpin the disciplines of analog and digital electronic logic circuits. 3 Various Number system and Boolean algebra. 4 Design and implementation of combinational circuits.

***Unit 1*** Introduction to Programming **(4 lectures)**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)**.**Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

***Unit 2:***Arithmetic expressions and precedence. Conditional Branching and Loop.Writing and evaluation of conditionals and consequent branching. Iteration and loops.

***Unit 3***Arrays **(6 lectures)**

Arrays (1-D, 2-D), Character arrays and Strings.Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

***Unit 4***Recursion **(4 -5 lectures)**

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

***Unit 5***Structure **(4 lectures)**

Structures, Defining structures and Array of Structure.Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation.File handling (only if time is available, otherwise should be done as part of the lab)

**Course Outcomes**

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration

**Suggested Text**

**Books**

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

**Suggested Reference Books**

**(ii)** Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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|---|---|---|---|---|---|
| **BCSE-151/BCSE-251** | Programming for Problem Solving Lab | 0L | 0T | 2P | 1 Credit |

**Laboratory - Programming for Problem Solving[ L : 0; T:0 ; P : 4 (2credits)]**

**[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]**

**Tutorial 1:** Problem solving using computers:

**Lab1:** Familiarization with programming environment

**Tutorial 2:** Variable types and type conversions:

**Lab 2:** Simple computational problems using arithmetic expressions

**Tutorial 3:** Branching and logical expressions:

**Lab 3**: Problems involving if-then-else structures

**Tutorial 4:** Loops, while and for loops:

**Lab 4:** Iterative problems e.g., sum of series

**Tutorial 5:** 1D Arrays: searching, sorting:

**Lab 5:** 1D Array manipulation

**Tutorial 6:** 2D arrays and Strings

**Lab 6:** Matrix problems, String operations

**Tutorial 7:** Functions, call by value:

**Lab 7:** Simple functions

**Tutorial 8 &9:** Numerical methods (Root finding, numerical differentiation, numerical integration):

**Lab 8 and 9:** Programming for solving Numerical methods problems

**Tutorial 10:** Recursion, structure of recursive calls

**Lab 10:** Recursive functions

**Tutorial 11:** Pointers, structures and dynamic memory allocation

**Lab 11:** Pointers and structures

**Tutorial 12:** File handling:

**Lab 12:** File operations

**Laboratory Outcomes**

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self- referential structures.

To be able to create, read and write to and from simple text files

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| **BME-152/BME-252** | Workshop Practices | L | T | P | 3 Credits |
| | | 1 | 0 | 4 | |

**Detailed contents**

**1.** Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
**2.** CNC machining, Additive manufacturing **(1 lecture)**
**3.** Fitting operations & power tools **(1 lecture)**
**4.** Electrical &Electronics **(1 lecture)**
**5.** Carpentry **(1 lecture)**
**6.** Plastic moulding, glass cutting **(1 lecture)**
**7.** Metal casting **(1 lecture)**
**8.** Welding (arc welding & gas welding), brazing **(1 lecture)**

**Course Outcomes**

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

**(ii) Workshop Practice:(60 hours)[ L : 0; T:0 ; P : 4 (2 credits)]**

**1.** Machine shop **(10 hours)**
**2.** Fitting shop **(8 hours)**
**3.** Carpentry **(6 hours)**
**4.** Electrical & Electronics**(8 hours)**
**5.** Welding shop **( 8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
**6.** Casting **(8 hours)**

**7.** Smithy **(6 hours)**

8. Plastic moulding& Glass Cutting (6 hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

**Laboratory Outcomes**

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

By assembling different components, they will be able to produce small devices of their interest.

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|---|---|---|---|---|---|
| **BAS-203** | Mathematics -II | L | T | P | 4 Credits |
| | | 3 | 1 | 0 | |

UNIT 1: **Multivariable Calculus (Integration): (10 lectures)**

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT 2: First order ordinary differential equations: (6 lectures)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT 3: Ordinary differential equations of higher orders: (8 lectures)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

UNIT 4: Complex Variable – Differentiation: (8 lectures)

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm)

UNIT 5: Complex Variable – Integration: (8 lectures)

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of

definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

**Course Outcomes**

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The mathematical tools needed in evaluating multiple integrals and their usage.
- The effective mathematical tools for the solutions of differential equations that model physical processes.
- The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.

**Suggested Text/Reference Books**


(ii) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

(iii) Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(iv) W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.

(v) S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

(vi) E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

(vii) E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.

(viii) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.

(ix) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(x) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.


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|---|---|---|---|---|---|
| **BHU-201** | Professional English | L | T | P | 2 Credits |
| | | 2 | 0 | 0 | |

**Detailed contents**

**1. Vocabulary Building**

1.1 The concept of Word Formation

1.2 Root words from foreign languages and their use in English

1.3 Acquaintance with prefixes and suffixes from foreign languages in

English to form derivatives.

1.4 Synonyms, antonyms, and standard abbreviations.

**2. Basic Writing Skills**

2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

**3. Identifying Common Errors in Writing**

3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

**4. Nature and Style of sensible Writing**

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence

Writing introduction and conclusion

**5. Writing Practices**

5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing

**6. Oral Communication**

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

**Course Outcome**

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills**.**

**Suggested Readings:**

(i) *Practical English Usage.* Michael Swan. OUP. 1995.
(ii) *Remedial English Grammar.* F.T. Wood.
Macmillan.2007 (iii)*On Writing Well.* William
Zinsser. Harper Resource Book. 2001
(iv) *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(v) *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(vi) *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press

**Annexure.....**

# SWAMI VIVEKANAND
# SUBHARTI UNIVERSITY, MEERUT


## SYLLABUS

## B.TECH

## (CIVIL ENGINEERING)

## (Second Year)

## W.E.F. SESSION 2018-19

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**Subhartipuram, NH-58 Delhi-Haridwar Bypass Road,**
**Meerut -250005 (UP)**
**www.subharti.org**

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**

**STUDY & EVALUATION SCHEME**

**B.Tech 1st Year/ 1st Semester (Common to all branches)**

**W.E.F academic Session 2018-19**

| SEMESTER -III | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S. No.** | **Subject Code** | **Subject Title** | **Course Type** | **Periods** | | | **CCA** | | | | **ESE** | | **Total** | **Credits** |
| | | | | **L** | **T** | **P** | **CT** | **AT** | **TOTAL** | **PS** | **TE** | **PE** | | |
| 1 | BECE 305 | Basic Electronics | ESC-5 | 1 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 1 |
| 2 | BCE 301 | Computer aided Civil Engineering Drawing | PCC-1 | 1 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 1 |
| 3 | BCE 302 | Introduction to Civil Engineering | PCC-2 | 2 | 0 | 0 | 20 | 10 | - | - | 70 | - | 100 | 2 |
| 4 | BME 301 | Engineering Mechanics | ESC-6 | 3 | 1 | 0 | 20 | 10 | - | - | 70 | - | 100 | 4 |
| 5 | BAS 301 | Mathematics-III (Transform & Discrete Mathematics) | BSC-6 | 2 | 0 | 0 | 20 | 10 | - | - | 70 | - | 100 | 2 |
| 6 | BAS 302 | Life Science | BSC-5 | 1 | 0 | 0 | 20 | 10 | - | - | 70 | - | 100 | 1 |
| 7 | BAS 303 | Energy Science & Engineering | BSC-4 | 1 | 1 | 0 | 20 | 10 | - | - | 70 | - | 100 | 2 |
| 8 | BAS 304 | Biology | BSC-3 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 9 | BHU 301 | Humanities-I (Effective Technical Communication) | HSMC-2 | 3 | 0 | 0 | 20 | 10 | - | - | 70 | - | 100 | 3 |
| 10 | BCE 351 | Computer-aided Civil Engineering Drawing Lab | PCC-3 | 0 | 0 | 2 | 0 | 0 | | 15 | - | 35 | 50 | 1 |
| 11 | BECE 351 | Basic Electronics Lab | ESC-7 | 0 | 0 | 2 | 0 | 0 | | 15 | - | 35 | 50 | 1 |
| 12 | BAS 352 | Life Science Lab | BSC-7 | 0 | 0 | 2 | 0 | 0 | | 15 | - | 35 | 50 | 1 |
| 13 | BAS 354 | Biology Lab | BSC-8 | 0 | 0 | 2 | 0 | 0 | | 15 | - | 35 | 50 | 1 |
| **Total** | | | | | | | | | | | | | **1100** | **22** |

| SEMESTER –IV | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **Subject Title** | | **Periods** | **CCA** | **ESE** | **Total** | **Credits** |

| S. No. | Subject Code | | Course Type | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BCE 401 | Instrumentation & Sensor Technologies for Civil Engineering Applications | PCC-4 | 1 | 1 | 0 | 20 | 10 | 30 | | 70 | | 100 | 2 |
| 2 | BCE 402 | Engineering Geology | PCC-5 | 1 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 1 |
| 3 | BCE 403 | Introduction to Fluid Mechanics | PCC-7 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 4 | BCE 404 | Surveying & Geometrics | PCC-9 | 1 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 5 | BCE 405 | Materials, Testing &Evaluation | PCC-10 | 1 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 6 | BCE 406 | Civil Engineering - Societal & Global Impact | PCC-11 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 7 | BCE 407 | Introduction to Solid Mechanics | PCC-8 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 8 | BCE 408 | Disaster Preparedness &Planning | PCC-6 | 1 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 9 | BCE 409 | Mechanical Engineering | ESC-8 | 2 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 10 | BCE 410 | Management I (Organizational Behavior) | HSMC-3 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 0 |
| 11 | BCE 451 | Instrumentation & Sensor Technologies for Civil Engineering Applications Lab | PCC-12 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| 12 | BCE 452 | Engineering Geology Lab | PCC-13 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| 13 | BCE 453 | Introduction to Fluid Mechanics Lab | PCC-14 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| 14 | BCE 454 | Surveying & Geometrics Lab | PCC-15 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| 15 | BCE 455 | Materials, Testing &Evaluation Lab | PCC-16 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| **Total** | | | | | | | | | | | | | **1250** | **23** |

**Detailed Syllabus**
**YEAR – 2nd (3rd Semester)**
**Branch/Course: Civil Engineering/B. Tech**

| BECE 305 | Basic Electronics | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | |

**Course Objective:**

- Students will have introduction to broad treatment of the field of Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in Civil Engineering applications.
- Students will learn about basics of various Electronics technologies

**Syllabus:**

**Unit-1:** Diodes and Applications covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications;

**Unit-2:** Transistor Characteristics covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits;

**Unit-3: Thermal Sensors:**
Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators;

**Unit-4:** Operational Amplifiers and Applications covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground;

**Course Outcomes:** After having the course, students are expected to:

- Explain the principles of operation of the main types of sensors
- Understand basics of transistor and Diodes.

- Know about amplifiers and their working
- Identify the unique vocabulary associated with electronics and explain the basic concepts of Semiconductor diodes such as p-n junction diode, characteristics and ammeters, DC load line, Zener diode.
- Draw and explain the structure of bipolar junction transistor. Explain the operation of each device in terms of junction bias voltage and charge carrier movement. Identify and explain the various current components in a transistor.
-

**Reference books:**


- David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India
- Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
- Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education,
- Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
- R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson


| BCE 301 | Computer aided Civil Engineering Drawing | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | |

**Course Objective:**

- Develop Parametric design and the conventions of formal engineering drawing
- Produce and interpret 2D & 3D drawings
- Communicate a design idea/concept graphically/ visually
- Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
- Get a Detailed study of an engineering artifact

**Syllabus:**

**Unit 1:** Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co- ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

**Unit 2: Symbols And Sign Conventions:** Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing

symbols, welding symbols; dimensioning standards MASONRY BONDS:English Bond and Flemish Bond – Corner wall and Cross walls – One brick wall and one and half brick wall.

**Unit 3: Building Drawing:** Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity

**Unit 4:Pictorial View:** Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information Modelling

**Course Outcomes:** After having the course, students are expected have to:

- To develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs.
- Develop Parametric design and the conventions of formal engineering drawing
- Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
- Develop drawings for conventional structures using practical norms

**Reference books:**


i. Subhash C Sharma & Gurucharan Singh (2005), " Civil Engineering Drawing" , Standard Publishers
ii. Ajeet Singh (2002), " Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- Mc Graw-Hill Company Limited, New Delhi
iii. Sham Tickoo Swapna D (2009), " AUTOCAD for Engineers and Designers" , Pearson Education,
iv. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.,
v. Balagopal and Prabhu (1987), " Building Drawing and Detailing", Spades publishing KDR building, Calicut,
vi. (Corresponding set of) CAD Software Theory and User Manuals.
vii. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian
viii. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,


| BCE 302 | Introduction to Civil Engineering | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To inculcate the essentials of civil engineering field to the students.

- To provide the students an illustration of the significance of the civil engineering profession satisfying societal needs.
- To provide the student an illustration about soil mechanics and engineering structure like tunnel ,bridge etc

**Syllabus:**

**Unit 1: Basic Understanding:** What is Civil Engineering? Importance of Civil Engineering, Possible scopes for a career, Development of various materials of construction and methods of construction Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunneling

**Unit 2: Fundamentals of Building Materials:** Stones, bricks, mortars, cement, Plain, Reinforced & Prestressed Concrete, Structural Steel, High Tensile Steel, stress strain diagram of steel.

**Structural Engineering:** Types of buildings; tall structures; various types of bridges; Water retaining structures.

**Unit 3: Surveying & Geomatics:** Surveying, types of surveying, principal of surveying, surveying equipment, prismatic compass, surveyor compass, theodolite, leveling.

**Unit 4: Traffic &Transportation Engineering:** Role of transportation, modes of transportation, history of road development, road pattern, geometric design of highways, camber ,kerbs, road margin, sight distance, OSD, super elevation.

**Course Outcomes:** After having the course, students are expected have to:

- The students will be able to illustrate the fundamental aspects of civil engineering
- The students should able to plan a building.
- Students will be able to explain about surveying for making horizontal and vertical measurements.
- They will able to illustrate the uses of various building materials and construction of different components of a building.
- The student will be able to illustrate about fundamental concept of transportation engineering.

**Reference books:**


i. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
ii. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
iii. SK Duggal, “Building Materials” New Age International
iv. Purushothama Raj, “Building Construction Materials & Techniques” Pearson Edu.
v. PC Varghese, “Building Materials” PHI

| BME 301 | Engineering Mechanics | L | T | P | 4 Credits |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | |

**Course Objective:**

- To make the students to know the importance of this subject in the field of Engineering particularly Civil & Mechanical Engineering.
- To make them learn the fundamentals of Mechanics, equation of static equilibrium & dynamic equilibrium of particles and rigid bodies.
- To learn the effect of friction on equilibrium.
- To learn kinematics, kinetics of particle and rigid body, related principles.
- To implant the above know how to solve practical problems.

**Syllabus:**

**Unit 1: Basic concepts:** Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors.

**Force System:** Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem, Couple, Vector representation, Resolution of a force into a force and a couple.

**Force Systems:** Coplanar Concurrent Force system and Coplanar Non-Concurrent force systems, Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.

**Friction:** Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.

**Unit 2: Basic Structural Analysis:** Plane Truss, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members.

Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

**Unit 3: Centroid and Moment of Inertia:**

Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies.

Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas.

Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.

**Unit 4: Mechanics of Deformable Solids:**

**Simple stress and strain:** Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

**Bending of Beams:** theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

**Theory of Torsion,** Torque and twist, Shear stress due to torsion circular sections.

**Course Outcomes:**

- At the end of this course, student must be in a position to analysis and solve the practical problems of statics and dynamics.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts).
- Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution.
- Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy.

**Reference books:**


i. Van Wylen G.J. & Sonnlog R.E. : Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY.
ii. Wark Wenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY.
iii. Holman, J.P. : Thermodynamics, MC Graw Hill book Co. NY.
iv. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (Sl Edition) Central Publishing House Allahabad.
v. Yadav R. : Steam & Gas Turbines.
vi. Kshitish Chandra Pal : Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta.
vii. S. Rao, B.B. Parulekar, ‘Energy Technology’, Khanna Pub., New Delhi.
viii. G. H. Ryder : "Strength of Materials".

ix. F. L. Singer : "Strength of Materials".
x. Timoshenko : "Strength of Materials".

| BAS 301 | Mathematics-III (Transform & Discrete Mathematics) | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To provide the concepts and the understanding of basics in Partial Differential Equations and Transforms.
- To give the analytical methods for solving PDEs like applying Separation of Variables to solve elementary problems in linear second order Partial Differential Equations (heat and wave equations).
- To enable students to use Fourier series methods both in the solution of partial differential equations and in other wider contexts.

**Syllabus:**

**Unit 1: Transform Calculus -1:**Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials; Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method

**Unit 2: Transform Calculus-2**

Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications.

**Unit 3: Sets, relations and functions:** Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses

**Unit 4: Propositional Logic**: Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory. Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.

**Graphs and their basic properties –** degree, path, cycle, sub-graph, isomorphism, Eulerian and Hamiltonian walk, trees

**Unit 5: Partially ordered sets:** Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.

**Algebraic Structures:** Algebraic structures with one binary operation – semi-group, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations- ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).

