P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Sevalpatti (P.O), Sivakasi – 626140.

B.E Civil Engineering

U.G
Regulations 2016

Department of Civil Engineering

CANDIDATES ADMITTED DURING 2016-2017 AND ONWARDS

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CANDIDATES ADMITTED DURING 2016-2017 AND ONWARDS

DEPARTMENT OF CIVIL ENGINEERING

VISION

➢ The vision of the Civil Engineering Department is to produce the Civil Engineers to meet the dynamic problems in the society with human values.

MISSION

➢ To provide high-class engineering education.

➢ To join hands with organizations to provide training and internship.

➢ To facilitate the students for research and development.

➢ To deliver good Civil Engineering graduates with human values.

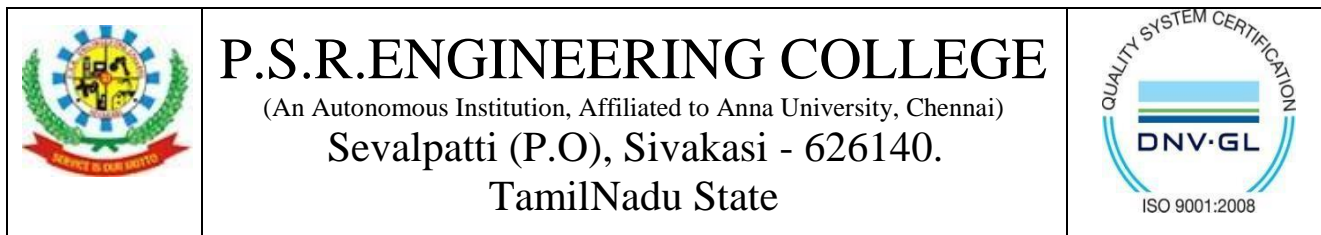## PROGRAM OUTCOMES (PO's) OF CIVIL ENGINEERING

The Program Outcomes of B.E in Civil Engineering are:

1. Apply knowledge of mathematics, physical sciences and Civil Engineering fundamentals.

2. Able to identify, formulate, analyze and solve for Civil Engineering problems.

3. Able to design and realize civil structures to meet desired needs within practical constraints such as economical, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

4. Able to investigate and conduct experiments, as well as to analyze and interpret data.

5. Use of techniques, skills and modern engineering tools necessary for engineering practice

6. Contextual knowledge to assess societal, health, safety, legal and cultural issues related to Engineering.

7. Realize the impact of Civil Engineering solutions in a global, economic and environmental context.

8. Apply ethical principles and commitment to professional ethics and responsibility.

9. Function as an individual and as a member or leader in multidisciplinary teams.

10. Communicate effectively with the engineering community and society at large.

11. Knowledge and understanding of management and business practices and their limitations.

12. Recognize the need and have the ability to engage in life-long learning.

PROGRAMSPECIFIC OUTCOMES (PSO's) OF CIVIL ENGINEERING

The Program Specific Outcomes of B.E in Civil Engineering are:

1. Proficiency in Civil Engineering problem identification, formulation, analysis, design, execution and safety using appropriate tools.

2. Solve problems in the hydraulics, transportation geotechnical and Surveying disciplines of Civil Engineering with competence in modern tool usage.

3. Apply modern construction techniques, equipment and management tools so as to complete the project within specified time and funds.

4. Graduates will have a broad understanding of economical, environmental, societal and health involved in infrastructural development and ability to function within multidisciplinary teams.

P.S.R.ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Sevalpatti (P.O), Sivakasi - 626140.
TamilNadu State

REGULATIONS FOR UG [B.E/B.TECH] PROGRAMME

UNDER CHOICE BASED CREDIT SYSTEM

[For the Students Admitted from the Academic Year 2016 – 2017 and Onwards]

[UG Regulation-2016]

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P.S.R.ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Sevalpatti (P.O), Sivakasi - 626140.
Tamilnadu State

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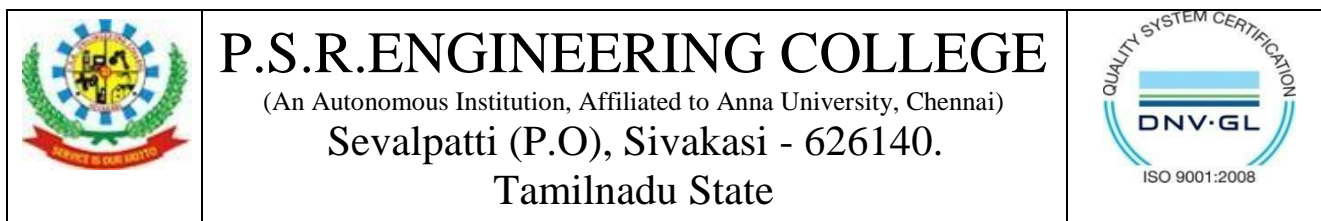

REGULATIONS FOR UG [B.E/B.Tech.] PROGRAMME

UNDER CHOICE BASED CREDIT SYSTEM

[For the Students Admitted from the Academic Year 2016 – 2017 and Onwards]
[UG Regulation-2016]

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1   PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i)   "**Programme**" means Under Graduate Degree Programme (B.E./B.Tech.)

ii)   **"Branch"** means specialization or discipline of B.E./B.Tech. Degree Programme like "Civil Engineering", "Mechanical Engineering", "Computer Science and Engineering", etc.

iii)   "**Course**" means Theory or Practical subject that is normally studied in a semester, like Digital Electronics, Engineering Graphics, etc.

iv)   "**Head of the Institution**" means the Principal of a College / Institution who is responsible for all academic activities of the College / Institution and for implementation of relevant Rules and Regulations.

v)   **"Head of the Department"** means Head of the Department concerned.

vi)   "**Controller of Examinations**" means the Authority of the College who is responsible for all activities of the Examinations.

vii)   "**University**" means **ANNA UNIVERSITY.**

viii)   **"College"** or **"Institution"** means P.S.R. Engineering College.

2   ELIGIBILITY FOR ADMISSION

Students for admission to the first year of the four year B.E / B.Tech Degree programme shall be required to have passed.

i)   The higher secondary examination (academic stream) conducted by the Government of Tamilnadu with Mathematics, Physics and Chemistry (OR)

ii)   The higher secondary examination(Vocational stream offering the vocational groups of Engineering and Technology) conducted by the Government of Tamilnadu (OR)

iii)   An examination of any university or authority, accepted by the Anna University as equivalent thereto

iv)   Any other examinations as notified by the Government of Tamilnadu.

Students for admission to the second year (Third Semester) of the four year B.E / B.Tech Degree programme shall be required to have passed.

Diploma in Engineering / Technology conducted by the Directorate of Technical Education and

Any other conditions as notified by the Government of Tamilnadu

3   PROGRAMMES OFFERED

A student may be offered admission to any one of the programme of study approved by the AICTE and University. The medium of instruction is English. The following programmes are offered in this college:

1.   B.E - Civil Engineering
2.   B.E - Mechanical Engineering
3.   B.E - Electrical and Electronics Engineering
4.   B.E - Electronics and Communication Engineering
5.   B.E - Computer Science and Engineering
6.   B.Tech. - Bio-Technology

4   STRUCTURE OF THE PROGRAMMES

4.1   Categorization of Courses

B.E. / B. Tech. Programme will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows:

i)   **Humanities and Social Sciences (HS)** courses include English, Professional Ethics, Communication skills, Environmental Science and Engineering, Management courses.

ii)   **Basic Sciences (BS)** courses include Mathematics, Physics, Chemistry, etc.

iii)   **Engineering Sciences (ES)** courses include Engineering Practices, Engineering Graphics, Basics of Civil/ Mechanical / Electrical / Electronics / Computer Engineering, etc.

iv)   **Professional Core (PC)** courses include the core courses relevant to the chosen specialization / branch, Project Work.

v)   **Open Core (OC)** courses include the core courses relevant to the chosen specialization / branch which a student of other programmes can choose as an elective.

vi)   **Professional Elective (PE)** courses include the elective courses relevant to the chosen specialization / branch.

vii)   **Open Elective (OE)** courses include the courses relevant to the chosen specialization / branch which a student can choose from the curriculum of other B.E. / B. Tech. programmes.

viii)   **English Enhancement Courses (EEC)** includes Internship, Seminar, Industrial/Practical Training, courses on soft skills and technical skills.

4.2   **Personality and Character Development**

The students shall enroll in any one of the personality and character development programmes

- National Service Scheme (NSS) - will have social service activities in and around the college/institution.
- Youth Red Cross (YRC) - will have activities related to social service in and around college/institution.
- Red Ribbon Club (RRC) - will have activities to improve health awareness among the people in and around the college campus.
- Indian Society for Technical Education (ISTE) - will have activities to improve students' technical skill and career development.
- Institution of Electrical and Electronics Engineers (IEEE) - will have activities to enhance professional students' innovative skill.
- Department Association - will have activities to improve students' technical skill and personality development.
- Sports / Games, etc.

4.3   **Industrial Training / Internship**

The students may undergo Industrial Training / Internship during summer / winter vacation at Research Organization and Industries with due approvals of the HOD and Principal.

4.4   **Industrial Visit**

Every student is required to undergo one industrial visit, starting from the second year of the programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

5   DURATION OF THE PROGRAMMES

5.1   A student is normally expected to complete the B.E. / B.Tech. Programme in 4 years (8 Semesters) but in any case not more than 8 years (16 Semesters). In the case of Lateral entry students, it is not more than 7 years (14 semesters) from the date of admission to the course, even if the candidate discontinues and rejoins subsequently.

5.2   Each semester shall normally consist of 90 teaching days (including examination days). The Head of the Department shall ensure that every faculty member imparts instruction as per the number of periods specified in the syllabus covering the full content of the syllabus for the course being taught.

5.3   The total duration for completion of the programme reckoned from the commencement of the first semester to which the student was admitted shall not exceed the maximum duration specified in clause 5.1 irrespective of the period of break of study (vide clause 18) or prevention (vide clause 7.3) in order that the student may be eligible for the award of the degree (vide clause 13).

6   COURSE ENROLLMENT AND REGISTRATION

6.1   The students on admission have to register and study the courses prescribed in the curriculum in the student's first Semester of study.

6.2   Each student shall be assigned to a Faculty Advisor who shall advice and counsel the student about the details of the academic programme and the choice of courses considering the students academic background and career objectives from second semester onwards.

6.3   Every student shall enroll for the course of the succeeding semester before the last working day of the current semester as notified by the Principal. However, the student shall confirm the enrollment by registering for the courses within the first three working days after the commencement of the concerned semester.

6.4   If the student wishes, the student may drop or add courses (from III to VIII semesters only) within three working days after the commencement of the concerned semester and complete the registration process duly authorized by the Faculty Advisor. Total number of credits of such courses cannot exceed 6. However the maximum number of credits the student can register in a particular semester cannot exceed 30 credits (including courses for which the student has done reappearance registration).

6.5   No course shall be offered by a Department unless a minimum of 10 students register for that course.

6.6   The student shall register for the project work in the semester as specified in the curriculum.

6.7   After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.8   The student shall register for theory courses in which the student has failed in the subsequent semesters when they are offered next (Reappearance Registration). The attendance requirement (vide clause 7) is not compulsory for such courses.

6.9   A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter grades / marks.

7   ATTENDANCE REQUIREMENTS FOR APPEARING SEMESTER EXAMINATION

A student who has fulfilled by the following conditions shall be deemed to have satisfied the requirements for appearing end semester examination of a particular course.

7.1   A student will be permitted to appear for the end semester examination of a course, only if he/she secures not less than 75% of attendance taking into account the number of periods required for that course as specified in the curriculum.

7.2   If a student secures attendance between 65% and less than 75% in any course in the current semester of his / her studies due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level Sports events with prior permission from the Head of the

Department concerned and Principal. The student shall be given exemption from the prescribed attendance requirement and the student shall be permitted to appear for the end semester examination of that course. In all such cases, the students should submit the required documents on joining after the absence.

Students who do not satisfy clause 7.1 and 7.2 and who secure less than 65% attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in a subsequent semester when it is offered next.

In the case of reappearance registration for a course, the attendance requirement as mentioned in Clauses 7.1 - 7.3 is not applicable. However, the student has to register for examination in that course by paying the prescribed fee.