**Course Outcomes:** After having the course, students are expected to:

- Apply the fundamental concepts of Ordinary Differential Equations and Partial Differential Equations and the basic numerical methods for their resolution.
- Solve the problems choosing the most suitable method.
- Understand the difficulty of solving problems analytically and the need to use numerical approximations for their resolution.

**Reference books:**


i. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
ii. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
iii. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
iv. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
v. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
vi. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
vii. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
viii. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
ix. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
x. N. Deo, Graph Theory, Prentice Hall of India, 1974.
xi. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
xii. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.


| BAS 302 | Life Science | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | |

**Course Objective:**

- Develop an understanding of the differences in the structure and function of different types of ecosystems.
- The goal of this subject to gain knowledge about ecosystem and and population ecology.
- To aware about environmental condition and problems.

**Syllabus:**

**Unit 1: Ecology and Environment:** Introduction, objective, history of ecology, ecology and its sub division, Ecosystem structure and its function, Biotic and a-biotic factor, Decomposition, energy flow, food web, Ecological pyramid, Ecological succession and ecological succession of plants, Nutrient cycle, carbon cycle, phosphorus cycle.

**Unit 2: Population ecology:** Introduction, influence on population, natality, mortality, population density, population fluctuation, population dispersal,

**Environmental Management covering, Principles:** Perspectives, Policies and legal aspects-Environment Protection Acts and modification, International Treaties;

**Unit 3:** Molecular Genetics covering, Structures of DNA and RNA; Concept of Gene, Gene regulation Soil And Water conservation covering, Soil erosion, wind Erosion, effect of soil erosion ,mulching, Regeneration, Crop rotation ,Contour ploughing, Control of flood.

**Unit 4: Environmental pollution**: Introduction, Water pollution, eutrophication, air pollution, green house effect, photochemical smog, chloroflourocarbons, smog, London smog, acid rain, thermal pollution, noise pollution, pollution control, control of oil pollution.

**Course Outcomes:** After having the course, students are expected have to:

- Become familiar about ecosystem and population ecology.
- Student aware about the policies and legal aspect of environment protection act.
- Student aware about molecular genetics DNA and RNA.
- Student aware about the environmental pollution and process to deal with it.

**Reference books:**


- Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
- Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
- Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
- Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

- Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

| BAS 303 | Energy Science & Engineering | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 1 | 1 | 0 | |

**Course Objective:**

- The objective of this Course is to provide an introduction to energy systems and renewable energy resources.
- The class will explore society's present needs and future energy demands, examine conventional energy sources and systems.
- The class will explore renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear.
- Energy conservation methods will be emphasized from Civil Engineering perspective.
- The knowledge acquired lays a good foundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.

**Syllabus:**

**Unit 1: Introduction to Energy Science:** Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment.

**Unit 2: Energy Sources:** Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

**Unit 3: Energy & Environment:** Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy

**Unit 4: Civil Engineering Projects connected with the Energy Sources:** Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and

construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems.

**Unit 5: Engineering for Energy conservation:** Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

**Course Outcomes:** After having the course, students are expected have to:

- Student aware about the basic concept of energy, sustainable development, societal and global impact.
- Get knowledge about conventional and non conventional energy sources.
- Student aware about clean energy and its utilization and carbon foot prints.
- Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation
- To quantify energy demands and make comparisons among energy uses.

**Reference books:**


i. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
ii. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University PresS
iii. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
iv. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
v. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
vi. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
vii. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company


| BAS 304 | Biology | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers.

- The course is expected to encourage engineering students to think about solving biological problems with engineering tools.
- To familiarize the students with the basic organization of organisms and subsequent building to a living being
- To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.

**Syllabus:**

**Unit 1: Basic Cell Biology :** Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism-Homoeostasis- Cell growth, reproduction, and differentiation.

**Unit 2: Biochemistry And Molecular Aspects Of Life:** Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis—Stem cells and Tissue engineering.

**Unit 3: Enzymes And Industrial Applications:** Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases—Photosynthesis

**Unit 4: Mechanochemistry:** Molecular Machines/Motors—Cytoskeleton—Bioremediation—Biosensors

**Unit 5: Nervous System, Immune System, And Cell Signaling:** Nervous system--Immune system- General principles of cell signaling

**Course Outcomes:** After having the course, students are expected have to:

- Student aware about cell function and its structure.
- Student can gain knowledge about biochemistry and human biology.
- Student gain knowledge about biological problems that require engineering expertise to solve them.
- The student will be able to illustrate about the function of nervous system and immune system.

**Reference books:**


i. S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, “Biology for Engineers,” Tata McGraw-Hill, New Delhi, 2012.

ii. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, “Biochemistry,” W.H. Freeman and Co. Ltd., 6th Ed., 2006. 2. Robert Weaver, “Molecular Biology,” MCGraw-Hill, 5th Edition, 2012.

iii. Jon Cooper, “Biosensors A Practical Approach” Bellwether Books, 2004.

iv. Martin Alexander, “Biodegradation and Bioremediation,” Academic Press, 1994.
v. Kenneth Murphy, “Janeway's Immunobiology,” Garland Science; 8th edition, 2011.
**vi.** Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, “Principles of Neural Science, McGraw-Hill, 5th Edition, 2012.

| BHU 301 | Humanities-I (Effective Technical Communication) | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- The goal of this course is to prepare engineering students with the individual and collaborative technical writing.
- The goal of this course is to prepare engineering students for presentation, and research skills necessary to be effective technical communicators in academic and professional environments.
- This course meets the criteria for a Communications Intensive

**Syllabus:**

**Unit 1:** Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

**Unit 2:**Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

**Unit 3:** Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

**Unit 4:** Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report**.**

**Unit 5:** Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer,

Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

**Course Outcomes:** After having the course, students are expected have to:

- Clearly convey specialized information from a technical field to a non-specialized audience.
- Identify and use appropriate formats and conventions derived from individual disciplines.
- Assess effectiveness and validity of information sources, such as web sites, business documents, and professional journals.
- Develop strategies for information design, to include producing visually enhanced documents.
- Summarize larger texts in clear, direct style for practical applications.
- Design and produce a research project appropriate to the student's major and/or career interests.
- Edit documents with peer exchange and according to professional guidelines

**Reference books:**


i. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
ii. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
iii. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
iv. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
v. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
vi. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002
vii. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)


| BCE 351 | Computer-aided Civil Engineering Drawing Lab | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | |

- Buildings with load bearing walls including details of doors and windows.
- Taking standard drawings of a typical two storey building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500 -700 words.
- Reinforcement drawings for typical slabs, beams, columns and spread footings.
- Industrial buildings - North light roof structures – Trusses
- Perspective view of one and two storey buildings

| BECE 301 | Basic Electronics Lab | L | T | P | 1 Credits |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | | **0** | **0** | **2** | |

- Laboratory Sessions covering, Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices – Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;
- Study and Operation of Digital Multi Meter, Function / Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Amplitude, Phase and Frequency of Sinusoidal Signals using Lissajous Patterns on CRO; (CRO);

- Experimental Verification of PN Junction Diode Characteristics in A) orward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS) Configuration;
- Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gain and Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators; Module 5: Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications – Differentiator and Integrator, Square Wave and Triangular Wave Generation, Applications of 555 Timer – Astable and Monostable Multivibrators;
- Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4-bit/8-bit Shift Register ICs; Functionality of Up-Down / Decade Counter ICs;

| **BCE 352** | **Life Science Lab** | **L** | **T** | **P** | **1 Credits** |
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- Comparison of stomatal index in different plants;
- Study of mineral crystals in plants;
- Determination of diversity indices in plant communities;
- To construct ecological pyramids of population sizes in an ecosystem;
- Seminar (with PPTs) on EIA of a Mega-Project (e.g., Airport, Thermal/Nuclear Power Plant/ Oil spill scenario);
- Preparation and extraction of genomic DNA and determination of yield by UV
- absorbance; Isolation of Plasmid DNA and its separation by Gel Electrophoresis; Data
- analysis using Bio-statistical tools

| **BAS 354** | **Biology Lab** | **L** | **T** | **P** | **1 Credits** |
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- Study the presence of suspended particulate matter in the air at two widely different sites.
- Meiosis in onion bud cell or grasshopper testis through permanent slides.
- Common disease-causing organisms Like Ascaris, Entamoeba, Plasmodium, Ringworm through permanent slides or specimens. Comment on symptoms of diseases that they cause.
- Two plants and two animals (models/virtual images) found in xeric conditions. Comment upon their morphological adaptations.
- Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations
- Study pollen germination on a slide.
- Collect and study soil from at least two different sites and study them for texture, moisture content, pH & water holding capacity. Correlate with the kinds of plants found in them.
- Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.
- Prepare a temporary mount of the onion root tip to study mitosis.
- Study the effect of different temperatures & 3 different pH on the activity of salivary amylase on starch..

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**Detailed Syllabus**
**YEAR – 2nd**
**Branch/Course: Civil Engineering/B. Tech**

| BCE 401 | Instrumentation & Sensor Technologies for Civil Engineering Applications | L | T | P | 2 Credits |
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**Course Objectives:**

- Introduce the sensor used in the industries and their characteristics, properties, interfaces connection.
- Students learn how to analyze, design, build and troubleshoot a variety of sensor circuit.

**Syllabus:**

**Unit-1:** Introduction to Sensor Technologies, Types of Sensors, Importance of Sensor Technology in Civil Engineering, Fundamentals of Measurement, Functions of Sensors

**Unit-2:** Review of Static characteristics of Instrument systems, dynamic characteristics of Instrument systems Review of Op-Amp Circuit, passive-, and active-filters, Differentiate between types of Sensor and their mode of operation and measurement, approach to planning monitoring programs, Define target, Sensor selection, Sensor sitting

**Unit-3: Thermal Sensors:**
**Thermistors:** Semiconductor Resistance versus Temperature, Thermistor Characteristics
**Thermocouples:** Thermoelectric Effects, Thermocouple, Characteristics And Thermocouple Sensors
**Other thermal sensor:** Bimetal Strips, Gas Thermometers, Vapor Pressure Thermometers, Liquid-Expansion Thermometers, Solid-State Temperature Sensors

**Unit-4: Mechanical Sensors:** Displacement, Location, or Position Sensors: Resistive-, Capacitive-, and Inductive Sensors Variable-Reluctance Sensors, LVDT**,** Level Sensors
**Optical Sensors:** Fundamentals of EM radiation Nature of EM Radiation, Characteristics of Light, Photometry
**Photo-detectors:** Characteristics, Photoconductive Detectors, Photovoltaic Detectors, Photodiode Detectors, Photo-emissive Detectors

**Course Outcomes:** After studying the course, students will be able to:

- Explain the principles of operation of the main types of sensors.
- Utilize the merits of various types of sensors for a wide range of applications.
- Understand the limitations in the performance of instrumentation systems.

- Analyze the specifications of various types of sensors.
- Understand the main characteristics of sensors.

**Reference books:**


i. "Process Control Instrumentation Technology, 6th Edition", Author: Curtis D. Johnson, Publisher: Prentice Hall International Edition, ISBN: 0-13-978-200-3
ii. "Measurement, Instrumentation, and Sensors Handbook", Author/Chief Editor: John G. Webster. Publisher: CRC – Press – Taylor and Francis Group, ISBN: xxx-xxx-xxxx
iii. "Introduction to Instrumentation and Measurement, 3rd Edition", Authors: Robert B. Northrop, Publisher: CRC – Press – Taylor and Francis Group, ISBN: 13: 978-1-4665-9679
iv. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd Edition, Butterworth Hienemann
v. David A. Bell (2007), Electronics Instrumentation and Measurement, 2nd Edition, Oxford Press


| BCE 402 | Engineering Geology | L | T | P | 1 Credits |
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**Course Objectives:**

- Site characterization and geologic hazard identification and mitigation.
- The engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects.
- The quantification of processes such as rock slides, soil-slope stability, settlement, and liquefaction.
- Discussed the assessment and mitigation of geologic hazards such earthquakes, landslides, flooding; the assessment of timber harvesting impacts; and groundwater remediation and resource evaluation.

**Syllabus:**

**Unit 1: Study of Rocks:**

Introduction and importance of Geological knowledge. Rocks: their origin, structure and texture. Classification of igneous, sedimentary and metamorphic rocks and their suitability as engineering materials, Weathering and erosion of rocks, Stratification, Lamination bedding. Outcrop-its relation to topography. Dip and Strike of bed. Overlap, outlier and Inlier. Building stones and their engineering properties.

**Unit 2: Study of Minerals:**

Physical properties of minerals. Detailed study of certain rock forming minerals. Alkali aggregate reaction. Grouting. Pozzolonic materials.

**Unit 3: Rock Deformation & Earthquake**

Folds, Faults, Joints and unconformities: Their classification, causes and relation to engineering behavior of rock masses. Landslides, its causes and preventive measures. Earthquake, its causes, classification, seismic zones of India and its geological consideration.

**Unit 4: Geophysical Exploration and Geological Investigation:**

Geophysical exploration methods for sub-surface structure. Underground water and its origin. Aquifer & Aquiclude. Artesian wells. Underground provinces and its role as geological hazard. Site selection for dam, reservoir, tunnel, bridge and highway.

**Course Outcomes:** After studying the course, students will be able to know:

- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice.
- The fundamentals of the engineering properties of Earth materials and fluids.
- Rock mass characterization and the mechanics of planar rock slides and topples.
- Soil characterization and the Unified Soil Classification System.
- The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.

**Reference books:**


i. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria& Sons.
ii. Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
iii. Geology for Geotechnical Engineers, J.C. Harvey, Cambridge University Press (1982).
iv. D Venkat Reddy: Engg. Geology, Vikas Publication
v. Tony Waltham: Foundations of Engg. Geology, Spon Press
vi. Tony Waltham: Foundations of Engineering Geology, SPON Press.
vii. D Venkat Reddy: Engineering Geology, Vikas Publishing House Pvt. Ltd.
viii. J M Treteth: Geology of Engineers, Princeton, Von. Nostrand.
ix. K V G K Gokhale: Text book of Engineering Geology, B S Publication.


| BCE 403 | Introduction to Fluid Mechanics | L | T | P | 2 Credits |
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**Course Objectives:**

- The concepts of fluid mechanics useful in civil engineering applications.
- The concept of fluid statics, kinematics and dynamics. Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems.

- A training to analyze engineering problems involving fluids with pipe flow, open channel flow, jets, turbines and pumps, dams and spillways, culverts, river and groundwater flow.
- To prepare a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters.

**Syllabus:**

**Unit 1:**Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

**Unit 2:** Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

**Unit 3:** Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

**Unit 4:** Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.

**Course Outcomes:** After studying the course, students will be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics.
- Understand definitions of the basic terms used in fluid mechanics.
- Understand classifications of fluid flow.
- Be able to apply the continuity, momentum and energy principles.
- Be able to apply dimensional analysis.

**Reference books:**


i. Fluid Mechanics and Machinery, C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press,2010
ii. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
iii. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGrawHill

iv. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, McGraw Hill.

| BME 404 | Surveying & Geometrics | L | T | P | 2 Credits |
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**Course Objectives:**

- Describe the function of surveying in civil engineering.
- Work with survey observations, and perform calculations.
- Customary units of measure. Identify the sources of measurement errors and mistakes; differential leveling, and angular measurements.
- Be familiar with the principals of recording accurate, orderly, complete, and logical field notes from surveying operations, whether recorded manually or with automatic data collection methods.
- Identify and calculate the errors in measurements and to develop corrected values for differential level circuits, horizontal distances and angles for open or closed-loop traverses,

**Syllabus:**

**Unit 1:**
Introduction to Surveying: Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and it methods, Meridians and Bearings, Methods of leveling, Booking and reducing levels, Reciprocal leveling, distance of visible horizon, Profile leveling and cross sectioning, Errors in leveling; Introduction to methods of plane table surveying;

**Unit 2:**
Contouring: Characteristics, methods, uses, computation of areas and volumes, Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Methods of horizontal and vertical control,
Triangulation: Figures or systems, Signals, Satellite station, Baseline and its importance, corrections, Trigonometric leveling: Accessible and inaccessible objects.

**Unit 3:** Curves: Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves- types, characteristics and equations of various transition curves; Introduction to vertical curves.

**Unit 4:** Modern Field Survey Systems: Principle and types of Electronic Distance Measurement systems and instruments, Total Station- its advantages and applications; Global Positioning Systems Segments, working principle, errors and biases. Geographic Information System: Concepts and data types, data models, data acquisition. GIS applications in civil engineering.

**Unit 5:** Photogrammetric Survey: basic principles, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope and stereoscopic views, parallax equations. Introduction to digital photogrammetry.

**Course Outcomes:** After studying the course, students will be able to:

- Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations.
- Calculate, design and layout horizontal and vertical curves.
- Operate a total station and GPS to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system.
- Relate and apply principles of photogrammetry for surveying.
- Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.