8 ASSESSMENT PROCEDURE FOR AWARDING MARKS

All B.E. / B.Tech. Programmes consist of Theory Courses, Practical Courses and Skill Enhancement Courses. Appearance in End Semester Examination is mandatory for all courses including Theory, Practical and Project work. Performance in each course of study shall be evaluated based on (i) Internal Assessments throughout the semester and (ii) End Semester Examination at the end of the semester. Each course shall be evaluated for a maximum of 100 marks as shown below:

Category	Internal Assessment	End Semester Examination
Theory Courses	30	70
Practical Courses	30	70
Project Work	30	70
Skill Enhancement Courses	100	Nil

Internal Assessment For Theory Courses

The criteria for determining the internal assessment marks are:

i) **Internal Tests [60% weightage]**

Three tests each carrying sixty (60) marks shall be conducted by the department / Institution. The total marks obtained in all tests put together out of 180, shall be reduced to 60 marks and rounded to nearest integer (this implies equal weight to all the three tests). However retest at the discretion of the head of the department may be conducted for the deserving candidates.

ii) **Assignment or Mini project [20% weightage]**

A student has to carry out either an assignment or mini project.

- An assignment normally requires work of average 5 to 6 hours of study and written work of average 5 to 6 hours which has to be submitted to the course tutor for evaluation.

- A mini project shall be in hardware or software. The student has to submit a report before the end of the semester. Mini project will be

assessed based on the model presentation and report as decided by the department.

iii)   **Seminar [10% weightage]**

The student has to make seminar on the topics related to the course. The students are expected to submit a report of his / her presentation. The seminar will be assessed by the course tutor with common parameters as described by the department.

iv)   **Attendance [10% weightage]**

(refer clause 8.5)

8.2 **Internal Assessment For Practical Courses**

Every practical exercise / experiment shall be evaluated based on conduct of exercise / experiment and records maintained. There shall be at least one test. The criteria for determining the internal assessment marks are:

Experiment / Record / Average

Practical classes performance: 60% weightage

Practical Test   :30% weightage

Attendance (refer clause 8.5):   10% weightage

8.3 **Internal Assessment For Project Works**

There shall be three assessments during the semester by a review committee. The students shall make presentation on the progress made before the committee. The criteria for arriving the internal assessment marks for the project work evaluated for 50 marks are:

Work assessed by the Project Guide: 50% weightage

Assessment by a internal review committee: 50% weight

(Guide will be one of the members of the committee)

8.4 **Internal Assessment For Skill Enhancement Courses**

The courses under Skill Enhancement are evaluated by Continuous Assessments only. The Course Committee (vide clause 16) shall devise a common evaluation procedure. In all the above cases, marks awarded for 100 marks shall be reduced to 30 Marks.

8.5 Awarding Marks for Attendance

% of Attendance	Below 75	75	76-80	81-85	86-90	Above 90
Marks	0	2	4	6	8	10

The student on doing reappearance registration has to appear for the assessments along with the current batch of students and earn internal assessment marks again.

9   PASSING REQUIREMENTS

- For each subject the examination will be conducted for 100 marks. A candidate who secures not less than 50% of the total marks in the end semester examinations and internal assessment put together in both theory and practical courses, including project work, subject to securing a minimum of 50% in the end-semester examination, wherever applicable, shall be declared to have passed the examination in that subject.

- When the mark secured for 100 in end-semester examination is converted to 70, minimum 35 marks must be secured for pass.

- If any programme, during any semester, conducts the laboratory in two parts, say Part A and Part B, a candidate should register and appear for both parts in the end semester practical examination. If a candidate for any reason is absent in any one part of the practical examination, despite his/her presence in the other part, he/she is declared as fail in both parts A and B (marked as absent in end semester examination) and should appear again for both part A and B in the next attempt.

- For a pass, a candidate should secure a minimum of 50% in each part and final mark secured is the sum of marks secured in Part A and B.

10   AWARD OF LETTER GRADES

The performance of a student will be reported using letter grades, each carrying certain points as detailed below:

Marks Scored	Letter Grade	Grade Points	Description
90 - 100	O	10	Outstanding
80 - 89	A +	9	Excellent
70 - 79	A	8	Very Good
60 - 69	B +	7	Good
59 - 50	B	6	above Average
0 - 49	RA	0	Reappearance
Incomplete	SA / AB	0	Shortage of Attendance / Absent

'RA' denotes Reappearance registration is required for that particular course.
'SA' denotes shortage of attendance (as per Clause 7) and hence prevented from writing end semester examination.

For the Co-curricular activities such as National Service Scheme (NSS) / YRC / RRC /Sports, a satisfactory / not satisfactory grading will appear in the mark sheet. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the first

year of the programme. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the second year. **A satisfactory grade in the above co-curricular activities is compulsory for the award of degree.**

11 GPA AND CGPA CALCULATION

11.1 After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- The list of courses registered during the semester and the grades scored.
- The Grade Point Average (GPA) for the semester and
- The Cumulative Grade Point Average (CGPA) of all courses registered from first semester onwards.

During each semester, the list of courses registered and the grades scored in each course are used to compute the Grade Point Average (GPA). GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

$$GPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum^n C_i}$$

Where,

C_i - is the Credits assigned to the course

GP_i - is the grade point corresponding to the letter grade obtained for each course

n - is number of all Courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA.

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. "RA" and "SA" grades will be excluded for calculating GPA and CGPA.

11.2 If a student studies more number of electives (PE/OE) than required as per the student's programme curriculum, the courses with higher grades alone will be considered for calculation of CGPA.

12 EXAMINATION PROCEDURE

End Semester examination shall be conducted by the office of the Controller of Examination of the College as per the prescribed rules and regulation on examinations of the college.

12.1 Issue of Mark Sheet

Individual mark sheet for each semester will be issued to the students, through the head of the department concerned, after the publication of the result.

The mark sheet will contain credit, grade, grade point and result status for the course concerned.

12.2   **Malpractice**

If a student indulges in malpractices in any of the end semester examination, he/she shall be liable for punitive action as prescribed by the Anna University, Chennai from time to time.

12.3   **Revaluation**

i)   Copies of answer script for the theory course(s) can be obtained from the Office of the Controller of Examinations on payment of a prescribed fee specified for this purpose through proper application.

ii)   A candidate can apply for revaluation of his/her examination answer paper in a theory course, within a week from the declaration of results, on payment of a prescribed fee through proper application to the Office of the Controller of Examinations, as per the prescribed norms of the College. Revaluation is not permitted for practical course and for project work.

i**i**) Re totaling is permissible for all arrear and current theory courses.

12.4   **Challenging Valuation**

In case the student is not satisfied with the outcome of the revaluation the student can apply for 'Challenge Valuation'. The highest marks obtained by the student in all of the above will be considered for grading.

12.5   **Supplementary Examination**

i)   The students who have failed in the regular End Semester Examination only are eligible to apply for writing Supplementary Examination.

ii)   There is no Supplementary Examination for the arrear and practical courses.

iii)   Absent and Withdrawal candidates are not eligible for Supplementary Examination.

iv)   A student shall be allowed to appear in maximum of four failed courses of his / her choice.

v)   The application for supplementary examination has to be recommended and forwarded by the concerned HOD after due verification.

13   ELIGIBILITY FOR THE AWARD OF DEGREE

A student shall be declared eligible for the award of the B.E/B.Tech. degree provided the student has

i)   Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

ii)   Successfully completed the course requirements and has passed all the prescribed examinations in all the 8 semesters within a maximum period of 8 years from the commencement of first semester to which the student was admitted.

i**i**) In the case of lateral entry, the student successfully completed the course

requirements and has passed all the prescribed examinations in all the 6 semesters within a maximum period of 7 years from the commencement of third semester to which the student was admitted.

iv) Approval by the University for the Award of degree.

14 CLASSIFICATION OF DEGREE

14.1 **First Class With Distinction**

A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

- Should have passed the examination in all the courses of all the eight semesters in First Appearance within **five** years, which includes authorized break of study of one year. Withdrawal from examination (vide Clause 17) will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50
- Should NOT have been prevented from writing end semester examination due to lack of attendance in any of the courses.

14.2 **First Class**

A student who satisfies the following conditions shall be declared to have passed the examination in **First class**:

- Should have passed the examination in all the courses of all eight semesters **within five years**, which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than 7.0

14.3 **Second Class**

All other students (not covered in clauses 14.1 and 14.2) who qualify for the award of the degree (vide Clause 12) shall be declared to have passed the examination in **Second Class**.

14.4

A student who is absent in semester examination in a course/ project work after having registered for the same shall be considered to have appeared in that examination (except approved withdrawal from end semester examinations as per clause 17) for the purpose of classification.

15 FACULTY ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department of the students will attach a certain number of students to a faculty of the Department who shall function as Faculty Advisor for those students throughout their period of study. The Faculty Advisor shall advise the students in registering and reappearance registering of courses, authorize the process, monitor their attendance and progress and counsel them periodically. If necessary, the Faculty Advisor may also discuss with or inform the parents about the progress /

performance of the students concerned.

The responsibilities for the faculty advisor shall be:

- To inform the students about the various facilities and activities available to enhance the students' curricular and co-curricular activities.
- To guide student enrollment and registration of the courses.
- To authorize the final registration of the courses at the beginning of each semester.
- To monitor the academic and general performance of the students including attendance and to counsel them accordingly.

16   COURSE COMMITTEES

16.1   Common Course Committee

A theory course handled by more than one faculty member shall have a "Common Course Committee" comprising of all faculties teaching that course and some students who have registered for that course. There shall be two student representatives from each batch of that course. One of the faculty members shall be nominated as Course Coordinator by the Head of the Department duly approved by the Principal.

The first meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. Two or three subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to the whole batch.

In addition the faculty members of a Common Course shall meet to ensure uniform evaluation of continuous assessments and prepare a common question paper for the continuous assessment tests after arriving at a common scheme of evaluation for the assessments (vide clause 8). The question paper for the end semester examination is common.

16.2   Multiple Courses Committee

If course(s) handled by a single faculty member, there will be "Multiple Courses Committee". This committee comprises of all the above faculty members and two student representatives from each course. One of the above faculty members, nominated by the Head of the Department shall coordinate the activities of this committee.

The functions of this committee is similar to that of the common course committee, which is as follows:

The first meeting of the Multiple Courses Committee shall be held within fifteen days from the date of commencement of the semester. Two or three subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions

and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

16.3 Overall Monitoring Committee

In addition, there shall be a overall monitoring committee for each semester of a programme which comprises of (i) the Course Coordinators / Course Faculty (as applicable), and (ii) Head of the Department. This overall monitoring committee shall meet periodically to discuss academic related matters, progress and status of the students of the semester concerned. The overall monitoring committee can invite the Faculty Advisors or students for any of the committee meetings if necessary.

17 PROVISION FOR WITHDRAWAL FROM EXAMINATION

17.1 A student may, for valid reasons, (medically unfit / unexpected family situations / National / International sports) be granted permission to withdraw from appearing for the end semester examination in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree programme. The application shall be sent to Principal, through HOD with required documents.

17.2 Withdrawal application shall be valid only if the student is otherwise eligible to write the examination (Clause 7) and if it is made a week before the commencement of the end semester examination in that course or courses and also recommended by the Head of the Department.

17.3 Withdrawal shall not be considered as an appearance for deciding the eligibility of a student for First Class with Distinction.

17.4 Withdrawal is permitted for the end semester examinations in the final semester only if the period of study the student concerned does not exceed 5 years as per clause 14.

18 TEMPORARY BREAK OF STUDY FROM A PROGRAMME

(i) A student is not normally permitted to temporarily break the study. However if a student intends to temporarily discontinued the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later than the last date for registering for the semester examinations of the semester in question, through the head of the department starting the reasons thereof.

(i) The student permitted to rejoin the programme after the break shall be governed by the rules and regulations in force at the time of rejoining.

(ii) The duration specified for passing all the course for the purpose of classification vide clause 14 shall be increased by the period of such break of study permitted.

(iv) The period for completion of the programme reckoned from, the commencement of the first/third semester to which the candidate was admitted shall not exceed the maximum period specified in clause 8(iii) irrespective of the period of break of study in order that he/she may be eligible for the award of the degree (vide clause 13).

(v) If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'break of study' and clause 19(iii) is not applicable for this case.

19   RANK OF STUDENT

A student who qualifies for the degree by passing the examination in all subjects of the entire course in first attempt within a period of four (three for lateral entry) consecutive academic years from the date of admission to the course can be given his/her position in the class as rank. The rank is determined from III semester to VIII semester examination CGPA. Student transferred from other institution to P.S.R. Engineering College are not eligible for rank.

20   PROCUDURE FOR USING SCRIBER

If a student is physically handicapped (in case of accidents/ill health) at the time of examination, he/she may be permitted to use a scriber to write the examination. In such case 30 minutes, extra time will be permitted. The scriber shall be a non-engineering student/graduate.