**Reference books:**


i. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
ii. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
iii. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
iv. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
v. Anji Reddy, M., Remote sensing and Geographical information system, B.S.Publications, 2001.
vi. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.
vii. Punmia BC et al: Surveying Vol. I, II, Laxmi Publication
viii. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science


| BCE 405 | Materials, Testing & Evaluation | L | T | P | 2 Credits |
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**Course Objectives:**

- Make measurements of behavior of various materials used in Civil Engineering.
- Provide physical observations to complement concepts learnt
- Introduce experimental procedures and common measurement instruments, equipment, devices.
- Exposure to a variety of established material testing procedures and techniques
- Different methods of evaluation and inferences drawn from observations.

**Syllabus:**

**Unit 1:** Scope of Study of building Materials: building materials and their performance, economics of the building materials.

Stones: Requirement of good building stone, characteristics of building stone sand their testing. Common building stones.

Bricks: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. Different types of bricks.

Gypsum: properties of gypsum plaster, building products made of gypsum and their uses. Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement.

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi(burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction.

Timber: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factor affecting strength of timber, Methods of seasoning and preservation of timber. Wood based products.

**Unit 2:** Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. Paints, varnishes and distempers: Common constituents, types and desirable properties, Cement paints. Ferrous metals: Desirable characteristics of reinforcing steel. Principles of cold working. Strength, Telemechanical, physical Properties and chemical composition. Brief discussion on properties and uses of Aluminum and lead. Glass: Ingredients, properties types and use in construction. Insulating Materials: Thermal and sound insulating material, desirable properties and types.

**Unit 3:** Building Construction: Components of building area considerations, Construction Principle and Methods for layout, Damp proofing, anti termite treatment in buildings, Vertical circulation: stair cases and their types and planning. Different types of floors, and flooring materials .Bricks and stone masonry construction. Cavity wall & hollow block construction.

**Unit 4:** Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning.

**Unit 5:** Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance.

**Course Outcomes:** After studying the course, students will be able:

1. To identify and characterize building materials and understand the manufacturing process of bricks and cement.
2. To identify the methods for preservation of timber and metals.
3. The various construction principles and methods.
4. Construction of doors and windows, principles of building planning.
5. To know the ventilation aspects, various types of fittings, plastering and maintenance of building.

**Reference books:**


i. SK Duggal, "Building Materials" New Age International
ii. Purushothama Raj, "Building Construction Materials & Techniques" Pearson Edu.
iii. PC Varghese, "Building Materials" PHI
iv. Rangwala, "Building Materials" Charotar Publishing House.
v. Sushil Kumar, "Building Construction" Standard Publisher.
vi. Domone, "Construction Materials" 4/e, CRC Press Taylor & Francis Group.
vii. Adams, "Adams' Building Construction Adams" CRC Press Taylor & Francis Group.
viii. BC Punmia, "Building Construction" Laxmi Publication.
ix. Jha & Sinha, "Building Construction" Khanna Publishers
x. Sahu, "Building Materials and Construction" Mc Grew Hill Education


| BCE 406 | Civil Engineering - Societal & Global Impact | L | T | P | 2 Credits |
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**Course Objectives:**

- Awareness of the importance of Civil Engineering and the impact it has on the Society and at global levels
- Awareness of the impact of Civil Engineering for the various specific fields of human endeavor.
- Need to think innovatively to ensure Sustainability.

**Syllabus:**

**Unit-1:** Recent major Civil Engineering breakthroughs and innovations, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes, Human Development Index and Ecological Footprint of India Vs other countries, Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering

**Unit-2:** Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)

**Unit-3:** Environment- Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution

**Unit-4:** Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability, Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects, Health & Safety aspects for stakeholders

**Course Outcomes:** After studying this subject students will be able:

1. To know about the civil engineering, its importance and awareness of various projects.
2. To know the extent of Infrastructure, its requirements for energy for past, present and future.
3. Estimate the level of resource utilization for present and future.
4. Incorporate the goal of sustainable development to minimize the potential impacts on the global environment.
5. Associate various measures for enhancing the build environment, thereby improving quality of life of the occupants.

**Reference books:**


- ŽigaTurk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer,Dordrecht
- Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
- NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
- Allen M. (2008) Cleansing the city. Ohio University Press. AthensOhio.
- Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options
- http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

- Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water ResearchFR/R0014
- Barry M. (2003) corporate social responsibility – unworkable paradox or sustainable paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. p 129-130
- Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainability with application to urban water systems. J. Water Resources Planning and Management. ASCE. Vol. 134, No. 3, May.
- Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63
- Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional Agency Entrapment: An Agenda for Urban Water Research. Water Resources Management. Vol. 23, No.4. European Water Resources Association (EWRA) ISSN0920-4741


| BCE 407 | Introduction to Solid Mechanics | L | T | P | 2 Credits |
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**Course Objectives:**

- To introduce to continuum mechanics and material modeling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design.
- Analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various members in a structural system.
- The behavior of a member depends not only on the fundamental laws that govern the equilibrium of forces, but also on the mechanical characteristics of the material.

**Syllabus:**

**Unit-1:** Deflection of Beams: Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. Short Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules.

**Unit-2:** Classification of Structures, stress resultants, degrees of freedom per node, Static and Kinematic determinacy. Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient

**Unit-3:** Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's principal & its application for determinate structures

**Unit-4:** Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, spandrel braced arch, moving load & influence lines.

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods.

**Unit-5:** Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural section.

Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.

**Course Outcomes:** After studying the course, students will have :

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as being able to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs.
- An ability to function in multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.

**Reference books:**


- Hibbler ," Structural Analysis ", Pearson Education
- T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
- Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
- Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
- Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures ". Vol. I & II Nem Chand.
- Vazirani & Ratwani et al ," Analysis of Strcuctures " , Khanna Publishers
- Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.


| BCE 408 | Disaster Preparedness &Planning | L | T | P | 2 Credits |
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**Course Objective:**

- To Understand Definitions and Terminologies used in Disaster Management
- To Understand basic concepts in Disaster Management
- To Understand the Challenges posed by Disasters
- To Understand Types and Categories of Disasters
- To understand Impacts of Disasters Key Skills

**Syllabus:**

**Unit-1:** Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks- severity, frequency and details, capacity, impact, prevention, mitigation).

**Unit-2:** Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India.

**Unit-3:** Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

**Unit-4:** Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction,

**Course Outcomes:** After studying the course, students will be able to:

- Develop competencies in
- The application of Disaster Concepts to Management
- Analyzing Relationship between Development and Disasters.
- Ability to understand Categories of Disasters and realization of the responsibilities to society

**Reference books:**


- http://ndma.gov.in/ (Home page of National Disaster Management Authority)
- http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
- Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
- Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
- Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
- Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC


| BCE 409 | Mechanical Engineering | L | T | P | 3 Credits |
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**Course Objectives:**

- Ability to apply mathematics, science, and engineering
- Ability to design and conduct experiments, as well as to analyze and interpret data
- Ability to identify, formulate, and solve engineering problems
- Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.
- Ability to comprehend the thermodynamics and their corresponding processes that influence the behavior and response of structural components
- Ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) and thermodynamics to model, analyze, design, and realize physical systems, components, or processes

**Syllabus:**

**Unit 1:** Simple stress and strains: Concept of stress and strain, types of stresses and strains, Hook's law, stress and strain diagram for ductile and brittle metal. Lateral strain, Poission ratio, volumetric strain, elastic moduli and relation between them. Bar of varying cross section, composite bar and temperature stress. Strain energy for gradual, sudden and impact loading.

Compound stress and strains: Normal stress and strain, shear stress and strain, stresses on inclines sections, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law-3D, Theories of failure and factor of safety.

**Unit 2:** Shear force and bending moment diagrams Shear force (SF) and Bending moment (BM) diagrams for simply supported, cantilevers, overhanging and fixed beams. Calculation of maximum BM and SF and the point of contra-flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads.

**Unit 3:** Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.
Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

**Unit 4:** Helical and Leaf Springs: Deflection of springs by energy method, helical springs under Axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs.

Thin cylinders, Thick cylinders & Spheres: Introduction, difference between thin walled and Thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain. Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders.

**Course Outcomes:** After having the course, students will be able to:

- Apply knowledge of mathematics, science and engineering to analyze, design and evaluate mechanical components & systems using state -of-the-art IT tools.
- Analyze problems of mechanical engineering including thermal, manufacturing and industrial systems to formulate design requirements.
- Design, implement, and evaluate mechanical systems and processes considering public health, safety, cultural, societal and environmental issues.
- Design and conduct experiments using domain knowledge and analyze data to arrive at valid conclusions.
- Apply current techniques, skills, knowledge and computer based methods & tools to develop mechanical systems.

**Reference books:**


- Mechanics of Materials by Hibbeler, Pearson.
- Mechanics of material by Gere, Cengage Learning
- Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
- Strength of Materials by Pytel and Singer, Harper Collins
- Strength of Materials by Ryder, Macmillan.
- Strength of Materials by Timoshenko and Yσungs, East West Press.
- Introduction to Solid Mechanics by Shames, Pearson
- Mechanics of material by Pytel, Cengage Learning
- An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
- Strength of Materials by Jindal, Pearson Education
- Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
- Kazmi, S. M. A., “Solid Mechanics” TMH, Delhi, India.


| BCE 410 | Management I (Organizational Behavior) | L | T | P | 0 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- Objective of the course is to give a basic perspective of Management theories and Practices.
- This will form foundation to study other functional areas of management and to
- Provide the students with the conceptual framework and the theories underlying Organizational Behavior.

**Syllabus:**

**Unit-1:** OB: Learning objectives, Definition & Meaning, Why to study OB, An OB model, New challenges for OB Manager
Learning: Nature of learning, How learning occurs, Learning & OB

**Unit-2:** PERSONALITY: Meaning & Definition, Determinants of Personality, Personality Traits, Personality & OB, Perception: Meaning & Definition,
Motivation: Nature & Importance, Herzberg's Two Factor theory, Maslow's Need Hierarchy theory, Alderfer's ERG theory

**Unit-3:** Communication: Importance, Types, Barriers to communication, Communication as a tool for improving Interpersonal Effectiveness
Groups in organization: Nature, Types, Why do people join groups, Group Cohesiveness & Group Decision Making- managerial Implications, Effective Team Building
Leadership: Leadership & management, Theories of leadership- Trait theory, Behavioural Theory,
Conflict: Nature of Conflict & Conflict Resolution

**Unit-4:** Organizational Culture: Meaning & Definition, Culture & Organizational Effectiveness
Human Resource Management: Introduction to HRM, Selection, Orientation, Training & Development, Performance Appraisal, Incentives
Organizational Change: Importance of Change, Planned Change & OB Techniques

**Course Outcomes:** After having the course, students are expected to:

- Demonstrate an understanding of the forces that shape the business and economic structure
- Explain why business ethics is an integral part of every business organization.
- Understand the business and related factors; and business's dependency on the interactions with different environmental variables.
- Develop analytical skills and widen the understanding of macro environmental issues by applying the knowledge of macroeconomic policies and their impact on business organization and strategy

**Reference books:**


- Organizational Behavior, Stephen P. Robbins, Pearson Education
- Organizational Behaviour, S.S.Khanka, S.Chand
- Organizational Behavior , Mishra .M.N ,Vikas


| BCE 451 | | L | T | P | 1 Credits |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | **Instrumentation & Sensor Technologies for Civil Engineering Applications Lab** | **0** | **0** | **2** | |

- Demonstration & use of sensor technologies
- Measurement of Low Resistance Kelvin's Double Bridge
- Study of Characteristics of IC Temperature Sensor
- Study of Characteristics of Platinum RTD
- Study of Characteristics of NTC Thermistor
- Study of the temperature controlled alarm system (Using 1 NTC)
- Measurement of Unknown Frequency using Lissajius Pattern.
- Study of Distortion factor meter and determination of % distortion of given Oscillator

| **BCE 452** | **Engineering Geology Lab** | **L** | **T** | **P** | **1 Credits** |
|---|---|---|---|---|---|
| | | **0** | **0** | **2** | |

- Study of physical properties of minerals.
- Study of different group of minerals.
- Study of Crystal and Crystal system.
- Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
- Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite and Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
- Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
- Identification of rocks (Metamorphic Petrolody): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite,Phyllite.
- Study of topographical features from Geological maps. Identification of symbols in maps.

| **BCE 453** | **Introduction to Fluid Mechanics Lab** | **L** | **T** | **P** | **1 Credits** |
|---|---|---|---|---|---|
| | | **0** | **0** | **2** | |

- To verify the momentum equation using the experimental set-up on impact of jet.
- To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
- To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.

- To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
- To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
- To determine Meta-centric height of a given ship model.
- To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
- To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.

| BCE 454 | Surveying & Geometrics Lab | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | |

- To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
- To find out reduced levels of given points using dumpy/Auto level.
- To measure horizontal angle between two objects by theodolite.
- Demonstration and working on Electronic Total Survey Station
- Demonstration and working with Pocket/ Mirror stereoscopes, Parallax bar and Aerial photographs
- Plane Table Survey
- To perform fly leveling with a Auto /tilting level.
- To study parts of a venire / Electronic theodolite and practice for taking angle measurements.
- Visual Interpretation using IRS false colour composite

| BCE 455 | Materials, Testing &Evaluation Lab | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | |

- Cement
  - (i) Normal Consistency of cement.
  - (ii) Initial & final setting time of cement
  - (iii) Compressive strength of cement
  - (iv) Fineness of cement by air permeability and Le-chatalier's apparatus.
  - (v) Soundness of cement.
  - (vi) Tensile strength
- Coarse Aggregate
  - (i) Crushing value of aggregate
  - (ii) Impact value of aggregate
  - (iii) water absorption of aggregate
  - (iv) Sieve Analysis of Aggregate

(v) Specific gravity & bulk density
(vi) Grading of aggregates.

- Fine Aggregate
  (i) Sieve analysis of sand
  (ii) Silt content of sand
  (iii) Bulking of sand
- Bricks:
  (iv) Water absorption.
  (v) Dimension Tolerances
  (vi) Compressive strength
  (vii) Efflorescence

**Annexure.....**

# SWAMI VIVEKANAND
# SUBHARTI UNIVERSITY, MEERUT


# SYLLABUS

## B.TECH

## (CIVIL ENGINEERING)

## (Third Year)

## W.E.F. SESSION 2018-19

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**Subhartipuram, NH-58 Delhi-Haridwar Bypass Road,**
**Meerut -250005 (UP)**
**www.subharti.org**

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**B.Tech 3rd Year**
**W.E.F academic Session 2018-19**

| SEMESTER –V | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject Title | Course Type | Periods | | | CCA | | | | ESE | | Total | Credits |
| | | | | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
| 1 | BCE – 501 | Hydraulic Engineering | PCC-18 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | BCE – 502 | Geotechnical Engineering | PCC-20 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 3 | BCE – 503 | Transportation Engineering | PCC-23 | 2 | 2 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 4 | BCE – 504 | Mechanics of Materials | PCC-17 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 5 | BCE – 505 | Structural Engineering | PCC-19 | 2 | 1 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 6 | BCE – 506 | Environmental Engineering | PCC-22 | 2 | 2 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 7 | BCE – 507 | Hydrology & Water Resources Engineering | PCC-21 | 2 | 2 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 8 | BHU – 502 | Profession Practice, Law & Ethics | HSMC-4 | 2 | 2 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 9 | BMC– 502 | Constitution of India/ Essence of Indian Traditional Knowledge | MC-1 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | - | 0 | 0 |
| 10 | BCE – 551 | Hydraulic Engineering Lab | PCC-24 | 0 | 0 | 2 | 0 | 0 | 0 | 15 | 0 | 35 | 50 | 3 |
| 11 | BCE – 552 | Geotechnical Engineering Lab | PCC-25 | 0 | 0 | 2 | 0 | 0 | 0 | 15 | 0 | 35 | 50 | 3 |
| 12 | BCE – 553 | Transportation Engineering Lab | PCC-26 | 0 | 0 | 2 | 0 | 0 | 0 | 15 | 0 | 35 | 50 | 3 |
| **Total** | | | | | | | | | | | | | **750** | **21** |

| SEMESTER –VI | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject Title | Course Type | Periods | | | CCA | | | | ESE | | Total | Credits |
| | | | | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
| 1 | BCE-601 | Construction Engineering &Management | PCC-27 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | BCE-602 | Engineering Economics, Estimation & Costing | PCC-28 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 5 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | BCE-611-BCE-613 | Professional Elective Course-I | PE-1 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 4 | BCE-621-BCE-623 | Professional Elective Course-II | PE-2 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 5 | BCE- 001-BCE-002 | Open Elective Courses-1 | OE-1 | 0 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 1 |
| 6 | BCE-631-BCE-633 | Professional Elective Course-III | PE-3 | 2 | 0 | 2 | - | - | - | 15 | - | 35 | 50 | 3 |
| 7 | BCE-641-BCE-643 | Professional Elective Course-IV | PE-4 | 1 | 0 | 4 | - | - | - | 15 | - | 35 | 50 | 3 |
| **Total** | | | | | | | | | | | | | **550** | **23** |
| **Summer Internship** | | During Summer Vacations / Non-credit (4-6 week) | | | | | | | | | | | | |

**PROFESSIONAL ELECTIVE COURSES (PE)**

| | |
|---|---|
| BCE-611 | Pavement Design |
| BCE-612 | Traffic Engineering and Management |
| BCE-613 | Railways Engineering |
| BCE-621 | Building Construction Practice |
| BCE-622 | Construction Project Planning & Systems |
| BCE-623 | Sustainable Construction Methods |
| BCE-631 | Rural Water Supply and Onsite Sanitation Systems |
| BCE-632 | Solid and Hazardous Waste Management |
| BCE-633 | Environmental Impact Assessment and Life Cycle Analysis |
| BCE-641 | Design of Hydraulic Structures/ Irrigation Engineering |
| BCE-642 | Open Channel Flow |
| BCE-643 | Urban Hydrology and Hydraulics |

**OPEN ELECTIVE COURSES (OE)**

| | |
|---|---|
| BCE-001 | Metro Systems and Engineering |
| BCE-002 | ICT for Development |

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**Detailed Syllabus**
**YEAR – 3rd (5th Semester)**
**Branch/Course: Civil Engineering/B. Tech**

| BCE 501 | Hydraulic Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering

**Syllabus:**

**Unit 1:** Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation. Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

**Unit 2:** Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section.

**Unit 3:** Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, flow in channels of non-linear alignment

**Unit 4:** Classical hydraulic jump, evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, open channel surge, celerity of the gravity wave, deep and shallow water wave.