21   DISCIPLINE

Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity, which will tend to bring down the prestige of the college. If an act of indiscipline reported, the principal shall constitute a disciplinary committee consisting of three senior faculty members / HODs of which one should be from the faculty of the student, to inquire into acts of indiscipline. The disciplinary action is subject to review by the Principal in case the student represents to the Principal. Any expulsion of the student from the college shall be with prior concurrence from directorate of technical education/university.

22   RESPONSIBILITIES OF A COURSE TUTOR

Every course tutor member is required to maintain an 'Attendance and Assessment Record' for every semester which consists of attendance marked in each Theory / Practical / Skill Enhancement, the assessment marks and the record of class work (topics covered), separately for each course handled by the them. This should be submitted to the Head of the Department periodically (at least three times in a semester) for checking the syllabus coverage and the records of assessment marks and attendance. The Head of the Department will affix his/her signature and date after due verification.

At the end of the semester, the record should be verified by the Head of the Department who shall keep this document in safe custody (for eight years). The records of attendance and assessment of both current and previous semesters should be available for inspection. The assessments on Course Outcomes (CO), Programme Outcomes (PO) and Programme Educational Objectives also should be carried out and submitted to Programme Coordinator / HOD.

23 REVISION OF REGULATION AND CURRICULUM

The College may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Academic Council of the College.

24 ANY OTHER RULES AND PROCEDURE

Any other rules and procedure which are not covered under the above clauses shall be discussed and framed by the Standing Committee of the college. Implementation of the Standing Committee resolutions is based on the approval / ratification by the Academic Council / Board of Management.

UG REGULATION-2016
CHOICE BASED CREDIT SYSTEM
B.E. CIVIL ENGINEERING
CURRICULUM
[I – VIII SEMESTERS – FULL TIME]

TOTAL CREDITS – 178

SEMESTER I

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1	161HS11	Essential English	HS	3-0-0	3	--
2	161MA11	Engineering Mathematics – I	BS	3-1-0	4	--
3	161PH11	Engineering Physics	BS	3-0-0	3	--
4	161CY11	Engineering Chemistry	BS	3-0-0	3	--
5	161CS11	Computer Programming	ES	3-0-0	3	--
6	161ME11	Engineering Graphics	ES	1-0-3	3	--
Practical						
7	161PC17	Physics and Chemistry Laboratory-I	BS	0-0-3	2	--
8	161CS17	Computer Practices Laboratory	ES	0-0-3	2	--
9	161EE17	Engineering Practices Laboratory	ES	0-0-3	2	--
						Total Credits - 25

SEMESTER II

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1	161HS21	Technical English	HS	3-0-0	3	161HS11
2	161MA21	Engineering Mathematics – II	BS	3-1-0	4	161MA11
3	161PH21	Physics of Materials	BS	3-0-0	3	161PH11
4	161CY21	Environmental Science	BS	3-0-0	3	--
5	161ME21	Engineering Mechanics	ES	3-0-0	3	--
6	161CE21	Building Materials	ES	3-0-0	3	--
Practical						
7	161PC27	Physics and Chemistry Laboratory-II	BS	0-0-3	2	161PH11, 161CY11
8	161CE28	Computer Aided Drafting Laboratory	ES	0-0-4	2	161ME11
						Total Credits – 23

SEMESTER - III

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	161MA31	Transforms and Partial Differential Equations	BS	3-1-0	4	161MA11, 161MA22
2.	161CE31	Mechanics of Solids - I	PC	3-1-0	4	161ME21
3.	161CE32	Mechanics of Fluids	ES	2-1-0	3	--
4.	161CE33	Surveying	PC	3-0-0	3	--
5.	161CE34	Geology for Civil Engineering	ES	3-0-0	3	--
6.	161CE35	Concrete Technology	PC	3-0-0	3	161CE21
Practical						
7.	161CE37	Survey Practical	PC	0-0-4	2	161CE33
8.	161CE38	Hydraulic Engineering Laboratory	PC	0-0-4	2	--
9.	161HS39	Functional English - I *	EEC	0-0-2	-	161HS21
						Total Credits – 24

* - Mandatory Non-credit Course

SEMESTER – IV

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	161MA42	Numerical Methods	BS	2-1-0	3	161MA31
2.	161CE41	Mechanics of Solids -II	PC	3-1-0	4	161CE31
3.	161CE42	Applied Hydraulic Engineering	PC	2-1-0	3	161CE32
4.	161CE43	Mechanics of Soils	PC	3-0-0	3	--
5.	161CE44	Construction Technology	ES	3-0-0	3	161CE35
6.	161CE45	Water Supply Engineering	PC	3-0-0	3	--
Practical						
7.	161CE47	Strength of Materials Laboratory	PC	0-0-4	2	161CE31, 161CE41
8.	161CE48	Survey Camp	PC	0-0-4	2	161CE33, 161CE37
9.	161HS49	Functional English - II *	EEC	0-0-2	-	161HS21
						Total Credits – 23

* - Mandatory Non-credit Course

SEMESTER - V

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	161CE51	Structural Analysis - I	PC	3-1-0	4	161CE41
2.	161CE52	Irrigation Engineering	PC	3-0-0	3	161CE42
3.	161CE53	Sanitary Engineering	PC	3-0-0	3	161CE45
4.	161CE54	Highway Engineering	PC	3-0-0	3	--
5.	161CE55	Foundation Engineering	PC	3-0-0	3	161CE43
6.	161CE56	Reinforced Concrete Structures - I	PC	3-1-0	4	--
Practical						
7.	161CE57	Concrete and Highway Engineering Lab	PC	0-0-4	2	161CE35
8.	161CE58	Soil Mechanics Laboratory	PC	0-0-4	2	161CE43
9.	161HS59	Career English - I*	EEC	0-0-2	-	161HS41
					Total Credits – 24	

* - Mandatory Non-credit Course

SEMESTER - VI

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	161HS61	Engineering Economics and Management	HS	3-0-0	3	--
2.	161CE61	Structural Analysis – II	PC	3-1-0	4	161CE51
3.	161CE62	Reinforced Concrete Structures - II	PC	3-1-0	4	161CE56
4.	161CE63	Railway, Airport and Harbour Engineering	PC	3-0-0	3	161CE54
5.	--	Elective - I	PE	3-0-0	3	--
6.	--	Elective – II	PE/OE	3-0-0	3	--
Practical						
7.	161CE67	Structural Design and Detailing Laboratory	PC	0-0-4	2	161CE62
8.	161CE68	Environmental Engineering Laboratory	PC	0-0-4	2	161CE45
9.	161HS69	Career English - II*	EEC	0-0-2	-	161HS51
					Total Credits – 24	

* - Mandatory Non-credit Course

SEMESTER – VII

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	161CE71	Construction Management	ES	3-0-0	3	--
2.	161CE72	Basics of Dynamics and Aseismic Design	PC	3-0-0	3	--
3.	161CE73	Quantity Surveying and Valuation	PC	3-0-0	3	--
4.	161CE74	Design of Steel Structures	PC	3-1-0	4	--
5.	--	Elective – III	PE	3-0-0	3	--
6.	--	Elective – IV	PE/OE	3-0-0	3	--
Practical						
7.	161CE77	Computer Applications Laboratory	PC	0-0-4	2	--
8.	161CE78	Design Project	EEC	0-0-4	2	--
						Total Credits – 23

SEMESTER – VIII

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	--	Elective –V	PE	3-0-0	3	--
2.	--	Elective –VI	PE	3-0-0	3	--
Practical						
3	161CE87	Project Work	EEC	0-0-12	6	--
						Total Credits – 12

HS – Humanity Science, BS – Basic Science, ES – Engineering Science, PC – Programme Core,

PE – Programme Elective, OE – Open Elective, EEC – Employability Enhancement Course,

L – Lecture, T – Tutorial, P – Practical, C – Credit,   * - Mandatory Non-credit Course

I.   LIST OF PROGRAMME ELECTIVES (PE)

Sl.No.	Subject Code	Subject	L-T-P	C
1.	161CEE03	Prefabricated Structures	3-0-0	3
2.	161CEE04	Prestressed Concrete Structures	3-0-0	3
3.	161CEE05	Industrial Structures	3-0-0	3
4.	161CEE06	Repair and Rehabilitation of Structures	3-0-0	3
5.	161CEE07	Smart Materials and Structures	3-0-0	3
6.	161CEE08	Hydraulic Structures	3-0-0	3
7.	161CEE09	Water Resources System planning and management	3-0-0	3
8.	161CEE11	Industrial Waste Water treatment and disposal	3-0-0	3
9.	161CEE12	Air Pollution Management	3-0-0	3
10.	161CEE13	Municipal Solid Waste Management	3-0-0	3
11.	161CEE14	Climate change and Adaptation	3-0-0	3
12.	161CEE16	Traffic Engineering and Management	3-0-0	3
13.	161CEE17	Town Planning & Architecture	3-0-0	3
14.	161CEE18	Remote Sensing and GIS	3-0-0	3
15.	161CEE19	Ground Improvement Techniques	3-0-0	3
16.	161CEE20	Contract Laws And Regulations	3-0-0	3

II.   LIST OF OPEN ELECTIVES (OE)

Sl.No.	Subject Code	Subject	L-T-P	C
OPEN ELECTIVES OFFERED BY CSE DEPARTMENT				
1.	161OE101	Web development using PHP	3-0-0	3
2.	161OE102	Programming in PERL	3-0-0	3
3.	161OE103	Multimedia & Animation Tools	3-0-0	3
4.	161OE104	Multi core Architecture	3-0-0	3
5.	161OE105	Green Computing	3-0-0	3
6.	161OE106	Soft Computing	3-0-0	3
7.	161OE107	Java Scripts	3-0-0	3
OPEN ELECTIVES OFFERED BY ECE DEPARTMENT				
8.	161OE201	Bio Medical Instrumentation	3-0-0	3
9.	161OE202	Digital Image Processing	3-0-0	3
10.	161OE203	Consumer Electronics	3-0-0	3
11.	161OE204	Multimedia Compression and Communication	3-0-0	3
12.	161OE205	High Speed Networks	3-0-0	3
OPEN ELECTIVES OFFERED BY EEE DEPARTMENT				
13.	161OE401	Energy audit and conservation	3-0-0	3
14.	161OE402	Principles of Virtual Instrumentation	3-0-0	3
15.	161OE403	Sensors and Transducers	3-0-0	3
16.	161OE404	Aircraft electronic system	3-0-0	3
17.	161OE405	Electrical safety	3-0-0	3
18.	161OE406	Vehicle electric power Systems	3-0-0	3
19.	161OE407	Domestic and Industrial Electrical Installation	3-0-0	3
OPEN ELECTIVES OFFERED BY BIO-TECH DEPARTMENT				
20.	161OE501	Process Equipment and Plant Design	3-0-0	3
21.	161OE502	Biomaterials	3-0-0	3
22.	161OE503	Biosensors	3-0-0	3
23.	161OE504	Food Science and Technology	3-0-0	3
OPEN ELECTIVES OFFERED BY MECHANICAL ENGG DEPARTMENT				
24.	161OE601	Maintenance Engineering	3-0-0	3
25.	161OE602	Non Destructive Testing and Materials	3-0-0	3
26.	161OE603	Operations Research	3-0-0	3
27.	161OE604	Renewable Sources of Energy	3-0-0	3
28.	161OE605	Robotics	3-0-0	3
OPEN ELECTIVES OFFERED BY CIVIL ENGG DEPARTMENT				
29.	161OE701	Disaster Management System	3-0-0	3
30.	161OE702	Fundamentals of Fire Safety Engineering	3-0-0	3
31.	161OE704	Renewable Energy Sources	3-0-0	3
32.	161OE705	Environmental Impact and Risk Assessment	3-0-0	3
33.	161OE706	Environment and Ecology	3-0-0	3
34.	161OE707	Technology Management	3-0-0	3
35.	161OE708	Sustainable Management of Urban Ecology	3-0-0	3

		OPEN ELECTIVES OFFERED BY MBA DEPARTMENT		
36.	161OE801	Essentials of Management	3-0-0	3
37.	161OE802	Fundamentals of Marketing	3-0-0	3
38.	161OE803	Managing Human Resources	3-0-0	3
39.	161OE804	Professional Ethics in Engineering	3-0-0	3

Credit Distribution

Category	No. of Credits	Percentage	Range As per AICTE in %
Humanities and Social Sciences [HS]	9	5.06%	5-10
Basic Science [BS]	31	17.42%	15-20
Engineering Science [ES]	32	17.97%	15-20
Professional Core [PC]	80	44.94%	30-40
Professional Elective [PE]	12	6.74%	10-15
Open Elective [OE]	6	3.37%	5-10
Employability Enhancement Course [EEC]	8	4.49%	10-15
Total	**178**	**100**	

Curriculum Content

■ Basic Sciences   ■ Engineering Sciences
■ Humanities and Social Sciences   ■ Program Core
■ Program Electives   ■ Open Electives
■ Employability Enhancement Course
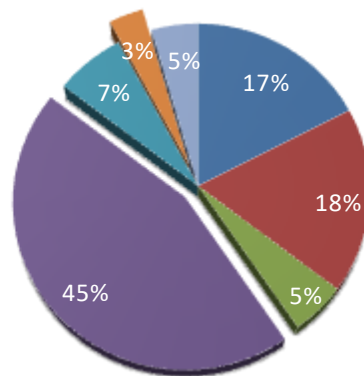
161HS11	**ESSENTIAL ENGLISH**		L-T-P	C
			3-0-0	3
Programme:	B.E. Civil Engineering	Sem: I	Category	HS
Pre-requisites:	Nil			
AIM:	To impart Basic English Language skill to develop the students ability to use English effectively.			

UNIT 1   **9**

Grammar-tense –past simple, present simple, verbal vs. non-verbal communication, Vocabulary-Commonly used words-Spelling, Reading- Reading News papers, Writing- Formal Letters-Requisition for leave- Bonafide, Listening- Listening to famous speeches, Speaking- introducing oneself.

UNIT II   **9**

Grammar-tenses - past and present simple continuous, Vocabulary- Prefixes, Suffixes-Parts of Speech, Reading - Basic reading comprehension, Writing Formal Letters- Permission letters- In-plant training-Industrial visit, Listening - Listening to Interviews, Speaking - Speaking about interests, one's friends, hobbies, favourite programmes.

UNIT III   **9**

Grammar – tense-past and present perfect, Vocabulary -Forms of Verb – Analogy – Sentences-Types, Reading- Cloze Test, Writing-Paragraph writing-descriptions-Comparing and contrasting- describing pictures, Listening- Listening to News, Speaking- Future plan-Native place, Appropriate body language.

UNIT IV   **9**

Grammar-perfect tenses, Vocabulary – Single-line definitions – Pronoun-Adverbs-Preposition, Reading- Reading for comprehension, Writing - e-mail- basic conventions writing – Instructions-Recommendations, Listening- Listening to Debates, Speaking- Giving opinions.

UNIT V   **9**

Grammar – subject–verb agreement, Vocabulary –commonly confused words – Linkers –
Abbreviation-Voice, Reading- Reading for Inferences, Writing - Agenda Note-taking- Editing the text, Listening - Listening to Telephonic Conversation, Speaking- short talks on general topics, short conversations.

TOTAL PERIODS: 45

TEXT BOOKS
1. Jack.C.Richards, interchange (fourth edition), Cambridge University Press, New Delhi. 2015 ISBN 9781107570894

REFERENCES

1. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering.
Orient Blackswan, Chennai. 2011
2. www.usingenglish.com
3. www.grammar.org
4. www.audioenglish.com
5. http://www.manythings.org
6. www.onestopenglish.com

7. www.learnenglish.com

Course Outcomes:
The Students will be able to
CO1: Understand and use different forms of language
CO2: Write formal letters
CO3: Speak in English with clarity
CO4: Listen actively and grasp the contents of the speech
CO5: Read general texts and comprehend their content
CO6: Use grammar to make meaning in both speaking and writing

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1										3		3	3			2
CO2										3		2	1			3
CO3							3			3		3	2			2
CO4					2		2			3		3	3			3
CO5				2						3		3	2			2
CO6										3		2	2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA11   **ENGINEERING MATHEMATICS - I**   **L-T-P**   **C**
                                                 3-1-0   4

| **Programme:** | B.E. Civil Engineering | **Sem:** I | **Category** | **BS** |

Pre-requisites: Nil

AIM: To Develope the basic mathematical skills of Engineering Student.

MATRICES   12
Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem (without proof) and its application - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form.

ORDINARY DIFFERENTIAL EQUATIONS   12
Higher order linear differential equations with constant coefficients – Method ofvariation of parameters – Cauchy's and Legendre's linear equations – Simultaneousfirst order linear equations with constant coefficients.

DIFFERENTIAL CALCULUS   12
Curvature - Radius of curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and Evolutes – Envelope.

FUNCTIONS OF SEVERAL VARIABLES   12
Partial Derivatives - Total Derivative - differentiation of Implicit function – Jacobian - Taylor's Expansion - Maxima/Minima for function of two variables - Method of Lagrange's multipliers.

SEQUENCES AND SERIES   12
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test andD'Alembert's ratio test – Alternating series – Leibnitz's test - Series of positive and negative terms – Absolute and conditional convergence.

TOTAL PERIODS: 60

TEXT BOOKS
1. B.S.Grewal, "Higher Engineering Mathematics', Thirty Sixth Editions,Khanna Publishers, Delhi,2005.

2. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001

REFERENCES
1. Greenberg, M.D. **"Advanced Engineering Mathematics",** Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K., "**Engineering Mathematics**",Volume I and II Revised enlarged Fourth Edition, The National Publishing Company,Chennai,2004.
3. Veerarajan.T **"Engineering Mathematics(for first year)"**,Fourth Edition,Tata McGraw– hill

publishing company Ltd,New Delhhi,2005
4. Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy,S.Chand& Company Ltd. Ram Nagar,New Delhi.
5. Ravish R Singh,Mukul Bhatt, **"Engineering Mathematics-I",** McGraw Hill Education(India)Private Ltd,New Delhi.

Course Outcomes:

The Students will be able to,
CO1: Solve the inverse of given matrix and reduce matrix equation using Cayley Hamilton Theorem.
CO2: Elaborate given function as a power series using Taylor's series.
CO3: Develop a series solution to an ODE, and recognize special functions defined by series.
CO4: Make use of Calculus in finding the envelope, Evolutes & Involutes.
CO5: Able to check whether the series is convergent or divergent.
CO6: Evaluate maxima and minima for function of two variables.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		1								2	3			1
CO2	2	3		2								1	2			2
CO3	3	3										3	2			3
CO4	1	1											3			2
CO5	3	2		1									2			1
CO6	2	2		1								3	1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PH11	**ENGINEERING PHYSICS**		**L-T-P**	**C**
			3-0-0	3

Programme:	B.E. Civil Engineering	**Sem: I**	**Category**	**BS**

Pre-requisites: Nil

AIM: To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.

CRYSTAL PHYSICS   **9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal growth techniques- Solution, melt (Bridgemann and Czochralski).

ACOUSTICS   **9**

Classification of sound – Decibel-Weber-Fechner Law - Sabine's formula - Derivation using growth and decay method - absorption coefficient and its determination - Acoustic of building - Factors affecting acoustics of buildings and their remedies.

ULTRASONICS   **9**

Production of ultrasonics – Magnetostriction - Piezoelectric methods - Velocity measurement – Acoustic grating - Industrial applications – Non Destructive Testing – Pulse echo system through transmission and reflection modes - SONAR, Medical applications – Sonograms.

QUANTUM PHYSICS   **9**

Black body radiation – Planck's theory (derivation) - Photoelectric effect - Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box.

APPLIED OPTICS   **9**

LASERS: Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coeffcients – Derivation - Types of lasers – CO_2, Nd-YAG - Industrial Applications - Lasers in welding, cutting – Holography and its applications.

FIBER OPTICS: Optical Fiber - Classification - Principle and propagation of light in optical fibres - Numerical aperture and Acceptance angle-Fibre optical communication system - Sensors (Active and passive) – Displacement and Temperature Sensors.

TOTAL PERIODS:45

TEXT BOOKS

1. Gaur R. K., Gupta S. C., "Engineering Physics" DhanpatRai Publications, New Delhi(2003)

2. Avadhanulu M. N., Kshirsagar, P. G., "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 2005.

REFERENCES

1. Serway and Jewett., "Physics for Scientists and Engineers with Modern Physics",6th Edition, Thomson Brooks/Cole, Indian reprint (2007)

2. AritherBeiser, Concepts of Modern Physics, Tata McGraw Hill, NewDelhi (2010)

3. Palanisamy, P.K., "Engineering Physics" Scitech publications, Chennai, (2007).

4. Rajendran, V and Marikani A, "Engineering Physics" Tata McGraw Hill Publications Ltd, III Edition, New Delhi, (2004).
5. Chitra Shadrach and SivakumarVadivelu, "Engineering Physics", Pearson Education, New Delhi, (2007).

Course Outcomes:

The Students will be able to

CO1: Understand the theory and various crystal structures and crystal growth techniques.

CO2: Acquire knowledge about the properties of sound, production of ultrasonic waves and their application in the field of Non-destructive testing and Sonogram.

CO3: Gain knowledge about basic equations of Quantum mechanics and its applications.

CO4: Know about the basic configuration of a Laser, types of lasers and the industrial applications of Laser.

CO5: Understand principle behind fiber optic communication and the electronic devices involved in the transmission and reception of data.

CO6: Elaborate the different function of LASERs in Fiber Optic Communication.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	2							2		2	2	2
CO2	3	2	2	2	2	2	1					2	2	2	2	2
CO3	2	2		2	2							2	2	2	2	2
CO4	3	2	2	2	2	2	2					2	3	3	3	3
CO5	3	2	2	2	2		3					3	3	3	3	3
CO6	3	2	2	2	2	2	1					3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CY11	**ENGINEERING CHEMISTRY**	**L-T-P**	**C**
		3-0-0	**3**

Programme:	B.E. Civil Engineering	**Sem:**	**I**	**Category**	**BS**

Pre-requisites: Nil

AIM: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

WATER TECHNOLOGY   9
Hardness – Types and Estimation by EDTA method, alkalinity – types of alkalinity and determination–Domestic water treatment –disinfection methods (Chlorination, ozonation, UV treatment) – Boiler feed water– requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination and reverse osmosis.

ELECTROCHEMISTRY   9
Electrochemical cells – reversible and irreversible cells – EMF — electrochemical series and its significance-Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH– potentiometer titrations (redox - Fe^{2+}vs dichromate) and conductometric titrations (acid-base – HCI vsNaOH) titrations.

SURFACE CHEMISTRY   9
Adsorption types – adsorption of gases on solids – adsorption isotherms –Frendlich and Langmuir isotherms – adsorption of solutes from solution – role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement.

NANOCHEMISTRY   9
Nanomaterials – introduction to nanochemistry – synthesis – hydrothermal, solvothermal – Chemical vapour deposition – sol-gel - Electro deposition – ball milling – properties of nanoparticles and applications. Carbon nanotubes- fabrication - arc method – pulsed laser deposition - Chemical vapour deposition - structure, properties & applications.

SPECTROSCOPY & QUANTITATIVE ANALYSIS   9
Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – Determination of the amount of calcium in milk powder by EDTA Complexometry - Estimation of iodine in iodized common salt by Iodometry - Estimation of phosphoric acid in soft drinks (coca cola) by molybdenum blue method .

                                                                      TOTAL PERIODS: 45

TEXT BOOKS
1.   P. Kannan, A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.
2.   P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2002)

REFERENCES
1. S.S. Dara, S.S. Umare, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
2. B.K.Sharma, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
3. B.Sivasankar, "Engineering chemistry" Tata McGraw Hill Publishing Company (P) Ltd., New Delhi, 2006.
4. Pradeep, "Nano the essential" McGraw Hill Publishing Company (P) Ltd., New Delhi,

Course Outcomes:

The Students will be able to

CO1: Demonstrate the essential concept of water chemistry with their properties and applications of water technology.

CO2: Elaborate the treatment of water for potable and industrial purposes.

CO3: Understand the operating principles and the reaction involved in electrochemistry

CO4: Explain the core concepts of surface chemistry.

CO5: Illustrate the structure, properties and applications of nano materials.

C06: Learn the principles, importance and application of analytical techniques.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2			3					3	1			1
CO2	3	2	2	2	2	2	2	2	2	2	2	2	1	1		1
CO3	3	2		2								2	1			1
CO4				2			2					2	1			1
CO5	2	1	2	2			2					1	1			1
CO6	3	2	2	1								2	1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| **161CS11** | **COMPUTER PROGRAMMING** | | **L-T-P** | **C** |
| | | | **3-0-0** | **0** |

Programme: B.E. Civil Engineering   **Sem: I**   **Category   ES**
Pre-requisites: Nil

AIM: To provide an awareness to Computing and Programming

INTRODUCTION   9
Generation and Classification of Computers- Basic Organization of a Computer – Number System
– Binary – Decimal – Conversion – Problems. Software – Types, Development Steps. Algorithm –
Pseudo code – Flow Chart. Problem formulation – Problem Solving.