**Unit 5:** Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves. Introduction, Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

**Course Outcomes:** After having the course, students are expected have to:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

**Reference books:**


i. Garde,R.J., " Fluid Mechanics through Problems", New Age International
ii. Streeter, V.L. and White, E.B., "Fluid Mechanics", McGraw Hill, New York, 8th
iii. Asawa,G.L., "Experimental Fluid Mechanics", Vol.1, NemChand and Bros.,

iv. Ranga Raju, K.G., Flow through open channels, T.M.H. 2nd edition
v. Rajesh Srivastava , Flow through Open Channels , Oxford University Press

| BCE 502 | Geotechnical Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To apply knowledge of geotechnical engineering to produce engineers to integrate and build concepts to improve professional leadership, teamwork, life-long learning, and career advancement.
- To design and conduct experiments, to analyze and interpret data related to the geotechnical engineering, as well as to formulate systems within realistic constraints such as economic, environmental, social, political, ethical, health and safety,
- manufacturability, and sustainability To accentuate the understanding of the basic principles and exposes the student to the latest developments, with a strong research foundation so as to provide engineering solutions in a global, economic, environmental, and societal context.

**Syllabus:**

**Unit 1:** Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Clay minerals, Index properties, Particle size analysis, Soil classification.

**Unit 2:** Soil-water systems, capillarity-flow, Darcy's law, permeability, field and lab tests, piping, quick sand condition, seepage, flow nets, flow through dams, filters. Soil compaction, water content – dry unit weight relationships, OMC, field compaction control, Proctor needle method.

**Unit 3:** Effective stress principle, Stresses due to applied loads, Boussinesq and Westergaard equations. Compressibility and consolidation characteristics, Rate of consolidation, Terzaghi's one dimensional theory of consolidation and its applications, Over Consolidation Ratio, determination of coefficient of consolidation and secondary consolidation (creep), consolidation under construction loading.

**Unit 4:** Shear strength - direct & triaxial shear tests, Mohr – Coulomb strength criterion, drained, consolidated, undrained and unconsolidated tests, strength of loose and dense sands, Normally Consolidated and Over Consolidated soils, dilation, pore pressure, Skempton's coefficient. Earth pressure theories, Coulomb and Rankine approaches for c-φ soils, smooth and rough walls, inclined backfill.

**Unit 5:** Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ test, SPT, CPT, DCPT Types of foundations – shallow / deep, isolated, combined, mat, etc., Definitions, Bearing capacity of shallow foundations (Terzaghi analysis), general, local

and punching shear failures, corrections for size, shape, depth, water table, Bearing capacity by consolidation method, insitu bearing capacity determination, Provisions of IS code of practice, selection of depth of footing, eccentrically loaded footings.

**Course Outcomes:** After having the course, students are expected have to:

- Knowledge of site specific field investigations including collection of soil samples for testing and observation of soil behavior/ building damage.
- Be able to identify and classify soil based on standard geotechnical engineering practice.
- Be able to perform laboratory compaction and in-place density tests for fill quality control.

**Reference books:**


i. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
ii. K.R. Arora – Soil Mechanics and Foundation Engineering
iii. Alam Singh – Modern Geotechnical Engineering
iv. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
v. I.H. Khan – Text Book of Geotechnical Engineering
vi. C. Venkataramaiah – geotechnical Engineering
vii. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
viii. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics


| BCE 503 | Transportation Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 2 | 0 | |

**Course Objective:**

- The process of collecting and recording field inventory, condition inspection, traffic data, and database development for deterioration modeling. Understand transportation engineering is multi-faceted. The field is wide open and leads to diverse
- Sampling design considering full and partial factorials based on functional class, structural thickness levels, subgrade strength levels, age levels, and traffic levels. Development of pavement deterioration models, to predict
- Understand the basic principles and processes of transportation engineering.

**Syllabus:**

**Unit 1: Introduction:** Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types and pattern.

**Geometric Design:** Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

**Unit 2: Traffic Engineering:** Traffic characteristic, volume studies, speed study, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection.

**Unit 3: Design of Highway Pavement:** Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC: 37-2001), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC: 58 – 2002).

**Unit 4: Road Construction Methods:** WBM, Surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction.

**Course Outcomes:** After having the course, students are expected have to:

- Plan highway networks
- Design highway geometrics.
- Design Intersections and prepare traffic management plans.
- Design flexible and rigid pavements.
- Understand the principles of construction and maintenance of highways

**Reference books:**


i. Highway Engineering by S. K. Khanna & C.E.G.Justo.
ii. Transportation Engineering by L. R. Kadiyali.
iii. Highway Engineering by S. K. Sharma
iv. Principles of Transportation Engineering by P. Chakraborty & A. Das


| BCE – 504 | Mechanics of Materials | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- Studying Basic property of Steel members
- Study various types of steel joints
- Study of various failures of steel structure members

**Syllabus:**

**Unit 1:** Consider various primary loads, load combinations for obtaining a worst design load. Plan the structural framing of industrial buildings and bridges from the given data/design constraints. Apply the concepts of structural design to obtain suitable member sizes/sections. Prepare and deliver rough sketches to the draftsman.

**General Considerations:** Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild

Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

**Introduction to Limit State Design:** Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria

**Unit 2: Simple Connections:** Riveted, Bolted and Pinned Connections Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Pin Connections

**Simple Welded Connections:** Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Section of Fasteners, Working Load Design

**Unit 3: Tension Members:** Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio ($\lambda$), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design

**Unit 4: Compression Members:** Introduction, Effective Length, Slenderness Ratio ($\lambda$), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Encased Column, Splices, Design of Column Bases

**Unit 5:** Beams Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Lintels, Purlins, Beam Bearing Plates.

**Course Outcomes:** After having the course, students are expected have to:

- Understand and appreciate various aspects of steel construction like different types of steel sections, their specifications, advantages of steel construction etc.

- Analyze and design various types of steel connections using rivets, bolts and weld.
- Design basic elements of a steel building like beam, column, and column bases etc. for given conditions and loading.
- Introduction to Plate Girder , Introduction to Gantry Girder

**Reference books:**


i. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
ii. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
iii. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
iv. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
v. Anji Reddy, M., Remote sensing and Geographical information system, B.S.Publications, 2001.
vi. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.
vii. Punmia BC et al: Surveying Vol. I, II, Laxmi Publication
viii. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science


| BCE 505 | Structural Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 1 | 0 | |

**Course Objective:**

- Visualize the concepts of loads, supports and displacements.
- Analyse statically determinate structural systems.
- Choose a suitable method and technique for determination of structural displacement and force resultants.
- Visualize the effect of loads, rolling loads and/or reactions, support displacements and temperature on the structural response
- Utilize the concept of influence lines for deciding the critical forces and sections while designing

**Syllabus:**

**Unit 1:** Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

**Unit 2:** Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

**Unit 3:** Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

**Unit 4:** Basics of Force and Displacement Matrix methods for beams, frames and trusses.

**Unit 5:** Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

**Course Outcomes:** After having the course, students are expected have to:

- Able to interpret the various methods of structural displacements.
- Able to analyze the determinate structure and its reaction diagram.
- Able to draw the influence line diagram for rolling loads.
- Able to compute the pressure on supporting tower, suspension bridge etc. and to calculate loads for no tension criteria on domes chimneys and retaining walls.
- Able to interpret the various methods of structural displacements.

### Reference books:


i. Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros., Roorkee.
ii. Structural Analysis by C. S. Reddy, Tata Mc Graw Hill Publishing Company Limited, New Delhi
iii. Theory of Structures Vol 1 & 2 by Gupta & Gupta , TMH
iv. Theory and Analysis of Structures, Vol. I & II by O. P. Jain & B. K. Jain, Nem Chand & Bros., Roorkee.
v. Theory of Structures by S. P. Timoshenko and D. Young, Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
vi. Analysis of Statically Indeterminate Structures by P. Dayaratnam, Affiliated East-West Press.
vii. Indterminate Structural Analysis by C. K. Wang.
viii. Introduction to Matrix Methods of Structural Analysis by H. C. Martin, Mc-Graw Hill Book Publishing Company Ltd.
ix. Matrix Analysis of Framed Structures by Weaver and Gere.
x. Theory of Structures Vol. II by Vazirani & Ratwani.
xi. Influence Line Diagrams by Dhavilkar.


| BCE 506 | Environmental Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 2 | 0 | |

**Course Objective:**

- To understand and explain the role of sanitation in the urban water cycle and its relation to public health and environment.

- To develop rational approaches towards sustainable wastewater management via pollution prevention.
- To understand the relevant physical, chemical and biological processes and their mutual relationships within various sanitation components.
- To contribute to the development of innovative approaches.

**Syllabus:**

**Unit 1: Water supply:** Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period.

**Sources of water:** Kinds of water sources and their characteristics, collection of surface and ground water; quality of surface and ground waters; factors governing the selection of a source of water supply; intakes and their design for lakes, streams and rivers, impounding reservoir and canal; determination of the capacity of impounding reservoir.

**Unit 2: Transmission of water:** Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures.

**Unit 3: Storage and distribution of water:** Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton - Raphson method and equivalent pipe method of pipe network analysis; rural water supply distribution system. Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply.

**Unit 4: Wastewater collection:** Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows. Storm water: Collection and estimation of storm water by different formulae.

**Flow in sewers:** Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines; small bore sewer systems. Planning of sewerage systems. Institutional and industrial wastewater management.

**Course Outcomes:** After having the course, students are expected have to:

- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- An ability to function on multidisciplinary teams;

- An ability to identify, formulate, and solve engineering problem.

**Reference books:**

- Peavy, Rowe and Tchobanoglous: Environmental Engineering
- Metcalf and Eddy Inc.: Wastewater Engineering
- Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
- Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).
- Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
- Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
- Steel and McGhee: Water Supply and Sewerage
- Fair and Geyer: Water Supply and Wastewater Disposal
- Arceivala: Wastewater Treatment for Pollution Control
- Hammer and Hammer Jr.: Water and Wastewater Technology
- Raju: Water Supply and Wastewater Engineering
- Sincero and Sincero: Environmental Engineering: A Design Approach
- Pandey and Carney: Environmental Engineering
- Rao: Textbook of Environmental Engineering
- Davis and Cornwell: Introduction to Environmental Engineering
- Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
- Punmia: Water Supply and Wastewater Engineering Vol. I and II
- Birdie: Water Supply and Sanitary Engineering
- Ramalho: Introduction to Wastewater Treatment Processes
- Parker: Wastewater Systems Engineering

| BCE 507 | Hydrology & Water Resources Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 2 | 0 | |

**Course Objective:**

- To know about objectives of Water resources project planning, investigations and data requirement.
- To understand Water resources system design, development, assessment and environment impact assessment
- To evaluate Engineering economy in flood control projects
- To Model watershed hydrology using different techniques.
- To understand requirements of multipurpose project developmental issues like hydroelectric , power development, inland water transportation and watershed management

**Syllabus:**

**Unit 1:** Hydrology: Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilistic maximum Precipitation (PMP) curves. Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.

Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices.

**Unit 2: Surface Runoff:** Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis. Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation. Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.

**Unit 3: Sediment Transportation:** Suspended and Bed load and its estimation Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

**Unit 4: Regulation and control of canal system:** Purpose, Types of canal regulation works and their functional aspects. Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion

**River Training:** Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

**Unit 5: Ground Water Hydrology:** Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries.

**Course Outcomes:** After having the course, students are expected have to:

- Various components of hydrologic cycle that affect the movement of water in the earth
- Various Stream flow measurements technique .
- The concepts of movement of ground water beneath the earth .
- The basic requirements of irrigation and various irrigation techniques, requirements of the crops
- Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design

**Reference books:**


i. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
ii. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
iii. Engineering Hydrology by K. Subramanya, TMH.
iv. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
v. Water Resources Engg. By Larry W. Mays, John Wiley India
vi. Water resources Engg. By Wurbs and James, John wiley India
vii. Water Resources Engg. By R. K. Linsley, McGraw Hill
viii. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
ix. Irrigation Theory and practices by A.M. Michel.


| BHU 502 | Profession Practice, Law & Ethics | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 2 | 2 | 0 | |

**Course Objective:**

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession

**Syllabus:**

**Unit-1:** Professional Practice – Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India)

**Unit-2:** Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India), Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches

**Unit-3:** Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment ( Standing Orders)

Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

**Unit-4:** Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957

Law relating to Patents under Patents Act, 1970, Process of obtaining patent – application, examination, opposition and sealing of patents

**Course Outcomes:** After having the course, students are expected have to:

- To familiarize the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing the profession.
- To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour.
- To give an understanding of Intellectual Property Rights, Patents.
- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.
- To develop good ideas of the legal and practical aspects of their profession

**Reference books:**


i. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
ii. The National Building Code, BIS, 2017
iii. RERA Act, 2017
iv. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
v. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
vi. Avtarsingh (2002), Law of Contract, Eastern Book Co.
vii. Dutt (1994), Indian Contract Act, Eastern Law House
viii. Anson W.R. (1979), Law of Contract, Oxford University Press
ix. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
x. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
xi. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
xii. Bare text (2005), Right to Information Act
xiii. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
xiv. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
xv. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House

xvi. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss2,pp 117-127, MCB UP Ltd
xvii. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
xviii. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill

| BMC 502 | Constitution of India/ Essence of Indian Traditional Knowledge | L | T | P | 0 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 0 | |

**Course Objective:**

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Syllabus:**

**Unit 1: History of Making of the Indian Constitution:** History, Drafting Committee, (Composition & Working)

**Unit 2: Philosophy of the Indian Constitution:** Preamble, Salient Features

**Unit 3: Contours of Constitutional Rights & Duties:** Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

**Unit 4: Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

**Unit 5: Local Administration: District's Administration head:** Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**Unit 6: Election Commission: Election Commission:** Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**Course Outcomes:** After having the course, students are expected have to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956

**Reference books:**


i. The Constitution of India, 1950 (Bare Act), Government Publication.
ii. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
iii. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
iv. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.


| BCE 551 | Hydraulic Engineering Lab | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | |

- To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
- To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
- To study the flow characteristics over a hump placed in an open channel.
- To study the flow through a horizontal contraction in a rectangular channel.
- To calibrate a broad-crested weir.
- To study the characteristics of free hydraulic jump.
- To study rotodynamic pumps and their characteristics
- To study characteristics of any two turbines ( Francis/ Kaplan / Pelton )

| BCE 552 | Geotechnical Engineering Lab | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | |

- Sieve Analysis
- Hydrometer Analysis
- Liquid & Plastic Limit Tests
- Shrinkage Limit Test
- Proctor Compaction Test
- Relative Density
- In Situ Density – Core cutter & Sand Replacement
- Permeability Test
- Direct Shear Test

- Auger Boring
- Static Cone Penetration Test

| BCE 553 | Transportation Engineering Lab | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | |

- Crushing Value Test of Aggregate
- Impact Value Test of Aggregate
- Los Angeles Abrasion Value of Aggregate
- Shape Test (Flakiness Index, Elongation Index) of Aggregate
- Penetration Test of Bituminous Sample
- Softening Point Test of Bituminous Sample
- Stripping Test of Bituminous Sample
- Ductility Test of Bituminous Sample
- Flash & Fire Point Test of Bituminous Sample
- Classified both directional Traffic Volume Study
- Traffic Speed Study ( Using Radar Speedometer or Enoscope)

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**Detailed Syllabus**
**YEAR – 3rd (6th Semester)**
**Branch/Course: Civil Engineering/B. Tech**

| BCE 601 | Construction Engineering & Management | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To introduce the students to various types of construction management techniques and how to monitor and schedule the project. At the completion of the course, the student should be able to know contract management.