C PROGRAMMING BASICS   9
Introduction to Unix Operating System – Introduction to ' C' programming –fundamentals –
structure of a 'C' program – compilation and linking processes – Constants, Variables – Data
Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision
Making and Branching – Looping statements – solving simple scientific and statistical problems.

ARRAYS AND STRINGS   9
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String
operations – String Arrays. Simple programs- sorting- searching – matrix operations.

FUNCTIONS AND POINTERS   9
Function – definition of function – Declaration of function – Pass by value – Pass by reference –
Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-
Example Problems.

STRUCTURES AND UNIONS   9
Introduction – need for structure data type – structure definition – Structure declaration – Structure
within a structure – Union – Programs using structures and Unions – File Manipulation – Storage
classes – Pre-processor directives.

TOTAL PERIODS: 45

TEXT BOOKS
1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling
   Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. PradipDey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1/e, Oxford
   University Press, 2009.
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 13/e, 2011.

REFERENCES
1. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-
   Hill, 2006.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson
   Education, 2006.

Course Outcomes:

The Students will be able to

CO1: Able to have fundamental knowledge on basics of computers hardware and number systems.

CO2: Able to understand the basic terminology used in computer programming.

CO3: Able to write, compile and debug programs in C language.

CO4: Able to use different data types in a computer program.

CO5: Able to design programs involving decision structures, loops and functions.

CO6: Able to understand the dynamics of memory by the use of pointers.

CO7: Able to use different data structures and create/update basic data files.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											1			
CO2	3	2											1			
CO3	3	3	2	1									1			
CO4	3	2	1										1			
CO5	2	2	3	2									1			
CO6	2	2			1								1			
CO7	2	2	2	2	1								1			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161ME11	**ENGINEERING GRAPHICS**	L-T-P	C
		1-0-3	3

Programme: B.E. Civil Engineering **Sem:** **I** **Category** ES

Pre-requisites: Basic knowledge in geometrical drawing

Aim: To develop graphics skills in students

Concepts and conventions (Not for Examination)   **1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

PLANE CURVES   **11**

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

PROJECTION OF POINTS, LINES AND PLANE SURFACES   **12**

Projection of straight lines located in the first quadrant – inclined to both planes – Determination of true lengths and true inclinations– Projection of regular polygonal and circular lamina inclined to both reference planes.

PROJECTION OF SOLIDS   **12**

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to one reference plane.

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   **12**

Sectioning of above solids in simple vertical position by cutting planes inclined to HP and perpendicular to VP – Obtaining true shape of section. Development of lateral surfaces of truncated solids – Prisms, Pyramids, Cylinder and Cone.

ISOMETRIC AND PERSPECTIVE PROJECTIONS   **12**

Principles of isometric projection – isometric scale – isometric projections of truncated Prisms, Pyramids, Cylinder and Cone.Perspective projection of simple prism and pyramid by Visual ray method.

                                                                        TOTAL PERIODS: 60

Text Books:

1. K.V. Natrajan, **"A text book of Engineering Graphics"**, Dhanalakshmi Publishers, Chennai (2015)
2. M.S. Kumar, **"Engineering Graphics"**, D.D. Publications, (2014).

References

1. K. Venugopal and V. Prabhu Raja, **"Engineering Graphics",** New Age International (P) Limited (2015)
2. M.B. Shah and B.C. Rana, **"Engineering Drawing",** Pearson Education (2014)
3. K.C. John, **"Engineering Graphics for degree"** PHI Learning Pvt. Ltd., New Delhi, (2013)
4. Basant Agarwal and Agarwal C.M., **"Engineering Drawing",** Tata McGraw Hill Publishing Company Limited, New Delhi, (2013)
5. Gopalakrishna K.R., **"Engineering Drawing"** (Vol. I&II combined), Subhas Stores, Bangalore, (2014).

Publication of Bureau of Indian Standards:
1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

Special points applicable to end semester examination on Engineering Graphics:
1. There will be five questions, first question is compulsory from Unit-I on engineering curves. Other four questions are either or type from Unit-II to V
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size
4. The end semester examination will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time

Course Outcomes:
The Students will be able to
CO1: Follow the conventions used in engineering graphics
CO2: Practice plane curves and free hand sketching
CO3: Draw the projections of points, lines and plane
CO4: Draw the projections of simple solids and their sectional views
CO5: Describe the applications of development of surfaces
CO6: Practice isometric and perspective projections

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3		3					1			1			1
CO2	3		2		2					1			1			1
CO3	3		2		3					1			1			1
CO4	3		3		2					1			1			1
CO5	3		3		3					1			1			1
CO6	2		2		3					1			1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PC17	**PHYSICS AND CHEMISTRY LABORATORY-I**	**L-T-P**	**C**
		0-0-3	**2**

Programme:	B.E. Civil Engineering	**Sem:**	**I**	**Category**	**BS**

Pre -requisites: Engineering Physics & Engineering Chemistry

AIM: To introduce the basic Physics concepts through experiments and to impart the basic analysis in chemistry.

LIST OF EXPERIMENTS - PHYSICS PART **(A minimum of five experiments shall be offered)**		
S.No	**NAME OF THE EXPERIMENT**	
1)	(a) Determination of Particle Size using Diode LASER. (b) Determination of wavelength of the LASER source. (c) Determination of Acceptance angle and Numerical aperture of an optical fibre.	3
2)	Determination of thickness of thin wire – Air wedge method.	3
3)	Determination of Velocity of sound and compressibility of liquid - Ultrasonic Interferometer.	3
4)	Determination of Dispersive power of a prism using Spectrometer.	3
5)	Determination of Young's modulus of the material - Non uniform bending	3
6)	Determination of thermal conductivity of a bad conductor - Lee's Disc method	3

LIST OF EXPERIMENTS – CHEMISTRY PART		
S.No	**NAME OF THE EXPERIMENT**	
1)	Estimation of Total Hardness of their home town Water by EDTA method.	3
2)	Estimation of Copper in brass by EDTA method.	3
3)	Estimation of Ferrous Ion by Potentiometric Titrations.	3
4)	Conductometric Titration of strong acid Vs strong base	3
5)	Estimation of Alkalinity of Water sample	3
6)	Estimation of iron by spectrophotometer (Demo only)	3

REFERENCES
1) Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London.
2) "Practical A. Ravikrishnan Engineering Chemistry", Sri Krishna Publications, Chennai (2002)
3) Engineering Physics Laboratory Manual
4) Engineering Chemistry Laboratory Manual

Course Outcomes:

The Students will be able to

CO1: Understand the laser light propagation in optical fibre
CO2: Learn the principle of interference
CO3: Determine velocity of sound, dispersive power and thermal conductivity of materials
CO4: Understand the knowledge of their home town water
CO5: Estimate the amount of substance by potentiometric technique
CO6: Outline the application of analytical instrument

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1		2				1	1		1	2		2	1
CO2	1	2	2						2	1		1	2		2	1
CO3	2	2	3	2	2		2		3	1	1	2	2	1	2	2
CO4	2	1	3		2				1	1		2		2		
CO5	2	2	1		1				2	1		1		2		
CO6	3	2	1	2	2				2	1		2		2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS17	**COMPUTER PRACTICES LABORATORY**	**L-T-P**	**C**
		0-0-3	**2**

Programme:	B.E. Civil Engineering	**Sem: I**	**Category**	**ES**

Pre -requisites: 161CS11- Computer Programming
AIM: To provide an awareness to Computing and C Programming

S.No	LIST OF EXPERIMENTS
1.	eSearch, generate, manipulate data using MS office/ Open Office
2.	Presentation and Visualization – graphs, charts, 2D, 3D
3.	C Programming using Simple statements and expressions
4.	Scientific problem solving using decision making and looping.
5.	Simple programming for one dimensional and two dimensional arrays.
6.	Solving problems using String functions
7.	Programs with user defined functions – Includes Parameter Passing
8.	Program using Recursive Function and conversion from given program to flow chart.
9.	Program using structures and unions.
10.	Program using files

Course Outcomes:

The Students will be able to

CO1: have fundamental concept on basics commands in Linux.

CO2: write, compile and debug programs in C language.

CO3: formulate problems and implement algorithms in C.

CO4: effectively choose programming components that efficiently solve computing problems in real - world.

CO5: design application oriented programs in C.

CO6: Structures and unions through which derived data types can be formed.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2						2				1			
CO2	3	2	2						2				1			
CO3	3	2	3						2				1			
CO4	2	3	2						2				1			
CO5	3		2						2				1			
CO6	2		2						1				1			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161EE17   **ENGINEERING PRACTICES LABORATORY**   **L-T-P**   **C**
                                                                   0-0-3   **2**

Programme:	B.E. Civil Engineering	**Sem:** I	**Category**	**ES**
Pre -requisites:	Nil			

AIM: To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

LIST OF EXPERIMENTS

GROUP A   CIVIL AND MECHANICAL

I .CIVIL ENGINEERING PRACTICE   9

Buildings:
    (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
   a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
   b) Study of pipe connections requirements for pumps and turbines.
   c) Preparation of plumbing line sketches for water supply and sewage works.
   d) Hands-on-exercise:
      Basic pipe connections – Mixed pipe material connection – Pipe Connections with different joining components.
   e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
   a) Study of the joints in roofs, doors, windows and furniture.
   b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II.   MECHANICAL ENGINEERING PRACTICE   13

Welding:
   a) Preparation of arc welding of butt joints, lap joints and tee joints.
   b) Gas welding practice

Basic Machining:
   a) Simple Turning and Taper turning
   b) Drilling Practice

Sheet Metal Work:
   a) Forming and Bending:
   b) Model making – Trays, funnels, etc.
   c) Different type of joints.

Machine assembly practice:
   a) Study of centrifugal pump
   b) Study of air conditioner

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending.
   Example – Exercise – Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step cone pulley.
c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B   ELECTRICAL and ELECTRONICS

III   ELECTRICAL ENGINEERING PRACTICE   10
1. Residential house wiring using switches, fuse, indicator, lamp and energymeter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power and power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

IV   ELECTRONICS ENGINEERING PRACTICE   13
1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL PERIODS: 45

Course Outcomes:

The Students will be able to
CO1. Express the pipe connections And identify the various components used in plumbing
CO2. Produce simple wooden joints using wood working tools
CO3. Create simple lap, butt and tee joints using arc welding equipments
CO4. Generate the simple components using lathe and drilling machine
CO5. Identify the fitting usage of square joint, L joint and stepped joints.
CO6. Facilitate the operation of fluorescent lamp, staircase wiring and measuring the consumed electrical energy
CO7. Express and analyze the fundamentals of Boolean algebra and digital logic gates
CO8. Generate clock signal and measure the parameters of the signal

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	3				3			1	1			1
CO2	2	2	3	3	3				3			2	1			1
CO3	2	2	3	3	3				3			1	1			1
CO4	2	1	3	3	3				3			2	1			1
CO5	2	2	3	3	3				3			1	1			1
CO6	2			3					3			3	1			1
CO7	2			3					3			2	1			1
CO8	2			3					3			2	1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS21	**TECHNICAL ENGLISH**	**L-T-P**	**C**
		3-0-0	**3**

Programme:	B.E. Civil Engineering	**Sem:**	**II**	**Category**	**HS**
Pre-requisites:	16HS11				

AIM: To develop students communication in English with specific reference to their area of specialization and the workplace.

UNIT 1   9

Grammar- active voice and passive voice, Vocabulary -Technical words-Foreign words-Adjective-Extended definitions Reading - Reading Technical passages, Writing - Formal Letters-Complaint letter – Listening - Listening to TED Talks to take notes, Speaking - Introducing others.

UNIT II   9

Grammar-question tags, Vocabulary -Interrogative Statements – Acronym- One-word substitution, Reading- Note-taking, Writing - describing a process,dialogue writing Listening - Listening to Group Discussion Speaking- Public Speech practice.

UNIT III   9

Grammar- reported speech, Vocabulary -Conditional Clauses – Punctuation-Concord, Reading-Reading Book/film/music reviews, Writing - Report –accident, survey, feasibility Listening-Listening to Technical Presentation, Speaking- Reporting events.

UNIT IV   9

Grammar - reported speech, Vocabulary -Words followed by prepositions – Articles-Action verb, Reading-Reading Famous speech text, Writing – Minutes-Checklist Listening-Listening for gist, Speaking- making mini presentations.

UNIT V   9

Grammar-practice, Vocabulary- Cause and effect Reading-Reading for vocabulary, Writing-Dialogue writing using 'wh' and 'Yes/ No'-job application-resume –Essay Listening - Listening for filling Information, Speaking- Participating in Group Discussions.

TOTAL PERIODS: **45**

TEXT BOOKS

1. Department of English, Anna University. Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012

REFERENCES
1. www.usingenglish.com
2. www.grammar.org
3. www.audioenglish.com
4. http://www.manythings.org
5. WWW.tedtalks.com
6. www.inktalks.com
7. www.documentariesheaven.com
8. www.nature.com

Course Outcomes:

The Students will be able to

CO1: Recall words and their meaning for the specific purpose

CO2: Write job applications

CO3: Listen and comprehend talks and lectures on technical subjects

CO4: Write issue- based essays

CO5: Describe a process both in speaking and writing

CO6: Summarize the key points

CO7: Use different words in speaking and writing

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1						1			3	3		3	1			
CO2						2			3	3		3	2			
CO3					3	2			3	3		3	2			
CO4										2		3	1			
CO5									3	3		3	2			
CO6												3	1			
CO7										3		3	2			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA21	**ENGINEERING MATHEMATICS – II**	**L-T-P**	**C**
		3-1-0	4

Programme: B.E. Civil Engineering   **Sem:** II   **Category** BS

Pre-requisites: 161MA11

AIM: To analyze the engineering problems using the techniques and the mathematical skills acquired by studying vector calculus, Laplace transform, complex variables and multiple integral.

LAPLACE TRANSFORM   12

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – First Shifting Theorem - Transform of derivatives on tf(t) , f(t)/t and periodic functions – Transform of unit step function and impulse functions. Inverse Laplace transforms by partial fraction method and Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

ANALYTIC FUNCTIONS   12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy–Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function (without proof) – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w = z+c, cz, 1/z, and bilinear transformation.

COMPLEXINTEGRATION   12

Statement and application of Cauchy's theorem and Cauchy's integral formula, Taylor and Laurent expansion, Singularities, Classification, Residues, Cauchy's residue theorem, Contour integration (Type I&II).

MULTIPLE INTEGRALS   12

Double Integration – Cartesian and Polar co-ordinates – Change of order of Integration - Change of variable between Cartesian and polar co-ordinates – Triple integration – Area as a double integral by Cartesian co-ordinates – Volume as a triple integral.

VECTORCALCULUS   12

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

TOTAL PERIODS: 60

TEXT BOOKS

1. B.S.Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi, 2005.

2. T. Veerarajan, "Engineering Mathematics(for first year)",Fourth Edition, Tata McGraw – hill publishing company Ltd, New Delhi, 2005.

REFERENCES

1. Greenberg. M.D. "Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K., "Engineering Mathematics", Volume I and II Revised enlarged Fourth

Edition, The National Publishing Company, Chennai, 2004.
3. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.
4. Ravish R Singh,Mukul Bhatt, **"Engineering Mathematics-I",** McGraw Hill Education(India)Private Ltd,New Delhi.
5. Dr.P.Kandasamy, Dr.K.Thilagavathy, Dr.K.Gunavathy,S.Chand& Company Ltd. Ram Nagar, New Delhi.

Course Outcomes:

The Students will be able to

CO1: Apply Laplace transform to solve first and second order differential equations with elementary forcing function.
CO2: Classify Green's theorem to evaluate line integrals along simple closed contours on the plane.
CO3: Construct an analytic function using the properties of analytic function.
CO4: Make use of Cauchy's residue theorem for applications in Engineering.
CO5: Evaluate complicated real integrals using the basics of analytic functions and the complex Integration.
CO6: Apply double integration to find area between two curves.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2		2								3				1
CO2	2	1		2												1
CO3	2	1		2								1				1
CO4	1	2		2								2				1
CO5	2	2														1
CO6	3	3										3				1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PH21	**PHYSICS OF MATERIALS**	**L-T-P**	**C**
		3-0-0	3

Programme:	B.E. Civil Engineering	**Sem:**	**II**	**Category**	**BS**

Pre-requisites: 161PH11

AIM: To transform the basic physics concepts to understand the utility of Engineering materials for various applications.

CONDUCTING MATERIALS   9
Conductors: Classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – Carrier concentration in metals.
Super Conductors: Properties - Types of super conductors - Applications of superconductors – SQUID, cryotron, magnetic levitation.

SEMICONDUCTING MATERIALS   9
Intrinsic semiconductor – Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Extrinsic semiconductors – Carrier concentration derivation in n-type and p-type semiconductor – Variation of Fermi level with temperature and impurity concentration – Hall effect – Determination of Hall coefficient – Applications.

MAGNETIC AND DIELECTRIC MATERIALS   9
Magnetic Materials: Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – Soft and hard magnetic materials – Anti ferromagnetic materials – Ferrites – Applications.
Dielectric Materials: Polarization - Electronic, ionic, orientational and space charge polarization – Frequency and temperature dependence of polarisation –Dielectric loss – Dielectric breakdown – Uses of dielectric materials (capacitor and transformer) – Ferroelectricity and applications.

ADVANCED MATERIALS   9
Metallic glasses: Preparation, properties and applications.
Shape memory alloys (SMA): Characteristics - Properties of NiTi alloy – Applications - Advantages and disadvantages of SMA.
Nanomaterials: Synthesis – Chemical vapour deposition – Electrodeposition – Ball milling - Properties of nanoparticles and applications.
Carbon nanotubes: Fabrication – Arc method – Pulsed laser deposition – Structure – Properties and applications.

CHARACTERIZATION TECHNIQUES   9
Principle, Characterization and applications of X- Ray diffraction – Scanning Electron Microscope – Transmission Electron Microscope – Atomic Force Microscope.

TOTAL PERIODS: 45

Text Books
1. William D. Callister, Jr., **"Material Science and Engineering",** John Wiley & Sons Inc., Seventh Edition, New Delhi (2010).
2. Ragavan, V., **"Material science and Engineering"**, Prentice Hall of India (2004).

References

1. Arumugam M., **"Materials Science",** Anuradha publications, Kumbakonam (2006).
2. Koch C., **"Nanostructured materials: processing, properties and applications",** William Andrew
   Pub (2008).
3. Kasap, S.O., **"Principle of Electronic Materials and devices"**, Tata Mc-Graw Hill (2007)
4. Charles P. Poole and Frank J.Ownen., **"Introduction to Nanotechnology"**, Wiley India (2007)
5. Charles Kittel., **"Introduction to solid state Physics"**, John Wiley & Sons, 7th editions, Singapore (2007).

Course Outcomes:

The Students will be able to

CO1: Understand the theory and processing of conducting, superconducting materials.

CO2: Acquire knowledge and types about semi conducting materials.

CO3: Gain knowledge about the types of magnetic and dielectric materials and their applications.

CO4: Understand about some exciting properties of modern engineering materials.

CO5: Know about Characterization Techniques of materials.

CO6: Explain the various Principle and applications of materials.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	1							1	1			1
CO2	3	1	2	1	1							1	1			1
CO3	3	1	1	2	1							1	1			1
CO4	3	2	2	2	2							1	1			1
CO5	3	2	2	3	2							2	1			1
CO6	3	2	2	3	2							2	1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CY21	ENVIRONMENTAL SCIENCE	L-T-P	C
		3-0-0	3
Programme:	B.E.(Common To All Branches) **Sem: II**	**Category**	**BS**
Pre-requisites:	Basic Science		
AIM:	To Impart the social groups and individuals to acquire knowledge of pollution and environmental degradation.		

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES
9

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. dams and their effects on forests and tribal people – Energy resources: Growing energy needs, renewable (solar energy and wind energy) and non renewable energy sources- Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generation (block diagram only), Petroleum processing and fractions, LPG and Natural gas.

ECOSYSTEM AND BIODIVERSITY
9

ECOSYSTEM : Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem-Nitrogen cycle, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers) –**BIODIVERSITY** : Introduction to Biodiversity – Definition– Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –India as a mega-diversity nation – Hot-spots of biodiversity.

ENVIRONMENTAL POLLUTION
9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Thermal pollution – Solid waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies– Disaster management: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT
9

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, and watershed management – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, Ozone layer depletion, nuclear accidents -case studies- Goal of Green chemistry.

HUMAN POPULATION AND THE ENVIRONMENT
9

Population growth, variation among nations – Population explosion – Family Welfare Programme – Human Rights – Value Education – HIV/AIDS –Women and Child Welfare – Role of Information Technology in Environment and human health-Case studies.

TOTAL PERIODS: 45

TEXT BOOKS:
1. A. Ravikrishnan, "Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Private Limited, 2010.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:
1. AnubhaKaushik, C.P. Kaushik, "Environmental Science and Engineering", New Age International Publishers, 2016.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.
3. Raman Sivakumar, *Introduction to Environmental Science and Engineering,* Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4. P.Meenakshi, Elements of Environmental Science and Engineering, PHI learning (P) Ltd., India.

Course Outcomes:

At the end of the course the student will be able to

CO1: Understand the basic concepts of environment studies and natural resources
CO2: Get knowledge about ecosystem and biodiversity.
CO3: Identify and analyse causes, effects and control measures of various types of pollution.
CO4: Understand the impact of social issues.
CO5: Analyse the social issues related to the environment.
CO6: Explain about population growth and human Health-Case studies.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1								1				1
CO2		2	1	1			1					1				1
CO3	2	1		2								1				1
CO4	1	2	1									1				1
CO5	2	3	2									2				1
CO6	2	3	2									2				1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161ME21 **ENGINEERING MECHANICS** **L-T-P** **C**
                                                    3-0-0 **3**

| **Programme:** | B.E. Civil Engineering | **Sem:** | **II** | **Category** | **ES** |

Pre-requisites: Nil

Aim: To impart a sound knowledge on the applied physics laws in different engineering applications.

BASICS & STATICS OF PARTICLES   9

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram andtriangular Law of forces – Vectors – Vectorial representation of forces and moments – Vectoroperations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution andComposition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle inspace – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

EQUILIBRIUM OF RIGID BODIES   9

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representationof moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium ofRigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples.

PROPERTIES OF SURFACES AND SOLIDS   9

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle,circle, triangle from integration – T section, I section, - Angle section, Hollow section by usingstandard formula – second and product moments of plane area – Rectangle, triangle, circle fromintegration – T section, I section, Angle section, Hollow section by using standard formula – Parallelaxis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertiaof plane areas – Principal axes of inertia.

DYNAMICS OF PARTICLES   9

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles.

FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS   9

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Beltfriction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Beer, F.P and Johnson Jr. E.R. **"Vector Mechanics for Engineers",** Vol. 1 Statics and Vol. 2Dynamics, McGraw-Hill International Edition, (2012)
2. Kottiswaran. N., **"Engineering Mechanics statics & dynamics",** Sri Balaji Publications (2013)

REFERENCE(S)

1. RajasekaranS, SankarasubramanianG,**"Fundamentals of Engineering Mechanics",**Vikas Publishing House Pvt. Ltd., (2009)
2. Hibbeller R.C., **"Engineering Mechanics",** PearsonEducation Asia Pvt. Ltd., (2010)
3. Palanichamy M.S., Nagam S., **"Engineering Mechanics–Statics & Dynamics",** Tata McGraw-Hill, (2002)
4. Irving H. Shames, **"Engineering Mechanics – Statics and Dynamics",** PearsonEducation Asia Pvt. Ltd., (2006)
5. Ashok Gupta, **"Interactive Engineering Mechanics – Statics",** Pearson Education Asia Pvt., Ltd., (2002)

Course Outcomes:

The Students will be able to

CO1: Recite the laws of mechanics and principle of transmissibility.

CO2: Describe the types of supports and equilibrium of rigid bodies in three dimensions.

CO3: Explain the parallel axis theorem and perpendicular axis theorem.

CO4: Determine moment of inertia and polar moment of inertia of various sections.

CO5: Solve the displacement, velocity and acceleration problems and their relationshipwith work energy equation of particles.

CO6: Explain the various Frictional forces and general plane motion of rigid bodies.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	3							2	3		1	2
CO2	3	3	3	2	3							3	2		2	2
CO3	3	3	1	2	2							2	3		3	2
CO4	3	3	1	2	2							2	3		2	2
CO5	2	3	2	2	1							3	3		2	1
CO6	2	2	2	3	2							2	2		1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE21	**BUILDING MATERIALS**	**L-T-P**	**C**
		3-0-0	**3**

Programme:	B.E. Civil Engineering	**Sem:**	**II**	**Category**	**ES**
Pre-requisites:	Nil				

AIM	To impart sound knowledge on the applications of various building materials in advanced construction technology.

BASIC LOAD BEARING MATERIALS   9

Conventional Materials: Stones: classification of rocks – quarrying – dressing –properties –uses of stones – tests for stones. **Bricks:** composition – manufacturing process –classification – qualities – uses – test for bricks – Paving bricks, Hollow bricks – Terracotta, Stoneware, Earthenware Glazing and their uses – Glazed Ceramic tiles, Fully vitrified tiles, ceramic sanitary appliances, Stoneware pipes and fittings.