**Syllabus:**

**Unit 1: Elements of Management:** Project cycle, Organization, planning, scheduling monitoring updating and management system in construction.

**Unit 2: Network Techniques:** Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, GERT, CPM AON and AOA in construction management. Project monitoring, cost planning, resource allocation through network techniques. Line of balance technique.

**Unit 3: Engineering Economics:** Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison present worth method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset. Depreciation and break even cost analysis.

**Unit 4: Contract Management:** Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items, settlements of disputes, arbitration and commissioning of project.

**Unit 5: Equipment Management:** Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipments for earth moving, Hauling Equipments, Hoisting Equipments, Conveying Equipments, Concrete Production Equipments

**Course Outcomes:** After having the course, students are expected have to:

- To know the different types of standard / special equipment used in the construction industry and select the appropriate equipment
- To determine the optimal use of the equipment, owning, operating and maintenance and repair costs of the equipment.
- To decide judiciously whether the equipment should be purchased or hired, repaired or sold.

**Reference books:**


i. "Construction Planning", Equipment and Methods. : R.L. Peurify. T.M.H., International Book Company.
ii. "PERT & CPM Principles and Applications" L.S. Srinath, E.W.P. Ltd., New Delhi.
iii. "Network Analysis Techniques" S.K. Bhatnagar, Willey Eastern Ltd.
iv. Construction Technology by Sarkar , Oxford
v.


| BCE 602 | Engineering Economics, Estimation & Costing | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To apply knowledge of economics engineering to produce engineers to integrate and build concepts to improve professional leadership, teamwork, life-long learning, and career advancement. To know what are the different materials cost and values according to their uses.

**Syllabus:**

**Unit 1: Estimating:** Different types of estimates, methods of estimating and scheduling quantities for the following works: Building, culverts, bridges, irrigation works, steel structures, road works, canal works, sanitary and water supply works, roofs, R.C.C. work.

**Analysis of Rates:** Schedule of rates, Analysis of rates: earth work, brick masonry, stone masonry, cement concrete, RCC work, iron work, plastering, flooring, white washing, painting, wood work, Road work.

**Unit 2: Specifications:** Detailed specifications of the following: earth work in foundation, lean concrete in foundation, lime concrete in roof terracing, cement concrete, RCC, brick work, plastering, painting, C.C. floor, mosaic floor, white washing, distempering, varnishing, painting, doors and windows, DPC, cantering and shuttering, stone masonry, cement mortar, lime mortar, brick ballast, surkhi, cinder and sand.

**Unit 3: Accounts Procedures:** Regular and work charged establishment, pay bill, ACR, classifications of works, contract, tender, tender notice, earnest money, security money, arranging contract, power of accepting tender, daily labour, muster roll, classification of contracts, penalty, measurement book, account procedures of stores, issue rate, stock accounting, Introduction to forms and bills, Advance payment, hand receipt, refund of security money, cash book, imprest, deposit works, temporary advances, treasury challan, inventory, administrative approval, competent authority, building bye laws.

**Unit 4: Valuation:** Gross income, net income, outgoing, scrap value, salvage value, obsolescence, annuity, capitalized value, year's purchase, sinking fund, depreciation, valuation of building, determination of depreciation, method of valuation, life of various items of works, mortgage lease, fixation of rates, plinth area required for residential building., Arbitration.

**Course Outcomes:** After having the course, students are expected have to:

- Knowledge of site specific field investigations including collection of soil samples for testing and observation of soil behavior/ building damage.
- Be able to identify and classify the material demand in the market with their prices.
- Be able to perform masonry work done on site and get knowledge of different building materials used at site.

**Reference books:**


i. B.N. Dutta, 'Estimating & Costing in Civil Engg.: Theory & Practice', UBS Publishers Distributors Ltd.
ii. G.S. Birdie, 'Estimation and Costing in Civil Engineering', Dhanpat Rai Publishing Co. Ltd, New Delhi, 2011.
iii. M. Chakraborti, 'Estimation, Costing, Specifications and Valuation in Civil Engineering', National Halftone Co. Calcutta.
iv. George H. Cooper, 'Building Construction Estimating'.
v. P.L. Bhasin, 'Estimating and Costing for Building & Civil Engg. Works'.
vi. 'Standard Schedule of Rates and Standard Data Book', Public Works Department.
vii. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)


| BCE 611-613 | Professional Elective Course-I | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

| BCE 611 | Pavement Design | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To introduce highway pavements, design concepts and material properties,
- To understand and enable students to carry out design of bituminous mixes, analyze and design flexible and rigid highway pavements.
- To introduce the concepts of pavement evaluation and rehabilitation.

**Syllabus:**

**Unit 1:** Introduction to highway pavements, Types and component parts of pavements, Factors affecting design and performance of pavements, Functions and significance of sub grade properties, Various methods of assessment of sub grade soil strength for pavement design Mix design procedures in mechanical stabilization of soils. Stresses and deflections in homogeneous masses, Burmister's 2 layer and 3 layer theories, Wheel load stresses, ESWL of multiple wheels, Repeated loads and ESWL factors.

**Unit 2:** Empirical, semi - empirical and theoretical approaches for flexible pavement design, Group index, CBR, Triaxial, Mcleod and Burmister layered system methods.

**Unit 3:** Introduction to analysis and design of rigid pavements, Types of stresses and causes, Factors influencing stresses, General conditions in rigid pavement analysis, Warping stresses, Frictional stresses, Combined stresses.

**Unit 4:** Joints in cement concrete pavements, Joint spacings, Design of slab thickness, Design and detailing of longitudinal, contraction and expansion joints, IRC methods of Design.

**Unit 5:** Introduction to pavement evaluation, Structural and functional requirements of flexible and rigid pavements, Quality control tests for highway pavements, Evaluation of pavement structural condition by Benkelman beam, rebound deflection and plate load tests, Introduction to design of pavement overlays and the use of geosynthetics.

**Course Outcomes:** After having the course, students are expected have to:

i. Identify the pavement components and design bituminous mixes.
ii. Analyze and design flexible and rigid pavements.
iii. Evaluate structural condition of pavement.

**Reference books:**


- Yoder and Witezak, Principles of Pavement design, John Wiley and sons, second edition,1975.
- Yang, Design of functional pavements, McGraw- Hill,1972.
- Khanna S. K. & Justo C. E. G., Highway Engineering, Nemchand & Bros.
- Hass & Hudson, 'Pavement Management System', McGraw Hill Book Co, 1978.
- IRC: 37-2012, 'Tentative Guidelines for the Design of Flexible Pavements.
- IRC: 58-2011, Guidelines for Design of Plain Jointed Rigid Pavements for Highways.


| BCE 612 | Traffic Engineering and Management | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To understand all the traffic characteristics.
- To understand all the traffic surveys conducted for complete analysis of busy roads, which requires for effective traffic management.
- To understand, to plan and design all the important elements on the roads like signals, junctions, islands for effective traffic engineering.
- To understand the various network flow problems, which includes the traffic management skills.

**Syllabus:**

**Unit 1: Introduction:** Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning

**Unit 2: Type of transportation system:** Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

**Unit 3: Travel demand:** Estimation and fore casting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

**Unit 4: Evaluation of transport planning proposals:** Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

**Unit 5: Transportation Facilities:** Pedestrian facilities, Bicycle facilities, parking and terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

**Course Outcomes:** After having the course, students are expected have to:

- The student are expected to understand the complete knowledge of traffic surveys, traffic characteristics and management skills related with various problems on busy roads.
- The students shall be in a commanding position to plan, design and implement the traffic signals, islands, markings, network flow characteristics required in the transportation planning.
- The student is expected to get full knowledge related to all the modern techniques, various important methods for effective management of control of traffic on all the important and busy urban roads

**Reference books:**


i. Introduction to Transportation Engineering: William W. Hay.
ii. Introduction to Transportation Engineering planning – E.K. Mortak.
iii. Metropolitan transportation planning – J.W. Dickey.
iv. Traffic Engineering, L.R. Kadiyali


| BCE 613 | Railways Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- Ability to mathematically develop and interpret design standards for horizontal and vertical geometry and super elevation Assignments: Homework and design project
- Ability to apply standards to design of alignments when considering topography and environmental concerns Assignments: Homework and design project
- Familiarity with CAD software for the design and modeling of roadways/highways Assignments: Design project
- Familiarity with professional ethics, conduct, current issues, and continuing education commitment.

**Syllabus:**

**Unit 1:** Indian railways: Development and organization of Indian Railways. Permanent way: Sub-grade, formation, embankment and cutting, track drainage. Rails: Rail gauges, types of rails, defects in rails, rail failure, creep of rail. Rail Fastenings: Fish plates, spikes, chairs, keys, bearing plates. Sleepers: Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density. Ballast: Ballast materials, size of ballast, screening of ballast, specification of ballast, tests on ballast.

**Unit 2:** Railway Track Geometry: Gradients, horizontal curves, super-elevation, safe speed on curves, cant deficiency, negative super elevation, and compensation for curvature on gradients, track resistance and tractive power. Points & Crossings : Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out.

**Unit 3:** Stations & Yards: Site selection for a railway station, layout of different types of stations, classification of stations, types of railway yard, functions of Marshalling yards. Signaling & Interlocking: Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station.

**Unit 4:** Airport Engineering: Air craft characteristics affecting airport design; Runway operation; Runway pavement design, design of overlay; Runway lighting and marking heliport.

**Unit 5:** Water Transport Major Project (BTCE-805) Harbors; Layout and port facilities; Inland waterways; Inland water operation.

**Course Outcomes:** After having the course, students are expected have to:

- Functions of components of railway track
- Apply existing technology to the design, construction, and maintenance of railway physical facilities.
- Aware of the current international technology relative to Railway Engineering.
- Develop an awareness of major issues and problems of current interest to the Airport Engineering

**Reference books:**

i. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
ii. Railway Engineering by M. M. Aggrawal.

| BCE 621-623 | Professional Elective Course-II | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

| BCE 621 | Building Construction Practice | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
- At the end of this course the student shall have a reasonable knowledge about the various construction procedures
- Students will get a deeper concept about substructure and super structure and also the equipments needed for construction of various types of structures from foundation to super structure

**Syllabus:**

**Unit 1: Construction Techniques:** Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism – floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials – responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones-Case studies of residential, office buildings and other buildings in each zones.

**Unit 2: Construction Practices:** Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection.

**Unit 3: Sub Structure Construction:** Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

**Unit 4: Super Structure Construction:** Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

**Unit 5: Construction Equipment:** Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling

**Course Outcomes:** After having the course, students are expected have to:

- Know the different construction techniques and structural systems
- Understand various techniques and practices on masonry construction, flooring, and roofing.
- Plan the requirements for substructure construction.
- Know the methods and techniques involved in the construction of various types of super structures
- Select, maintain and operate hand and power tools and equipment used in the building construction sites.

**Reference books:**


- Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
- Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
- Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
- Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
- Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2002.
- Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012.
- Mahesh Varma, “Construction Equipment and its Planning and Application”, Metropolitan Book Company, New Delhi, 1983.


| BCE 622 | Construction Project Planning & Systems | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To create and promote healthy conditions and environment for all the people.
- To make right use of the land for the right purpose by zoning
- To ensure orderly development

**Syllabus:**

**Unit 1:** Principles of town planning, Land use patterns, Population survey, Density concepts, and transportation planning

**Unit 2:** Concept of habitat including environmental pollution, problems of metropolis, Satellite town concepts, Garden city movement, Neighborhood planning, brief history of architecture

**Unit 3:** Impact of development of materials through ages, Evolution of architectural forms, Anesthetics and functional proportions

**Unit 4:** Principles of architecture Design, Building Bye-Laws, Scale, Forms, Texture, Colour, Balance, Composition of Space, Role of architects and town planners

**Unit 5:** Architectural Drawing, Different symbols used in building industry, Design of typical buildings such as school, hospital, residential and commercial complex, etc.

**Course Outcomes:** After having the course, students are expected have to:

i. Designing of a building satisfying all environmental constraints.
ii. Improvement in environmental condition.
iii. Overall development of better planning of a town

**Reference books:**


iv. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
v. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
vi. Percy Brown, Indian architecture (The Islamic Period), D. B. Taraporevala Sons & Co., Bombay.
vii. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.
viii. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
ix. Arthur Gallion, The Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
x. Nelson P. Lewis, Planning to Modern City, Routledge.
xi. George S. Salvan, Architectural Theories of Design, JMC Press, Quezon city
xii. S.C. Rangwala, Town Planning, Charotar Publishing House.
xiii. G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications.
xiv. S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co.

xv. A. Bandopadhyay, Text book of town planning, Books and Allied, Calcutta
xvi. B.B.Dutt, Town Planning in Ancient India, Gyan Publishing House, New Delhi

| BCE 623 | Sustainable Construction Methods | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:** Students will learn about:

- The social implications and economic value of sustainability.
- LEED principles
- The circular economy principles
- Basic sustainable construction methods for common building elements.

**Syllabus:**

**Unit 1:** Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with block work walls)

**Unit 2:** Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures;

**Unit 3:** Basics of construction methods for Bridges; Identification of cutting edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.

**Unit 4:** Examination of the current LEED for New Construction rating system, and case study analysis of highly successful recent "green construction projects" Through student team assignments and presentations.

**Unit 5:** Preparation for the LEED Green Associate professional licensing exam.

**Course Outcomes:** After having the course, students are expected have to:

- Demonstrate a broad understanding and critical appreciation of the key issues affecting sustainability and the circular economy.
- Recognise and address the impact of key environmental challenges facing the construction industry.
- Understand the importance of and reflect on the wider benefits of sustainably and biodiversity.
- Produce a body of sustainable interior design work which includes an outline set of drawings and specifications.

- Communicate research findings and detailed design using industry standard methods.

**Reference books:**

- Construction Materials, Methods & Techniques: Building for a Sustainable Future by WILLAM P.SPEMCE
- Heating, Cooling, Lighting: Sustainable Design Methods for Architects by NORBERT LECHNER
- Construction Materials Methods and Techniques Building for a Sustainable Future by Eva Kultermann I William P. Spence

| BCE 001-002 | Open Elective Courses-1 | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

| BCE 001 | Metro Systems and Engineering | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To acquire & understand the necessity of metro system for urban transport.
- To acquire & understand the differences between various urban transport system.
- To understand cost effectiveness of various urban transport systems.

**Syllabus:**

**Unit 1:** Origin of Metro Rail System, Overview of World Metro Systems, Metro Planning and Selection, Metro Construction Metro Track

**Unit 2:** Metro Electrification systems, Metro Rolling Stock, Metro Signaling, Metro Operations

**Unit 3:** Introduction of metro act, Report of Ministry of Urban Development on standardization of metro system.

**Unit 4:** Metro Depots, Metro Maintenance, Metro Station Management, Public Address System, Automatic Fare Collection System, Passenger Information System, Metro act

**Course Outcomes:** After having the course, students are expected have to:

- To understand integrated operation of metro system.
- To understand interdependency of various sub systems of metro working

**Reference books:**

- Metro Act _ Government of India – 2002
- Rolling Stock – Report of Ministry of Urban Development – GOI -2013

- Radio communication for Communications-Based Train Control (CBTC): A tutorial
- and survey – 2017
- Technical Details of Metro Rolling Stock _ Ansaldo Manual – 2016
- Technical Details of Metro Rolling Stock – Bombardier – 2015
- Technical Standards of Track Structure for Metro Railways/MRTS – RDSO
- Detailed Project Reports of Various Metro Projects in India – By Delhi Metro Rail
- Corporation
- Manual Of Specifications And Standards – Hyderabad Metro Government of Andhra Pradesh - 2008

| BCE 002 | ICT for Development | L | T | P | 1 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- Students should be equipped with the knowledge about ICT applications in the development field so as to enable them to provide ICT solutions to the target communities.
- In order to succeed in the practice of sustainable development, Students will be trained in a basic set of competencies that integrate cross-disciplinary knowledge for practical problem solving with the use of information and communication technologies.

**Syllabus:**

**Unit 1:** Introduction to ICTs for sustainable Development Introduction to Information and Communication Technology (ICT); Role of ICTs in Sustainable Development; Current Status of ICTs in Sustainable Development- Global and India Scenario. Potential of ICTs in various fields, impact of information Technologies on GDP growth

**Unit 2:** ICT Applications of ICT in education, Health ( telehealth, telemedicine and health informatics), Gender Equality, Agriculture ( , e Governance, telecentres, Mobiles for development, climate change and disaster management,

**Unit 3:** ICT Networks for water management (This module will be dealt with the help of country case studies in all the sectors and inputs from ICT4D practitioners Case Studies: eCME, Apollo Telemedicine Network Foundation, Bhoomi, eSewa, Gyandoot, eAgriculture. M-PESA, CYCLETEL)

**Unit 4:** ICT for Development in India Policy and Institutional Framework in India, e governance, ICT Models in health, education , agriculture, finance, gender equality, Mobiles for Development Experience sharing by ICT for Development practitioners Case Studies: Reuters Market Light, Iffco Kisaan Sanchar Ltd.

**Course Outcomes:** After having the course, students are expected have to:

- Familiarize the students with main theories and conceptual frameworks in the field of ICT for development
- Help students learn potential of both information and communication technologies in different areas such as health, education, agriculture, finance, gender equality and climate change.
- Learn how ICT models can be successfully implemented at the field and understand critical success factors and constraints in adoption.

**Reference books:**


- Burrell, J. & Toyama, K. 2009. "What Constitutes Good ICTD Research?". Information Technologies & International Development, 5(3): 82-94.
- Castells, M., 2003. The Rise of the Fourth World in Held, D. and McGrew, A. (Eds). The
- Global Transformations Reader. Oxford: Blackwell. pp. 430-439
- Crow, B., Zlatunich, N. & Fulfrost, B. 2009, "Mapping Global Inequalities: Beyond Income Inequality to Multi-Dimensional Inequalities.". Journal of International Development, 21:1051- 1065.
- Heeks, R. 2002. "i-Development not e-Development: Special Issue on ICTs and Development.". Journal of International Development, 14(1): 1-11.
- Heeks, R. 2009. "The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development?". Manchester: Centre for Development Informatics, Working Paper No. 42 (online resource).
- Ocampo, J. A. & Vos, R. 2008. Uneven Economic Development. London: Zed Books.
- Williams, G., Meth, P. & Willis, K. 2009. Geographies of Developing Areas. London: Routledge.
- Willis, K. 2005. Theories and Practices of Development. London: Routledge.
- World Bank Atlas of Global Development. 2007. Washington, DC: World Bank
- Hilbert, Martin. "Big Data for Development: From Information- to Knowledge Societies." SSRN


| BCE 631-633 | Professional Elective Course-III | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

| BCE 631 | Rural Water Supply and Onsite Sanitation Systems | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To update knowledge on the operation and maintenance aspects of rural water supply and sanitation programs and projects.

- To reinforce management skills with regard to sustainable operation and maintenance.
- To specify approaches for better working and planning with communities.
- To develop the capacity to plan for operation and maintenance in one's own working environment through individual assignments

**Syllabus:**

**Unit 1:** Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties. National policy. Infiltration

**Unit 2:** Water supply: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas. Development of proffered sources of water springs. Wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

**Unit 3:** Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS), diatomaceous earth filter, cloth filter, slow sand filter, chlorine diffusion cartridges. Pumps, pipe materials, appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas

**Unit 4:** Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas. Treatment and Disposal of waste water. Compact and simple waste water treatment units and systems in rural areas such as stabilization ponds, septic tanks, Imhoff tank, soak pit etc. Disposal of waste water soakage pits and trenches**.**

**Unit 5:** Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, Rural health. Other specific issues and problems encountered in rural sanitation

**Course Outcomes:** After having the course, students are expected have to:

- Identify problems pertaining to rural water supply and sanitation.
- Design water supply and sanitation system for rural community.
- Design low cost waste management systems for rural areas.
- Plan and design an effluent disposal mechanism.

**Reference books:**


i. 'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.
ii. 'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N., WHO
iii. 'Water Supply and Sewerage', by E.W.Steel & T.J.Mcghee, McGraw Hill.

iv. 'Manual on Water Supply and Treatment', CPHEEO, Mini. Of Urban Development, Govt. of India.
v. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Mini. Of Urban Development, Govt. of India
vi. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009
vii.

| BCE 632 | Solid and Hazardous Waste Management | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To provide comprehensive overview of solid, biomedical and hazardous waste management.
- To provide knowledge on solid waste management design aspects
- To learn about the different methods of solid waste management.

**Syllabus:**

**Unit 1:** Relevant Regulations Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; Fly ash rules; recycled plastics usage rules; batteries (management and handling) rules

**Municipal Solid Waste:** Management – Fundamentals Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options

**Unit 2: Hazardous Waste Management:** Fundamentals, Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

**Radioactive Waste Management:** Fundamentals, Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options

**Unit 3:** Environmental Risk Assessment, Defining risk and environmental risk; methods of risk assessment; case studies**.** Physicochemical Treatment of Solid and Hazardous Waste Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation

**Unit 4:** Biological Treatment of Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation

**Unit 5:** Landfill design: Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

**Course Outcomes:** After having the course, students are expected have to:

- Know solid waste remedial measures and their importance.
- Undertake projects related to solid waste management.

**Reference books:**


i. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.
ii. LaGrega, M.D.Buckingham,P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, New York, 1994.
iii. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York, 1997.


| BCE 633 | Environmental Impact Assessment and Life Cycle Analysis | L | T | P | 0 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To know the various types of environmental pollution
- To make aware the impact due to various types of pollutants and their assessment technique
- Students will learn about LCA and Its procedures

**Syllabus:**

**Unit 1:** Pollution, Types. Air pollution sources, effects, types of pollutants. Water pollution, characteristics of water pollutants. Solid wastes, sources, types, soil pollution, pesticide pollution. Noise pollution, Impacts, positive and negative

**Unit 2:** Environmental impact assessment, Evolution of EIA (Global and Indian Scenario)- Elements of EIA— Screening – Scoping - Public Consultation – Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India ) Notification steps of doing EIA, methodology adopted, EIA procedure in India, Case studies.

**Unit 3:** Life Cycle Analysis (Introduction, Material flow and waste management, What it all means for an engineer? Water energy and food nexus) Risk and Life Cycle Framework for Sustainability (Introduction, Risk, Environmental Risk Assessment, Example Chemicals and Health Effects, Character of Environmental Problems)

**Unit 4:** Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments, Overview of LCA Methodology – Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools)
Life Cycle Assessment – Detailed Methodology and ISO Framework (Detailed Example on LCA Comparisons, LCA Benefits and Drawbacks, Historical Development and LCA Steps from ISO Framework)

**Unit 5:** Life Cycle Inventory and Impact Assessments (Unit Processes and System Boundary Data Quality, Procedure for Life Cycle Impact Assessment, LCIA in Practice with Examples, Interpretation of LCIA Results), Factors for Good LCA Study (ISO Terminologies, LCA Steps Recap, Chemical Release and Fate and Transport, and Green Sustainable Materials), Case Studies (e.g., Odour Removal for Organics Treatment Plant, Comparison of Hand Drying Methods, Biofuels for Transportation, Kerosene Lamp vs. Solar Lamp, Bioplastc etc.).

**Course Outcomes:** After having the course, students are expected have to:

- The students will gain basic knowledge of various pollution sources and their impacts
- Students Will be able to carry out EIA and LCA

**Reference books:**


i. A K Srivastava, Environment impact Assessment, APH Publishing, 2014
ii. John Glasson, Riki Therivel & S Andrew Chadwick "Introduction to EIA" University College London Press Limited, 2011
iii. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Inc. , New York, 1995.
iv. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
v. Rau G J and Wooten C.D "EIA Analysis Hand Book" Mc Graw Hill
vi. Robert A Corbett "Standard Handbook of Environmental Engineering" McGraw Hill, 1999.
vii. Baumann, Henrikke & Tillman, Anne-Marie (2004). The hitchhiker's guide to LCA: an orientation in life cycle assessment methodology and application.
viii. Baumann H and Tillman A-M, The Hitch Hiker's Guide to LCA: An Orientation in Life Cycle Assessment Methodology and Application, Studentlitteratur, 2004.
ix. Life Cycle Assessment. Training Kit material. UNEP-SETAC Life cycle initiative: http://www.lifecycleinitiative.org/resources/training/lca-life-cycle-assessment-training-kit-material/
x. Lifecycle Assessment: Principles and Practice. US Environmental Protection Agency Report - EPA/600/R-06/060 May 2006 Available for download at http://www.epa.gov/nrmrl/std/lca/lca.html
xi. European Platform on Life Cycle Assessment. ILCD Handbook. General guide for Life cycle assessment. Provisions and action steps. EU DG JRC IES, 2010, http://eplca.jrc.ec.europa.eu/?page_id=86
xii. Guinée, et al. (2002), Handbook on life cycle assessment. Operational guide to the ISO standards. I: LCA in perspective. IIa: Guide. IIb: Operational annex. III: Scientific background. Kluwer Academic Publishers, ISBN 1-4020-0228-9, Dordrecht, 2002, 692 pp.
xiii. http://cml.leiden.edu/research/industrialecology/researchprojects/finished/new-dutch-lca-guide.html /RecipeHandbook%20on%20Life%20Cycle%20Assessment.pdf
xiv. Rebitzer et al. (2004) Life cycle assessment. Part 1: Framework, goal and scope definition, inventory analysis, and applications. Environment International 30 (2004) 701 – 720. AGH library electronic scientific journals.
xv. Pennington et al. (2004) Life cycle assessment Part 2: Current impact assessment practice, section 7. Environment International 30 (2004) 721– 739 AGH library electronic scientific journals.


| BCE 641-643 | Professional Elective Course-IV | L | T | P | 3 Credits |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | |

| **BCE 641** | **Design of Hydraulic Structures/ Irrigation Engineering** | **L** | **T** | **P** | **3 Credits** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | |

**Course Objective:**

- Study the Types of Head works
- Study the Principle and design of Distributor head regulator and cross regulator.

**Syllabus:**

**Unit 1:** Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient. Regulation Works: Falls, Classification, and Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars.

**Unit 2:** Canal head works: Functions, Location, and Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir. Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works.

**Unit 3:** Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method. Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria. Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis.

**Unit 4:** Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks.

**Unit 5:** Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates. Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse.

**Course Outcomes:** After having the course, students are expected have to:

- Integrate the hydraulics and water resources background by involving the students in water structures design applications
- Introduce the students to professional practice and design codes.

- Encourage class discussions for formulating and solving multi-variable hydraulic design problems in an open-ended solution
- To develop understanding of the basic principles and concepts of analysis and design of hydraulic structures.

**Reference books:**

i. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
ii. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal Larry W Canter, "

| BCE 642 | Open Channel Flow | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- Compute drag and lift coefficients using the theory of boundary layer flows
- Design channels
- Compute the flow profiles in channel transitions

**Syllabus:**

**Unit 1:** Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections, Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions.

**Unit 2:** Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.

**Unit 3: Rapidly Varied Flow (RVF):** Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater,

**Flow measurement:** by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

**Rapidly varied unsteady flow:** Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge,

**Unit 4:** Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack.

**Unit 5:** Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert.

**Course Outcomes:** After having the course, students are expected have to:

- Ability to develop the open channel flow equations from the basic conservation equations.
- Ability to explain the terms of the open channel flow equations and explain the interactions among the terms.

**Reference books:**


i. Chow, V.T., Open channel Hydraulics, McGraw Hill International
ii. Henderson, F.M., Open Channel Flow, McGraw Hill International
iii. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
iv. Ranga Raju, K.G., Flow through open channels, T.M.H.
v. M. Hanif Chaudhry, Open Channel Flow, PHI
vi. French, R.H., Open channel Hydraulics, McGraw Hill International


| BCE 643 | Urban Hydrology and Hydraulics | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To develop a basic understanding of the distinctive aspects of Hydrology in an urban milieu.
- The course will seek to quantify the changes in Hydrologic attributes that are likely to occur as the basin setting changes from an essentially natural state to that with progressively increasing levels of urbanization
- To study the various processes involved in the hydrological cycle.
- To study the Measurement of rainfall, computation of average rainfall, various water losses etc.

**Syllabus:**

**Unit 1:** Introduction: hydrologic cycle, water budget equations, world water balance, application in engineering. Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation.

**Unit 2:** Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration- measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities, indices, measurement & estimation

**Unit 3:** Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.

**Unit 4:** Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.

**Unit 5:** Distinctive characteristics of natural and urban watersheds; Urban Heat Island;
Changes in rainfall, infiltration and runoff characteristics in urban watershed; IDF relationship and its adaptation for urban settings; Adjusting runoff record for urbanization; Stormwater Management and rainwater harvesting; Urban drainage: layout, structures, flooding and control, combined sewer overflows, sedimentation; Management of stormwater

**Course Outcomes:** After having the course, students are expected have to:

- Principles of hydrologic cycle and water budgeting
- Measurement and analysis of precipitation and water losses
- Rainfall-Runoff relationships, runoff estimation and stream gauging techniques
- Hydrographs and unit hydrographs, application of unit hydrographs
- Steady and unsteady flow towards well, aquifer characteristics and yields from wells

**Reference books:**


i. Viessmann Jr., W., and Lewis, G.L., Introduction to Hydrology, 5th Ed., Pearson Prentice Hall
ii. Ward, R.C., and Robinson, M., Principles of Hydrology, Tata Mcgraw-Hill, 2011
iii. Zevenbergen, C et al., Urbon Flood Management, CRC Press, 2011
iv. Butler, D., and Davies, J.W., Urban Drainage, 3rd Ed., Spon Press, New York, 2011.
v. Chow, V.T., Maidment, D.R., and Mays, L.W., Applied Hydrology, Tata McGraw Hill
vi. Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
vii. 'Engineering Hydrology' by K. Subramanya

**Annexure.....**

# SWAMI VIVEKANAND
# SUBHARTI UNIVERSITY, MEERUT


# SYLLABUS

# B.TECH

# (CIVIL ENGINEERING)

# (Final Year)

## W.E.F. SESSION 2018-19


**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**Subhartipuram, NH-58 Delhi-Haridwar Bypass Road,**
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**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**STUDY & EVALUATION SCHEME**
**B.Tech 4th Year**
**W.E.F academic Session 2018-19**

| SEMESTER –VII | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject Title | Course Type | Periods | | | CCA | | | | ESE | | Total | Credits |
| | | | | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
| 1 | BCE-711-BCE-713 | Professional Elective Courses-V | PE-5 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | BCE-721-BCE-723 | Professional Elective Courses-VI | PE-6 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 3 | BCE-003-BCE-004 | Open Elective Courses-2 | OE-2 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 4 | BCE-751 | Project-1 | PROJ | 0 | 0 | 12 | - | - | - | - | - | 100 | 100 | 6 |
| **Total** | | | | | | | | | | | | | **400** | **15** |

### PROFESSIONAL ELECTIVE COURSES (PE)

| | |
|---|---|
| BCE-711 | Water Quality Engineering |
| BCE-712 | Environmental Fluid Mechanics |
| BCE-713 | Groundwater |
| BCE-721 | Concrete Materials |
| BCE-722 | Reliability Analysis of Structures |

### OPEN ELECTIVE COURSES (OE)

| | |
|---|---|
| BCE-003 | Human Resource Development and Organizational Behavior |
| BCE-004 | Cyber Law and Ethics |

BCE-723 Earthquake Engineering

| SEMESTER –VIII | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject Title | Course Type | Periods | | | CCA | | | | ESE | | Total | Credits |
| | | | | L | T | P | CT | AT | TOTAL | PS | TE | PE | | |
| 1 | BCE-811-BCE-813 | Professional Elective Courses-VII | PE-7 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 2 | BCE-821-BCE-823 | Professional Elective Courses-VIII | PE-8 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 3 | BCE-005-BCE-006 | Open Elective Courses-3 | OE-3 | 3 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 3 |
| 4 | BCE-007-BCE-008 | Open Elective Courses-4 | OE-4 | 2 | 0 | 0 | 20 | 10 | 30 | - | 70 | - | 100 | 2 |
| 5 | BCE-851 | Project-2 | PROJ | 0 | 0 | 12 | - | - | - | 100 | - | 250 | 350 | 6 |
| **Total** | | | | | | | | | | | | | **750** | **16** |

**PROFESSIONAL ELECTIVE COURSES (PE)**

| | |
|---|---|
| BCE-811 | Structural Geology |
| BCE-812 | Ground Improvement Techniques |
| BCE-813 | Environmental Geo- technology |
| BCE-821 | Structural engineering-I |
| BCE-822 | Structural engineering-II |
| BCE-823 | Design of concrete structure-I |

**OPEN ELECTIVE COURSES (OE)**

| | |
|---|---|
| BCE-005 | Introduction to Philosophical Thoughts |
| BCE-006 | History of Science & Engineering |
| BCE-007 | Introduction to Art and Aesthetics |
| BCE-008 | Economic Policies in India |

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING**
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**
**Detailed Syllabus**
**YEAR – 4th (7th Semester)**
**Branch/Course: Civil Engineering/B. Tech**

| BCE 711-713 | Professional Elective Courses-V | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

| BCE 711 | Water Quality Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- To understand the concept of water quality.
- Treatment of waste water.
- To develop rational approaches towards sustainable wastewater management via pollution prevention.
- To understand the relevant physical, chemical and biological processes and their mutual relationships within various sanitation components.

**Syllabus:**

**Unit 1: Introduction:** Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater. Water borne diseases and their control. Waste water characteristics: Temperature, pH, color and odor, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc.

**Objectives of treatment:** Water and wastewater treatment, unit operations and processes and flow sheets.

**Unit 2: Sedimentation:** Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling.

**Coagulation:** Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clari-flocculators.

**Unit 3: Filtration:** Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations; slow sand, rapid sand and pressure filters, backwashing; brief introduction to other filters; design of filters. Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals. Adsorption.

**Unit 4: Wastewater Treatment:** Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design, sedimentation and chemical treatment to be given.