ADVANCED LOAD BEARING MATERIALS   9

Cement: Introduction – ingredients – manufacturing process – dry and wet process – types of cement – properties – uses – tests for cement. **Mortar:** functions – requirements – types – properties – uses – tests on mortar. **Concrete:** Ingredients – functions – w/c ratio – grades – admixtures – test on concrete – properties – uses.

TIMBER AND ROOFING MATERIALS   9

Timber: Market forms, industrial products, moisture content as per IS 287-1993, popular species used in building construction, physical properties, seasoning of wood and preservative treatment – **Plywood:** pressed wood - Particle board - Hard board - Fibre board - Lamina board - bamboo and its products - **Roofing materials:** Asbestos sheets and G.I sheets - Tubes and light weight roofing materials - Assembling and fixing methods.

NON LOAD BEARING MATERIALS   9

Paints: Functions – constituents – characteristics – selection – types of paints –defects. **Varnishes:** Elements – properties – types. **Distempers:** composition –properties. **Asbestos:** Properties – uses – asbestos cements products. **Glass:** Constituents – composition – classification – properties – market form – uses. **Plastic:** constituents – classification – properties – uses.

FERROUS AND NON - FERROUS MATERIALS   9

Ferrous metals - Iron and steel, basic metallurgy, composition and grades, market forms and heat treatment - Steel as reinforcement - Corrosion of metals and protection.

Non-ferrous metals: Aluminum, glass products and their applications - Heat insulating materials - Acoustic materials and components.

TOTAL PERIODS: 45

TEXT BOOKS

1. Varghese .P.C, "*Building Materials*", Prentice Hall India, 2005.
2. Rangwala .S.C, "*Engineering Materials*", Charotor Publishing House, New Delhi, 2012.

REFERENCES

1. Gurucharan Singh, "*Building Construction and Materials*", Standard Book House, Delhi, 1988.
2. Shetty .M.S, "*Concrete Technology*", S.Chand and Company, New Delhi, 2010.
3. Arora and Bindra .S.P, Building Construction, "*Planning Techniques and Method of Construction*",   DhanpatRai Sons, New Delhi, 1988.

Course Outcomes:

The Students will be able to

CO1: Explain the importance of basic load bearing materials

CO2: Study the requirements of advanced load bearing materials

CO3: Describe the properties and behavior of timber and roofing materials

CO4: Demonstrate the functions of non load bearing materials

CO5: Explain the properties of ferrous materials

CO6: Explain the properties of non - ferrous materials

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1							1	1	1	2	2
CO2	2	2	1	1								1	2	1	2	2
CO3	2	1	2	2	2							1	1	2	1	1
CO4	1	2	1	2	2							1	3	2	1	2
CO5	2	3	2	1	2							2	2	1	1	1
CO6	2	3	2	1	2							2	2	1	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PC27	**PHYSICS AND CHEMISTRY LABORATORY-II**	**L-T-P**	**C**
		0-0-3	2

Programme:	Common to all Branches	**Sem:**	**II**	**Category**	**BS**
Pre-requisites:	161PH11, 161CY11				

AIM:	To introduce the basic Physics concepts through experiments and to impart knowledge on the application of chemistry in engineering branches.

LIST OF EXPERIMENTS - PHYSICS PART **(A minimum of five experiments shall be offered)**		
S.No	**NAME OF THE EXPERIMENT**	
1)	Torsional pendulum – Determination of rigidity modulus	3
2)	Determination of Young's modulus of the material – Uniform bending	3
3)	Determination of viscosity of liquid – Poiseuille's method.	3
4)	Determination of wavelength of mercury spectrum- Spectrometer Grating.	3
5)	Determination of Band Gap of a semiconductor material.	3
6)	Determination of specific resistance of a given coil of wire – Carey Foster Bridge.	3

LIST OF EXPERIMENTS – CHEMISTRY PART		
S.No	**NAME OF THE EXPERIMENT**	
1)	Estimation of HCl by pH metry	3
2)	Conductometric titration of mixture of acids (HCl& CH_3CO-OH)	3
3)	Estimation of Chloride ion in water sample by Argentometric method.	3
4)	Determination of molecular weight of a polymer by viscometry method	3
5)	Determination of corrosion rate by weight loss method	3

REFERENCES	
1) Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London. 2) "Practical A. Ravikrishnan Engineering Chemistry", Sri Krishna Publications, Chennai (2002) 3) Engineering Physics Laboratory Manual 4) Engineering Chemistry Laboratory Manual	

Course Outcomes:
The Students will be able to   CO1: Understand the rigidity modulus of the materials.   CO2: Learn the Young's modulus of the material.   CO3: Study the flow of liquid in capillary tube.   CO4: Determine the quantity of unknown solution by instrumental method.   CO5: Analyze the corrosion rate of a iron.   CO6: Determine the specific resistance of a given coil of wire

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1	1		1		1			1	1			1
CO2	2	2	1	1	1		1		2			1	1			1
CO3	2	2	1	1	1		1		1			1	1			1
CO4	2	2	1	2	2		1		2			1	1			1
CO5	3	2	2	2	2		2		2			2	1			1
CO6	3	2	2	2	2		2		2			2	1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE28	**COMPUTER AIDED DRAFTING LABORATORY**			**L-T-P**	**C**
				0-0-4	**2**
Programme:	B.E. Civil Engineering	**Sem:**	**II**	**Category**	**ES**
Prerequisites:	161ME11				
Aim:	To gain more knowledge in 2D, 3D drawings by using relevant software				

List of Exercises using software capable of Drafting and Modeling

- Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures
- Drawing of a Title Block with necessary text and projection symbol
- Drawing of curves like parabola, spiral, involute using B-spline or cubic spline
- Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning
- Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves)
- Drawing of a plan of residential building (Two bed rooms, kitchen, hall etc.,)
- Drawing of a simple steel truss
- Drawing sectional views of prism, pyramid, cylinder, cone, etc,
- Drawing isometric projection of simple objects
- Creation of 3-D models of simple objects
- Building with load bearing walls
- R.C.C framed structures

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

- Intel i3 core due processor with 4GB ram with 500GB hard disk – 30 Nos.
- Licensed software for Drafting and Modeling – 30 Licenses
- Laser Printer or Plotter to print / plot drawings – 2 Nos.

Total Periods: 45

Course Outcomes:
At end of this course, the students will be able to
CO1: Demonstrate the fundamentals of design and drafting
CO2: Outline the basic shapes and modeling
CO3: Interpret the drawing from different perspective
CO4: Devise plan of residential building
CO5: Draw sectional views and Isometric projection of simple objects
CO6: Create 3D models for simple objects

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3			2								3	1		1	
CO2	3		2									3			2	2
CO3	3				2							3	2		1	1
CO4				3	3							3			1	
CO5	3		3	2	2							3	2		2	
CO6	3		3	2	2							3	2		2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA31	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L-T-P	C
		3-1-0	4

Programme:	B.E. Civil Engineering	**Sem:**	**III**	**Category**	**BS**

Pre-requisites: 161MA11, 161MA22

AIM: The Course is aimed at Developing the basic mathematical skills of Engineering Student.

FOURIER SERIES   12
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

FOURIER TRANSFORMS   12
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

PARTIAL DIFFERENTIAL EQUATIONS   12
Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations(without reducing the standard type) – Linear partial differential equations of second and higher order with constant coefficients.

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   12
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

Z -TRANSFORMS AND DIFFERENCE EQUATIONS   12
Z-transforms – Elementary properties – Inverse Z-transform – Convolution theorem –

Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL PERIODS: 60

TEXT BOOKS
1. Grewal,B.S,**"HigherEngineeringMathematics",**40th Edition, Khannapublishers, Delhi,(2007).
2. Veerarajan, T.,**"Transforms and Partial Differential Equation",** TataMc-GrawHillPublishing Companylimited,NewDelhi (2011).

REFERENCES
1. Bali,   N.P   and   Manish   Goyal**"A   Textbook   of   Engineering Mathematics",**7[th]Edition,LaxmiPublications(P)Ltd.(2007).
2. RamanaB.V., **"Higher Engineering Mathematics",**Tata Mc-GrawHillPublishing Companylimited,NewDelhi (2007).
3. GlynJames,**"AdvancedModernEngineeringMathematics",**3[rd]edition-Pearson

Education(2007).

4. ErwinKreyszig**"AdvancedEngineeringMathematics",**8th edition-WileyIndia (2007).
5. Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy,S.Chand& Company Ltd.Ram Nagar,New Delhi.

Course Outcomes:

The students will be able to

CO1: Classify the Fourier series and half range Fourier sine and cosine series.

CO2: Explain the Fourier transform and with their properties.

CO3: Determine Z-inverse transform using convolution theorem and partial fraction method.

CO4: Solve the partial differential equation by using Lagrange'slinearequation.

CO5: Analyze separation of variable to solve linear partial differential equation.

CO6: Formulate partial differential equation.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		2								3	1			
CO2	3	2		3								3	1			
CO3	3	2		3								3	1			
CO4	3	2		1									1			
CO5	3	2		2								1	1			
CO6	2	2											2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE31	MECHANICS OF SOLIDS-I	L-T-P	C
		3-1-0	4

| **Programme:** | B.E. Civil Engineering | **Sem:** | **III** | **Category** | **PC** |

Pre-requisites: 161ME21

AIM: To provide knowledge in the field of Mechanics of Solids.

CONCEPT OF STRESS AND STRAIN   12

Introduction - Normal stress and strain - Mechanical properties of materials - Elasticity, plasticity and creep - Linear elasticity- Hooke's law - Poisson's ratio - Shear stress and strain - Elastic constants- Allowable stresses and allowable loads - Thermal stresses in compound bars – Stress-strain diagram – Concept of Factor of Safety and permissible stresses..

STRAIN ENERGY PRINCIPLES AND MOMENT OF INERTIA   12

Strain energy – Resilience – Stress due to suddenly applied loads and impact loads. Center of gravity – Mass moment of inertia – Principal moment of inertia – Product of inertia.

COMPLEX STRESSES   12

Components of stress on inclined planes – Expression for stressed element subjected to two normal stresses with shear – Principal stresses and Principal planes – Mohr's circle of stress.

BEAMS AND BENDING   12

Types of beams – Types of loads and loading diagrams –Shear force and Bending moment – Relationship between loading intensity, shear force and bending moment – Shear force and bending moment diagram for statically determinate beams – Theory of simple bending – Stress distribution due to shear force and bending moment – Design of beams – Beams of uniform strength – Flitched beams – Beams of two materials – Leaf spring.

TORSION AND SPRINGS   12

Torsion of solid and hollow circular shafts – Power transmitted through shafts – Strain energy due to torsion – Combined bending and torsion – Close coiled and open coiled helical springs.

TOTAL PERIODS: 60

TEXT BOOK(S)
1. Bansal R.K. Strength of materials, Laxmi Publications, New Delhi, Fourth edition, 2010.
2. Subramanian R., Strength of materials, Oxford university press, New Delhi – 2010.

REFERENCE(S)
1. William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, Tata McGraw-Hill publishing co., New Delhi – 2007.
2. Srinath L.S, Advanced Mechanics of Solids, Tata McGraw-Hill Publishing Co., New Delhi, 2003.

3. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.
4. Ramamrutham, S.,"Strength of Materials", DhanpatRai& Sons, 2008
5. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.
6. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.

Course Outcomes:

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

CO1: Analyze the concept of stress, strain and deformation of solid state of stress
CO2: Analyze the concepts of strain energy, principal stress and principal planes
CO3: Assess the bending moment and shear force
CO4: Illustrate the theory of torsion and stresses in springs
CO5: Analysis of plane truss, thin cylinders and shells
CO6: Demonstrate the corresponding stress distribution for different types of beams

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	2							2	3	3		
CO2	3	3		2	3							2	3	1		
CO3	1	2		2	2							2	1	3		
CO4	3	1		1	1							2	3	2		
CO5	3	2		2	3							1	2	1		
CO6	2	2		2	2							3	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE32	**MECHANICS OF FLUIDS**	**L-T-P**	**C**
		2-1-0	**3**

Programme:	B.E. Civil Engineering	**Sem:**	**III**	**Category**	**ES**
Pre-requisites:	Nil				
AIM:	To provide knowledge in the field of Mechanics of Fluids and related areas.				