**Secondary Treatment:** Theory of organic matter removal; activated sludge process, of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B. C. etc.

**Unit 5: Anaerobic digestion of sludge**: Design of low and high rate anaerobic digesters and septic tank. Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up-flow anaerobic sludge blanket (UASB) reactor.

Disposal of wastewater on land and in water bodies. Introduction to Duckweed pond, vermiculture and root zone technologies and other emerging technologies for wastewater treatment.

**Course Outcomes:** After having the course, students are expected to:

- Demonstrate a firm understanding of various sewerage systems and their suitability.
- Design sewer and drainage systems layout for communities.
- Visualize waste water quality parameters and their characteristics.
- Understand relevant wastewater treatment processes, their design criteria and applicability.

- Make decisions regarding the treatment plant site selection, operation and maintenance and the need of advanced treatment.

**Reference books:**


vi. Peavy, Rowe and Tchobanoglous: Environmental Engineering
vii. Metcalf and Eddy Inc.: Wastewater Engineering
viii. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
ix. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).
x. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
xi. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
xii. Steel and McGhee: Water Supply and Sewerage
xiii. Fair and Geyer: Water Supply and Wastewater Disposal
xiv. Arceivala: Wastewater Treatment for Pollution Control
xv. Hammer and Hammer Jr.: Water and Wastewater Technology
xvi. Raju: Water Supply and Wastewater Engineering
xvii. Sincero and Sincero: Environmental Engineering: A Design Approach
xviii. Pandey and Carney: Environmental Engineering
xix. Rao: Textbook of Environmental Engineering
xx. Davis and Cornwell: Introduction to Environmental Engineering
xxi. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
xxii. Punmia: Water Supply and Wastewater Engineering Vol. I and II
xxiii. Birdie: Water Supply and Sanitary Engineering
xxiv. Ramalho: Introduction to Wastewater Treatment Processes
xxv. Parker: Wastewater Systems Engineering
xxvi. Mara: Sewage Treatment in Hot climates.


| BCE 712 | Environmental Fluid Mechanics | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- To calculate the steady state flow of different types of fluids with variable geometry and discharge.
- Performance of the typical fluid structures used during the discharge.
- Performance the main hydrological analysis needed for the design of hydropower structures.

**Unit-1**

**Unit-1:** Fluid and continuum, Physical properties of fluids, Rheology of fluids.
Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

**Unit-2:** Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic ,homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and networks.

**Unit-3:** Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method,
Newton - Raphson method and equivalent pipe method of pipe network analysis; rural water supply distribution system. Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply.

**Unit-4:** Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows. Storm water: Collection and estimation of storm water by different formulae. Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines; small bore sewer systems. Planning of sewerage systems. Institutional and industrial wastewater management.

**Course Outcomes:** At the end of this course students will be able:

- To understand the concept of fluids and effects of environment condition on fluids.
- Students also get information of treatment process of fluid flowing through machines.
- water reservoir and method of distribution through pipes.
- To install and demonstrate the working of small water distribution system.

**Refrences/Text Books:**


- Garg: Water Supply Engineering (Environmental Engineering Vol. – I.
- Hammer and Hammer Jr.: Water and Wastewater Technology.
- Punmia: Water Supply and Wastewater Engineering Vol. I and II.
- S Narasimhan : First Course in Fluid Mechanics , University Press.
- Modi, P.N., and Seth, S.H., "Hydrualics and Fluid Machines", Standard Book House, 1989.
- Garde, R.J., " Fluid Mechanics through Problems", New Age International Pvt. Ltd, New Delhi, 2nd Edition.
- Vijay Gupta and S.K.Gupta, " Fluid Mechanics and its Applications", Wiley Eastern Ltd, 1984.

| BCE 713 | Groundwater | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To impart knowledge of, and to mathematically model, basic processes in the domain of groundwater hydrology.
- To study various well losses.
- To study hydrological cycle.

**Syllabus:**

**Unit 1:** Introduction, importance and occurrence of groundwater, Aquifers and groundwater scenario in India, Surface and subsurface investigation of groundwater, Introduction, hydrological cycle & definitions, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium.

**Unit 2:** Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters,

**Unit 3:** Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation.

**Unit 4:** Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage,

**Unit 5:** Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge.

**Course Outcomes:** After study the course, students are expected to learn:

- Design of water wells.
- Control the losses of water by suitable design.
- Ground water recharge techniques.
- Techniques of ground water exploration.

**Reference books:**

- ‘Groundwater Hydrology’ by Todd D. K.
- ‘Groundwater Resource Evaluation’ by Walton W. C.
- ‘Groundwater’ by Raghunath H. M.
- ‘Handbook of Applied Hydrology’ by Chow V. T.
- ‘Irrigation: Theory & Practice’ by Michael A. M.

| BCE 721-723 | Professional Elective Courses-VI | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

| BCE-721 | Concrete Materials | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- To produce knowledge of ingredients of concrete, specific uses, mix design of concrete, special type of concrete.
- Various properties of concrete.
- Importance of concrete as a construction material.

**Syllabus:**

**Unit 1: Concrete Making Materials:** Cement, Fine Aggregate, Coarse aggregate, Water, Chemical & Mineral admixtures.

**Hydration of Cement:** Bogue’s compounds, Hydration, Gel formation, Types of cement, pore & capillary water.

**Unit 2: Quality tests on cement:** Different test on cement as per Indian standards

**Aggregates:** Tests on aggregates as per Indian standards, Bulking of sand, Sieve analysis –Grading .Different test on cement as per Indian standards

**Unit 3: Fresh concrete:** Properties of fresh concrete- Workability – different tests of workability- Factors influencing workability compaction, finishing, curing.

**Hardened concrete:** Tests on hardened concrete as per IS codes – Relationship between different strengths – factors influencing strength, NDT techniques.

**Unit 4: Durability:** Factors influencing durability – Chemical effects on concrete- Carbonation, Sulphate attack, and Chloride attack.

**Concrete Mix design:** Different methods of mix design – factors affecting mix design – exercises.

**Special concrete:** Heavy density concrete, underwater concrete, self-compacting concrete, light weight concrete etc.

**Course Outcomes:** After study the course, students are expected to:

- Identify Quality Control tests on concrete making materials.
- Understand the behavior of fresh and hardened concrete
- Design concrete mixes as per IS and ACI codes.
- Understand the durability requirements of concrete.
- Understand the need for special concretes.

**Reference books:**


i. Properties of Concrete – AM Nevelli – 5th Ed, Prentice Hall Publishers, 2012.
ii. Concrete Technology – M. S. Shetty – S Chand Co., Publishers – 2006.
iii. Concrete Technology – M. L. Gambhir – Tata Mc Graw Hill Publishers – 2012.


| BCE-722 | Reliability Analysis of Structures | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- To analyze the statically indeterminate portal frame
- To study the various methods for evaluating rotation and displacement parameters in complete frame.
- To analyze the symmetrical frame with symmetrical and anti-symmetrical loading.
- To understand the concept of analysis of non-prismatic frame and beam.
- To understand the concept of influence lines with respect to statically indeterminate beams.
- To understand the concept of plastic analysis with respect to the simple portal frame.

**Syllabus:**

**Unit 1:** Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

**Unit 2:** Hand computation of problems on trusses, frames and grids.

**Unit 3:** Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

**Unit 4:** Analysis for imposed deformation, temperature, support settlement, etc.

**Unit 5:** Transfer matrix method of analyzing framed structure.

**Course Outcomes:** After study the course, students are expected to:

- Explain the stiffness matrix method and analyze various types of structures using this method.
- Explain the conventional and approximate methods of analysis.
- Methodology involved in commercially available computer software for analysis which are based on stiffness matrix method
- Obtain the response of the indeterminate beams under the action of moving loads.
- Evaluate the displacement/ deflection in frames under the action of loads.

**Reference books:**


i. Weaver & Gere , Matrix Analysis of Framed structures.
ii. H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill, New York.


| BCE-723 | Earthquake Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- To study internal structure of earth.
- Earthquake and causes.
- To study various characteristics of Earthquake.
- Introduction of various methods for dynamic analysis such as Equivalent lateral force method and Response spectrum Method.

**Syllabus:**

**Unit 1:** Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes,

**Unit 2:** Response of Structure to Earthquake motion, modeling of structures, Dynamics of single degree of freedom system,

**Unit 3:** Dynamics of multi degree of freedom system, Idealization of structures, Dynamics of soils and seismic response, Conceptual design,

**Unit 4:** Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Design of Masonry buildings,

**Unit 5:** Reinforced Concrete buildings, Steel Buildings, Material Properties, Code provisions. Introduction to machine foundation. Degrees of freedom of a block foundation. I.S. code provisions for design and construction of machine foundations.

**Course Outcomes:** After study the course, students are expected:

- To explain the causes of earthquake, measure the intensity and magnitude.

- To calculate the dynamic parameters such as displacement, velocity and acceleration for multi degree of freedom systems.
- To apply seismic coefficient and response spectrum methods for analysis of multi storied buildings
- To apply concepts of ductility in the design of multi-storey structures.
- To analyze a water tank structure based on latest earthquake code CO4 Understand the concepts of base isolation.

**Reference books:**


i. Introduction to Structural Dynamics - J.M. Biggs
ii. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
iii. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
iv. Structural Dynamics - Theory & cpomputation - Mario Paz.
v. Dynamics of Structures Theory and Applicaions to Earhquake Engineering - Anil K. Chopra.
vi. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
vii. Earthquake Resistant of Design of structures, S.K.Duggal


| BCE 003-004 | Open Elective Courses-2 | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

| BCE 003 | Human Resource Development and Organizational Behavior | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- To familiarize the student with the fundamental aspects of various issues associated with Human Resource Management as a whole.
- To give a comprehensive overview of Organizational Behaviour as a separate area of management.
- To introduce the basic concepts, functions and processes and create an awareness of the role, functions and functioning of Human Resource Management and Organizational Behaviour.

**Syllabus:**

**Unit 1:** Introduction to Organizational Behaviour – Concept, Definitions, Evolution of OB. Importance of Organizational Behaviour – Cross-cultural Dynamics, Creating Ethical Organizational Culture and Climate. Individual and Group Behaviour – OB Models – Autocratic, Custodial, Supportive, Collegial and SOBC in Context with Indian OB. Human Relations and Organizational Behaviour.

**Unit 2:** Managing Communication – Conflict Management Techniques. Time Management Strategies. Learning Organization and Organizational Design. Rewards and Punishments – Termination, Layoffs, Attrition, Retrenchment, Separation and Downsizing.

**Unit 3:** HRM – Meaning Objectives, Scope and Functions. HRP – Definition, Objectives, Importance, Factors Affecting HRP, Process of HRP, Strategies of HRM and Global HR Strategies. HRD – Concept, Meaning, Objectives and HRD Functions

**Unit 4:** Performance Appraisal – Concept, Process, Methods and Problems, KRAs. Compensation – Concept, Components of Pay Structure, Wage and Salary Administration, Incentives and Employee Benefits. Career Planning – Concept of Career Planning, Career Stages and Carrier Planning.

**Course Outcomes:** After studying the course, students are expected to have:

- Knowledge about organization behavior and structure of organization
- Understanding about Human resources management and its importance.
- Understand principles, processes and practices of human resource management.
- Apply HR concepts and techniques in strategic planning to improve organizational performance.
- Understand tools to manage HR systems and procedures.

**Reference books:**


i. D'Cenzo, David A., Stephen P. Robbins, and Susan L. Verhulst, Human Resource Management, John Wiley and Sons, NewDelhi.
ii. Gomez-Mejia, Luis R., D. B. Balkin, and R. L. Cardy, Managing Human Resources, Prentice Hall, NewJersey.
iii. Ian, Beardwell, and Len Holden, Human Resource Management, Prentice Hall.
iv. Dessler, Garry, Human Resource Management, Prentice Hall of India.
v. McShane, S.L. and Von Glinow, M.A., Organizational Behaviour, New Delhi, Tata McGrawHill Publishing company ltd.
vi. P. Jyothi, P. and Venkatesh, D.N., Human Resource Management, New Delhi, Oxford University Press.
vii. Denhardt, R.B., Denhardt, J.V., and Aristigueta, M.P. (2009), Managing Human Behaviour in Public and Non-Profit Organizations, Second edition. California, Sage Publications.
viii. Pynes, J.E. (2004). Human Resources Management for Public and Nonprofit Organizations, Second Edition. San Francisco, CA: Jossey- Bass Publishers.
ix. Drucker, Peter F. Managing the Non-profit Organization: Principles and Practices. Harper Business, 1990


| BCE 004 | Cyber Law and Ethics | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objectives:**

- Enable the students to identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
- Students locate and apply case law and common law to current legal dilemmas in the technology field.
- Students demonstrate leadership and teamwork.

**Syllabus:**

**Unit 1:** Cyber laws and rights in today's digital age; IT Act, Intellectual Property Issues connected with use and management of Digital Data The similar Acts of other countries Information Warfare: Nature of information warfare, including computer crime and information terrorism;

**Unit 2:** Threats to information resources, including military and economic espionage, communications eavesdropping, computer break-ins, denial-of-service, destruction and modification of data, distortion and fabrication of information, forgery, control and disruption of information How, electronic bombs, and sops and perception management.

**Unit 3:** Countermeasures, including authentication, encryption, auditing, monitoring, intrusion election, and firewalls, and the limitations of those countermeasures.

**Unit 4:** Cyberspace law and law enforcement, information warfare and the military, and intelligence in the information age. Information warfare policy and ethical Issues

**Course Outcomes:** After having the course, students are expected to:

- Identify the professional's role in security and the tradeoffs involved.
- Outline the technical basis of viruses and denial-of-service attacks and enumerate techniques to combat the same.
- Distinguish among patent, copyright, and trade secret protection and explain how patent and copyright laws may vary internationally.
- Encourage the awareness in the society to control the cyber crime.

**Reference books:**


i. Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001
ii. Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd.


| BCE 751 | Project-1 | L | T | P | 6 Credits |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | | **0** | **0** | **12** | |

Students will do projects under the guidance of Supervisor.

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**Detailed Syllabus**
**YEAR – 4th (8th Semester)**
**Branch/Course: Civil Engineering/B. Tech**

| **BCE 811-813** | **Professional Elective Courses-VII** | **L** | **T** | **P** | **3 Credits** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | |

| **BCE 811** | **Structural Geology** | **L** | **T** | **P** | **3 Credits** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | |

**Course Objective:**

- The objective is to teach material of structural geology critical to practicing geologic professionals, including recognition of structural features,
- To develop enhanced understanding of earth dynamics and mechanics.

**Syllabus:**

**Unit 1:** Introduction, and opening mode brittle structures. Description and classification of faults and fault rock types. Fault scaling relationships, and fluid flow through rocks.

**Unit 2:** Stresses, stress fields and brittle failure. Brittle failure and Mohr envelopes, and the energetic of faulting. Ductile features and stress-strain material relationships.

**Unit 3:** Description and mechanics of folds. Axial planar cleavage and other deformation fabrics. Microstructures, and deformation at the lattice scale. Ductile shear zones and crustal strength profiles.

**Unit 4:** Cryptoexplosive structures, diapirs and intrusive structures. Neotectonics, burial and compaction structures. Fold and thrust belts. Structures of rift zones. Structures associated with strike-slip zones and the EPFZ - a major strike-slip fault system in the Appalachians.

**Course Outcomes:** After having the course, students are expected to:

- Understand geological aspects of Rocks
- Have knowledge about faults and folds.
- Understand the knowledge of failure of rocks.

**Reference books:**


i. Twiss, Robert J., and Eldridge M. Moores. Structural Geology. New York, NY: W. H. Freeman, 1992. ISBN: 9780716722526.

ii. Davis, George H., and Reynolds, Stephen J., 1996, Structural Geology of Rocks and Regions, 2nd edition: John Wiley & Sons, Inc., New York, New York, 776p.


| BCE 812 | Ground Improvement Techniques | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- Basic knowledge on various ground improvement techniques and their suitability for various types of soil conditions.
- The skills of implementation of geotechnical knowledge in field situations.
- Knowledge of reinforcement to soils in the form of geo textiles and other synthetic material

**Syllabus:**

**Unit 1:** Introduction, Review of compaction theory, effect of compaction on surface behavior, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-fly ash mixes.

**Unit 2:** In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement

**Unit 3:** In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method

**Unit 4: Grouting:** introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout.

**Unit 5: Granular Piles:** Ultimate bearing capacity and settlement, method of construction, load test Underpining of foundations: importance and situations for underpinning, methodology, typical examples. **Geotextiles:** types, functions, specifications, precautions in transportation and storage.

**Course Outcomes:** After having the course, students are expected have to:

- Understand soil dewatering techniques with respect to field conditions.
- Understand grouting techniques with respect to field conditions.
- Understand soil dewatering techniques with respect to field conditions.
- Understand and design principles of reinforced soil walls.
- Understand geo synthetics and their field

**Reference books:**


i. S. K. Garg – Soil Mechanics & Foundation Engineering.
ii. Purshotham Raju – Ground Improvement.
iii. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
iv. J. N. Mandal – Geosynthetics World
v. Bergado et. al. – Soft Ground Improvement
vi. Koerner, R. M. - Designing with geosynthetics.


| BCE 813 | Environmental Geo- technology | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- To impart to the students, in-depth knowledge of the modern skills and tools related to Environmental Geotechnical engineering so as to enable them to address the environmental aspects and sustainable issues related to infrastructure development of the country.
- Provide a strong foundation in basic and advanced knowledge in geotechnical engineering and environmental engineering enabling the students to excel in the various careers in the related areas.
- To identify the area for land-filling and the knowledge of Rehabilitation of Old Dumps and Contaminated Sites.

**Syllabus:**

**Unit 1:** Introduction, Sources & Impact of Contamination and Soil-Waste Interaction, Concepts of Integrated SWM & Geo-environmental Engineering, Concepts of Integrated SWM & Geo-environmental Engineering

**Unit 2:** Principles and Planning of Landfills, Liners for Landfills, Landfill Covers, Generation and Control of Leachate and Gas from Landfills, Stability of Slopes and Settlement of Landfills

**Unit 3:** Solved examples, Monitoring and Detection of Subsurface Contamination, Costs, Construction Aspects and Site Selection of Landfills, Control, Rehabilitation of Old Dumps and Contaminated Sites

**Unit 4:** Slurry Deposited Waste and their Geotechnical Properties, Planning & Design, Incremental Raisings and Failures of Slurry Ponds, Environmental Control Measures at Slurry Ponds, Geotechnical Reuse of Waste,

**Course Outcomes:** After having the course, students are expected to:

- attain an ability to identify, formulate and solve complex Environmental Geotechnical / Geotechnical engineering problems
- conduct investigations of complex problems in field of environment using research based knowledge and tests/experiments

**Reference books:**


i. Mitchell, J. K and Soga, K Fundamentals of Soil Behavior, John Wiley and Sons Inc., 2005
ii. Fang, H-Y, Introduction to Environmental Geotechnology, CRC Press, 1997.
iii. Daniel, D.E, Geotechnical Practice for Waste Disposal, Chapman, and Hall, 1993.
iv. Rowe, R.K., Quigley, R.M. and Booker, Clay Barrier Systems for Waste Disposal Facilities, J.R., E & FN Spon, 1995.
v. Rowe, R. K., Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic publishers, 2001
vi. Reddi, L. N. and Inyang, H. F, Geoenvironmental Engineering – Principles and Applications, Marcel Dekker Inc, 2000
vii. Sharma, H.D, and Lewis, S.P, Waste Containment Systems, Waste Stabilization and Landfills: Design and Evaluation, John Wiley & Sons Inc., 1994


| **BCE 821-823** | **Professional Elective Courses-VIII** | **L** | **T** | **P** | **2 Credits** |
|---|---|---|---|---|---|
| | | **2** | **0** | **0** | |

| **BCE 821** | **Structural Engineering-I** | **L** | **T** | **P** | **2 Credits** |
|---|---|---|---|---|---|
| | | **2** | **0** | **0** | |

**Course Objective:**

- To understand the concept of various load that acts on the various structures like building, bridges, e.t.c.
- To understand the design of various structural component.
- Consistently and successfully apply fundamental Structural Engineering principles within their chosen engineering application area (such as Aerospace, Civil, Marine, and Mechanical)

**Syllabus:**

**Unit 1:** Classification of Structures, stress resultants, degrees of freedom per node, Static and Kinematic determinacy.

Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.

**Unit 2:** Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's Principal & its application for determinate structures

**Unit 3:** Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, spandrel braced arch, moving load & influence lines.

**Unit 4:** Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods.

**Unit 5:** Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural section

Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures**.**

**Course Outcomes:** After having the course, students are expected to have :

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- An ability to apply various load combination and design various component of structure.
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Reference books:**


i. Hibbler ," Structural Analysis ", Pearson Education
ii. 2. T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
iii. 3. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.

iv. 4. Reddy, C.S., “Basic Structural Analysis”, Tata McGraw Hill.
v. 5. Jain, O.P. and Jain, B.K., “Theory & Analysis of Structures ”. Vol. I & II Nem Chand.
vi. 6. Vazirani & Ratwani et al ,” Analysis of Strcuctures “ , Khanna Publishers
vii. 7. Coates, R.C., Coutie, M.G. & Kong, F.K., “Structural Analysis”, English Language Book Society & Nelson, 1980.

| BCE 822 | Structural Engineering-II | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

**Course Objective:**

- To provide proficiency in the basic principles and advanced courses of technology in Structural Engineering so that students are able to formulate, analyse and solve the societal problems for sustainable development related to structural Engineering.
- To expose the students to the latest innovations and trends with a view to inculcate strong research orientation in structural engineering as well as in multidisciplinary streams.
- To produce Structural Engineers who integrate and build on the program's core curricular concepts in the pursuit of professional leadership, teamwork, life-long learning, and successful career advancement.

**Syllabus:**

**Unit 1:** Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

**Unit 2:** Muller-Breslau’s Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

**Unit 3:** Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

**Unit 4:** Basics of Force and Displacement Matrix methods for beams , frames and trusses.

**Unit 5:** Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames

**Course Outcomes:** After having the course, students are expected have to:

- The graduate is capable of applying the core and multidisciplinary knowledge for understanding the problems in structural engineering and allied fields.
- Problem Analysis: The graduates will possess critical thinking skills, problem solving abilities, and familiarity with the computational procedures essential to the field.
- Design & Development of Solutions: The graduate is able to formulate, analyze, design and execute the construction of various types of engineering structures with appropriate consideration for public health and safety and cultural, societal and environmental conditions.
- Conduct investigations of complex problems: Use research based knowledge and research methods to conduct experiments and to analyze and interpret experimental data.
- Modern Tool Usage: The student gets hands on training on various structural analysis and project management software's

**Reference books:**


i. Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros., Roorkee.
ii. Structural Analysis by C. S. Reddy, Tata Mc Graw Hill Publishing Company Limited, New Delhi.
iii. Theory of Structures Vol 1 & 2 by Gupta & Gupta , TMH
iv. Theory and Analysis of Structures, Vol. I & II by O. P. Jain & B. K. Jain, Nem Chand & Bros., Roorkee
v. Theory of Structures by S. P. Timoshenko and D. Young, Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
vi. Analysis of Statically Indeterminate Structures by P. Dayaratnam, Affiliated East- West Press.
vii. Indeterminate Structural Analysis by C. K. Wang.
viii. Introduction to Matrix Methods of Structural Analysis by H. C. Martin, Mc-Graw Hill Book Publishing Company Ltd.
ix. Matrix Analysis of Framed Structures by Weaver and Gere.
x. Theory of Structures Vol. II by Vazirani & Ratwani.
xi. Influence Line Diagrams by Dhavilkar.


| BCE 823 | Design of Concrete Structure-I | L | T | P | 2 Credits |
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| | | 2 | 0 | 0 | |

**Course Objective:**

- Students will understand the general mechanical behavior of reinforced concrete.
- Students will be able to analyze and design reinforced concrete flexural members.
- Student will be able to analyze and design reinforced concrete compression members.
- Students will be able to analyze and design for vertical and horizontal shear in reinforced concrete.

- Students will be able to analyze transfer and development length of concrete reinforcement.

**Syllabus:**

**Unit 1:** Concrete Making materials, mix design, Properties of concrete and reinforcements, testing of concrete, Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

**Unit 2:** Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.

**Unit 3:** Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

**Unit 4:** Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

**Unit 5:** Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

**Course Outcomes:** After having the course, students are expected have to:

- Understand the properties and role of various constituent materials used in concrete making.
- Understand the properties of concrete and various design mix techniques for concrete.
- Apply the fundamental concepts, techniques in analysis and design of reinforced concrete elements i.e. beam & slab.
- Apply the design principles by undertaking simple design examples.
- Apply the various codal requirements related to RC members i.e. slab & beam

**Note : All designs shall be conforming to IS : 456 – 2000.**

**Reference books:**


i. IS: 456 – 2000.
ii. Fundamentals of Reinforced Concrete by M L Gambhir, PHI,
iii. Reinforced Concrete Design by S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw
iv. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.
v. Reinforced Concrete Structures by R. Park and Pauley.

vi. Reinforced Concrete Design by P. Dayaratnam., Oxford & IBH11

| BCE 005-006 | Open Elective Courses-3 | L | T | P | 3 Credits |
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| | | 3 | 0 | 0 | |

| BCE 005 | Introduction to Philosophical Thoughts | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:**

- Understand the nature of reasoning; articulate his/her thoughts in a logical and clear fashion; recognize fallacies; construct good arguments; evaluate deductive arguments; evaluate inductive arguments.
- Express reasons in support of a moral claim; understand that there are better and worse reasons for making a moral decision; explain the difference between an act being morally permissible and being morally necessary.

**Syllabus:**

**Unit 1:** The difference between knowledge (Vidya) and Ignorance (Avidya): Upanishads; Six systems orthodox and Heterodox Schools of Indian Philosophy. Greek Philosophy:

**Unit 2:** Origin of the Universe: Nasidiya Sukta: "Who really knows?" Brhadaranyaka Upanishad; Chandogya Upanishad: Non-self, Self, real and unreal. Taittiriya Upanishad: Siksha Valli. Plato's Symposium: Lack as the source of desire and knowledge. Socratic method of knowledge as discovery. Language: Word as root of knowledge (Bhartrahari's Vakyapadiyam) Fourteen Knowledge basis as a sources of Vidya: Four Vedas; Six auxiliary sciences (Vedangas); Purana, Nyaya, Mimamsa and Dharma Sastras.

**Unit 3:** Knowledge as Power: Francis Bacon. Knowledge as both power and self-realization in Bagavad Gita; Knowledge as oppression: M. Foucault. Discrimination between Rtam and Satyam in Indian Philosophy; Knowledge as invention: Modern definition of creativity; scientific activity in the claim that science invents new things at least through technology

**Unit 4:** Knowledge about the self, transcendental self; knowledge about society, polity and nature; Knowledge about moral and ethics codes; Tools of acquiring knowledge: Tantrayuktis, a system of inquiry (Caraka, Sushruta, Kautilya, Vyasa)

**Course Outcomes:** After having the course, students are expected to:

- Students will develop strong natural familiarity with humanities along with right understanding enabling them to eliminate conflict and strife in the individual and society.
- Students shall be able to relate philosophy to literature, culture, society and lived experience can be considered.

**Reference books:**


i. Philosophical Questions: Classic and Contemporary Readings - William Lawhead
ii. What Does It All Mean? - Thomas Nagel
iii. Copleston, Frederick, History of Philosophy, Vol. 1.Great Britain: Continuum.
iv. Hiriyanna, M. Outlines of Indian Philosophy, Motilal Banarsidass Publishers; Fifth Reprint edition (2009)
v. Sathaye, Avinash, Translation of Nasadiya Sukta
vi. Ralph T. H. Griffith. The Hymns of the Ṛgveda. Motilal Banarsidass: Delhi: 1973.
vii. Raju, P. T. Structural Depths of Indian Thought, Albany: State University of New York Press.
viii. Plato, Symposium, Hamilton Press.
ix. Kautilya Artha Sastra. Penguin Books, New Delhi.
x. Bacon, Nova Orgum
xi. Arnold, Edwin. The Song Celestial.
xii. Foucault, Knowledge/Power.
xiii. Wildon, Anthony, System of Structure.
xiv. Lele, W.K. The Doctrine of Tantrayukti. Varanasi: Chowkamba Series.
xv. Dasgupta, S. N. History of Indian Philosophy, Motilal Banasidas, Delhi.
xvi. Passmore, John, Hundred Years of Philosophy, Penguin.


| BCE 006 | History of Science & Engineering | L | T | P | 3 Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | |

**Course Objective:** After studying this lesson the students will be able to:

- know the origin and development of historical inevitability, Science and Technology and Generalization in History.
- Understand the origin and growth of mathematics in ancient India.
- Assess the growth of engineering in ancient India.
- Identify the evolution and growth of medicine in Ancient India.
- list the contributions of India to the world in the field of Mathematics and other Sciences.

**Syllabus:**

**Unit 1: Concepts And Perspectives:** Meaning of History; Objectivity, Determinism, Relativism, Causation, Generalization in History; Moral judgment in history; Extent of subjectivity, contrast with physical sciences, interpretation and speculation, causation verses evidence, concept of historical inevitability, Historical Positivism. Science and Technology-Meaning, Scope and Importance, Interaction of science, technology & society, Sources of history on science and technology in India.

**Unit 2: Historiography Of Science And Technology In India:** Introduction to the works of D.D. Kosambi, Dharmpal, Debiprasad Chattopadhyay, Rehman, S. Irfan Habib, Deepak Kumar, Dhruv Raina, and others.

**Science And Technology In Ancient India:** Technology in pre-historic period; Beginning of agriculture and its impact on technology; Science and Technology during Vedic and Later Vedic times; Science and technology from 1st century AD to C-1200.

**Unit 3: Science And Technology In Medieval India:** Legacy of technology in Medieval India, Interactions with Arabs; Development in medical knowledge, interaction between Unani and Ayurveda and alchemy; Astronomy and Mathematics: interaction with Arabic Sciences; Science and Technology on the eve of British conquest

**Unit 4: Science And Technology In Colonial India:** Science and the Empire; Indian response to Western Science; Growth of techno-scientific institutions

**Unit 5: Science And Technology In A Post-Independent India:** Science, Technology and Development discourse; Shaping of the Science and Technology Policy; Developments in the field of Science and Technology; Science and technology in globalizing India; Social implications of new technologies like the Information Technology and Biotechnology

**Course Outcomes:** By the end of the course, student will be able to:

- Identify major changes in science and technology over time;
- Identify sources and methods used in historical writing and critically assess the validity of arguments in the history of science and technology;
- Describe how central ideas in science and technology, such as discovery, innovation, modernity, risk, etc., have been historically and socially constructed;
- Explain how understanding the historical dimensions of issues with contemporary significance can inform responsible actions in the present.

**Reference books:**


i. History of science and technology in India, by Dr. Binod Bihari Satpathy
ii. R. Parthasarathy, Paths of Innovators In Science, Engineering and Technology, EastWest Books (Madras) Pvt. Ltd, 2000.
iii. Glimpses of India‘s Statistical Heritage, Edited by: J.K. Ghosh, S.K. Mitra, K.R. Parthasarathy,Wiley Eastern Limited, 1992.
iv. Jagjit Singh, Some Eminent Indian Scientists, Publications Division, Ministry of Information and Broadcasting, Government of India, 1991.


| BCE 007-008 | Open Elective Courses-4 | L | T | P | 2 Credits |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | |

| BCE 008 | Economic Policies in India | L | T | P | 2 Credits |
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| | | | | | |
|---|---|---|---|---|---|
| | | **2** | **0** | **0** | |

**Course Objective:**

- This subject covers the major features of Indian Economy at Independence in the field of agriculture industry and other infrastructure of the economy.
- Students also deals with growth of development of different phases on the current issues in Indian economy policy.
- students in general will be able to pinpoint and understand the past, present economic conditions of the country.

**Syllabus:**

**Unit 1: Economic Development and its Determinants:** Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.

**Planning in India:** Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for development – Panchayats, NGOs and pressure groups.

**Unit 2: Demographic Features, Poverty and Inequality:** Broad demographic features of Indian population; rural-urban migration; Urbanization and civic amenities; Poverty and Inequality.

**Resource Base and Infrastructure:** Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing infrastructure development.

**Unit 3: The Agricultural Sector:** Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output; industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture and in food security – policies for sustainable agriculture.

**Unit 4: Public Finances:** Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India.

**Money, Banking and Prices:** Analysis of price behaviour in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India.

**Unit 5: Economic Reforms:** Rationale of internal and external reforms; Globalization of Indian economy; WTO and its impact on the different sectors of the economy; Need for and issues in good governance; Issues in competition and safety nets in Indian economy.

**Course Outcomes:** After having the course, students are expected have to:

- Develop ideas of the basic characteristics of Indian economy, its potential on natural resources.
- Understand the importance, causes and impact of population growth and its distribution, translate and relate them with economic development.
- Grasp the importance of planning undertaken by the government of India, have knowledge on the various objectives, failures and achievements as the foundation of the ongoing planning and economic reforms taken by the government.
- Understand agriculture as the foundation of economic growth and development, analyse the progress and changing nature of agricultural sector and its contribution to the economy as a whole.

**Reference books:**


i. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, New Delhi.

ii. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi.

iii. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, Guru Nanak Dev University Press, Amritsar.

iv. Brahmananda, P. R. and V. R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy: Inter-State Perspectives, Book well, Delhi.

v. Chakravarty, S. (1987), Development Planning : The Indian Experience, Oxford University Press, New Delhi.

vi. Dantwala, M. L. (1996), Dilemmas of Growth : The Indian Experience, Sage Publications, New Delhi.


| BCE 851 | Project-2 | L | T | P | 6 Credits |
|---|---|---|---|---|---|
| | | 0 | 0 | 12 | |

Students will do projects under the guidance of Supervisor.