FLUID PROPERTIES AND FLUID STATICS   6+6

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - Viscosity, density, vapour pressure ,surface tension, capillarity - Basic equation of fluid statics - Pressure measurements - Manometers. - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

FLUID KINEMATICS   6+6

Classification of Fluid Flow - Methods of describing fluid motion - Flow nets - Stream function and velocity potentials (Reynolds number and it's applications) – Linear acceleration and constant rotation of fluids in a container – Application and simple problems.

FLUID DYNAMICS   6+6

Dynamics - Application of control volume to continuity, energy and momentum - Euler's equation of motion along a stream line - Bernoulli's equation –limitation of Bernoulis's equations - Applications to velocity and discharge measurements (Venturi Meter, Flow nozzle meter, Bend meter, Pitot tube and current meter)- Linear momentum equation.

FLOW THROUGH PIPES   6+6

Laminar flow through pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Hagen Poiseullie equation – Darcy - Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel – Equivalent pipes – Power transmission through pipes.

DIMENSIONAL ANALYSIS AND MODEL STUDIES   6+6

Fundamental and derived units – Dimensional homogeneity- Similarities- Dimensional analysis - Rayleigh's method and Buckingham's Pi theorem – Model studies – Dimensionless numbers – Hydraulic similitude – Model laws – Undistorted and distorted models – Scale effect.

TOTAL PERIODS: 60

TEXT BOOK(S)
1. Rajput, R.K., "A text book of Fluid Mechanics" , S.Chand and Co.,New Delhi – 2007.
2. Streeter, Victor, L. and Wylie, Benjamin E., "Fluid Mechanics", McGraw-Hill Ltd., 2010.

REFERENCE(S)

1. John E. Finnemore and Joseph Franzini B., "Fluid Mechanics with Engineering Applications", McGraw-Hill International Edition, 2001.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995.
3. Rajesh Srivastava," Flow through open channels", Oxford University Press, New Delhi, 2008.

Course Outcomes:

The students will be able to

CO1: Apply the basic properties of fluids and their application in real problems
CO2: Examine the variation of pressure in fluid at rest and calculate the hydrostatic forces
CO3: Use the continuity equation for compressible and incompressible flow
CO4: Apply Hagen Poiseullie equation and Darcy-Weisbach equation in flow through pipes
CO5: Estimate the major and minor losses in pipe flow connected in series and in parallels
CO6: Evaluate the dimensional analysis and model studies

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2	2							2	2	3		
CO2	3	2	2	3	1							2	2	2		
CO3	3	2	2	2	1							1	2	3		
CO4	3	3	3	2	1							2	3	2		
CO5	2	2	2	1	1							2	2	1		
CO6	3	3	3	2	2							1	1	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE33	SURVEYING	L-T-P	C
		3-0-0	3

Programme: B.E., Civil Engineering   **Sem:** **III**   **Category** **PC**
Prerequisites: Nil
AIM: To make the student aware of surveying techniques in civil engineering.

CHAIN AND COMPASS SURVEYING   9

Surveying –Definition, principles and classification –Scale and Conventional signs - Survey instruments - handling and adjustments - Chain surveying- Reciprocal ranging - Setting perpendiculars - well conditioned triangles – Obstacles- Sources and limits of error and their correction –Compass Surveying –Types- Bearings - magnetic and true north, magnetic declination and its variation –Traversing- Local attraction and its elimination.

LEVELLING AND ITS APPLICATIONS   9

Levelling principles - Levels and staves – Accessories - Temporary and Permanent adjustments - Sensitiveness of bubble tube - Bench marks – Types of levelling – Booking - Reduced levels – Determination - Plotting LS and CS-curvature and refraction corrections – Contour types - Applications.

THEODOLITE SURVEYING   9

Theodolite –types and uses - Temporary and permanent adjustments – horizontal, vertical angles - Heights and distances - Traversing – Closing error and distribution - Gale's table - Omitted measurements

TACHEOMETRIC SURVEYING   9

Tacheometry principle systems - Tangential-stadia methods - Horizontal and inclined sights – Staffvertical and normal - Fixed and movable hairs - Stadia constants – Anallatic lens - Subtense bar.

MODERN METHODS OF SURVEYING   9

Electronic Distance Measurement (EDM) - Global Positioning System (GPS) - Total station and its – application – Photogrammetry - Cartography and Cadastral surveying - Hydrographic Surveying.

TOTAL PERIODS: 45

TEXT BOOK(S)

1. Arora, K.R., "Surveying", Vol. I, II and III, Standard Book House, 2010.
2. Duggal R.K, "Surveying", Vol. I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

REFERENCES
1. Bannister A and Raymond S, "Surveying", Addison Wesley Longman ltd, England, 2006.
2. Schofield, W. and Breach M., "Engineering Surveying", 6th Ed., Butterworth-Heineman, 2007.
3. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, Standard Publishers, NewDelhi 2008.

Course Outcomes:

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

CO1: Carry out preliminary surveying to prepare a layout for the given area.
CO2: Demonstrate the application of levelling in the field surveying
CO3: Execute a theodolite traverse and Set out for different types of curves.
CO4: Find the heights and distances using tacheometry
CO5: Understand the importance of advanced techniques involved in surveying.
CO6: Conduct the modern methods of surveying i.e Electronic Distance Measurement (EDM),
       Global Positioning System (GPS) and Total station

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	3							3	1	3		
CO2	3	2	3	3	2							2	3	2		
CO3	3	2	2	2	2							3	2	3		
CO4	3	2	2	2	2							2	3	3		
CO5	2	2	2	3	2							2	2	2		
CO6	3	2	3	3	3							3	3	2	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE34   **GEOLOGY FOR CIVIL ENGINEERING**   **L-T-P**   **C**
                                                                        3-0-0   **3**

Programme: B.E. Civil Engineering   **Sem:**   **III**   **Category**   **ES**

Prerequisites: Nil

AIM: To impart the concepts of geological agents and their processes.

GENERAL GEOLOGY   9

Earth structure - Lithosphere - Internal structure of the earth - Composition – Scope of Geology in Engineering - Geological Agencies - External Agencies - Weathering, Wind, River, Sea, Landslide - Internal Agencies - Earthquake, Plate Tectonics, Ground Water.

MINERALS OF THE EARTH'S CRUST   9

Rock Forming Minerals - Physical Properties of Minerals – Quartz group, Feldspar group, Mica - Calcite - Clay Minerals and its importance, Indian resource of Coal and Petroleum.

ROCKS OF THE EARTH'S CRUST   9

Rocks and their study - Rock Cycle - Igneous Rocks - Sedimentary Rocks - Metamorphic Rocks - Engineering Properties, Uses and Indian Occurrence of the following rocks - Granite, Diorite, Dolerite, Pegmatite, Basalt, Shale, Sandstone, Limestone, Breccia and Conglomerate, Gneiss, Schist, Slate, Quartzite and Marble.

STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS   9

Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.

GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING   9

Geological conditions necessary for construction of dams, tunnels, buildings, road cuttings- Landslides – Causes and preventions- Improvement of sites-Coastal protection

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Parbin Singh, "Engineering and General Geology", S.K.Kataria& Sons, 2012.
2. Duggal S.K., H.K.Pandey and N.Rawal, "Engineering geology", McGraw Hill Education Private limited,2013.

REFERENCE(S)
1. Varghese P. C, "Engineering Geology for Civil Engineers", PHI Learning Private Limited, Delhi, 2015.
2. F.G.H. Blyth and M.H.de Freitas, "Geology for Engineers", CRC Press, Boca Raton, 2015.

Course Outcomes:

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

CO1: Acquire the knowledge of the topographical formation, interior earth and gradational activities

CO2: Assess physical, mechanical and engineering properties of minerals and rocks

CO3: Evaluate engineering properties, uses and Indian Occurrence of the various rocks

CO4: Analyze the surface and subsurface geological structures and Investigate Seismic and electrical
     methods for subsurface

CO5: Prevent and Improvement of sites and Coastal protection

CO6: Predict the Geological conditions necessary for construction of dams, tunnels, buildings and road
      cuttings

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	2	3		2					2	2	2		
CO2	2	1	3	2	2		2					3	3	2		
CO3	2	2	2	1	3		3					2	1	2		
CO4	1	1	2	2	2		2					2	2	2		
CO5	2	2	2	1	3		1					1	2	3		
CO6	2	3	2	2	2		1					3	1	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE35	**CONCRETE TECHNOLOGY**		**L-T-P**	**C**
			3-0-0	**3**

Programme:	B.E. Civil Engineering	**Sem:**	**III**	**Category**	**PC**
Pre-requisites:	161CE21				
AIM:	To impart the knowledge about concrete making materials, properties of fresh and hardened concrete, special concretes, mix design and non-destructive testing.				

CONCRETE   9

Fresh concrete - Constituent materials – Cement – Manufacturing and chemical composition - Types and grades - Mechanism of hydration - Properties and tests - Aggregates - Water – Concrete manufacturing stages - Workability - Concepts and tests; Hardened concrete - Properties and tests.

CHEMICAL AND MINERAL ADMIXTURES   9

Necessity - Types - Chemical admixtures with specific properties - Accelerators - Retarders - Plasticizers and Super plasticizers - Water proofers - Mineral admixtures - Fly ash - Slag - Micro and Nano silica - Mineral additives and fillers and their effects on concrete properties.

MIX DESIGN   9

Concept and principles – Influencing factors - Types and methods - Design practice of ACI, British and IS method - Variability in test results - Sampling and acceptance criteria - Quality control - Software for mix design.

DESTRUCTIVE AND NON-DESTRUCTIVE TESTS   9

Creep of concrete - Shrinkage and thermal effects on concrete - Permeability - Air and water permeability tests & methods - Durability of concrete - Corrosion - Remedial measures - Destructive tests - NDT - Rebound Hammer - UPV - Corrosions Cell test.

SPECIAL CONCRETES AND CONCRETING METHODS

                                                                                9

Light weight concrete - Fibre reinforced concrete - Polymer concrete - Ferro-cement - Ready mix concrete- Self compacting concrete - High strength concrete - High performance concrete - Roller compacted concrete - Bio and bacterial concrete - Smart concrete - Extreme weather concreting - Vacuum dewatering concreting - Underwater concreting - Guniting and shotcreting .

TOTAL PERIODS : 45

TEXTBOOK(S)

1. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003.
2. Santhakumar,A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007.

REFERENCE BOOK(S)

1. Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007.
2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
3. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.

Course Outcomes:

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

CO1: Ability to test all the concrete materials as per IS code.
CO2: Describe the different types and necessity of admixtures.
CO3: Design concrete mix as per ACI, British and IS method.
CO4: Demonstrate the destructive and non-destructive tests of hardened concrete.
CO5: Invent special concretes and their specification.
CO6: Develop the underwater concreting, Guniting and shotcreting methods

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	2							2	3	3	2	
CO2	2	2	2	3	2							3	3	1	2	
CO3	2	2	3	2	2							2	1	3	2	
CO4	2	2	3	2	2							2	2	3	3	
CO5	2	2	3	2	2							3	3	2	2	
CO6	3	3	2	1	3							2	2	2	2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE37	**SURVEY PRACTICAL**	**L-T-P**	**C**
		0-0-4	2

Programme:	B.E., Civil Engineering	**Sem:**	**III**	**Category**	**PC**

Prerequisites: 161CE33

AIM: The aim of this course is to make the student familiar with geometric principles of surveying.

LIST OF EXPERIMENTS

1. Chain traversing.
2. Compass Traversing-open and closed Traversing.
3. Determination of reduced level Fly levelling using Dumpy level.
4. Check levelling.
5. Plotting LS and CS.
6. Contouring.
7. Measurement of horizontal angles by reiteration and repetition and vertical angles.
8. Theodolite survey traverse.
9. Trilateration.
10. Setting out works - Foundation marking
11. Field observation for and Calculation of azimuth, Latitude and Longitude.
12. Determination of angles and height measurement using total station.
13. Determination of area of a given plot using total station

TOTAL PERIODS : 45

REFERENCE BOOK(S)
1. Arora, K.R., "Surveying", Vol. I, II and III, Standard Book House, 2010.
2. Duggal R.K, "Surveying", Vol. I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

Course Outcomes:

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

CO1: Use conventional surveying tools such as chain/tape, compass and plane table
CO2: Apply the procedures involved in field work and to work as a surveying team.
CO3: Carryout a survey appropriately with the skill to understand the surroundings and Field observation
CO4: Estimate the horizontal and vertical angles and Calculate the azimuth, Latitude and Longitude
CO5: Estimate the angles and height measurement using total station
CO6: Examine setting out works and Foundation marking

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	3				2			3	3	2	2	1
CO2	1	2	1	3	2				2			3	3	1	2	2
CO3	1	1	1	2	2				2			3	1	3	3	2
CO4	3	2	1	2	2				2			3	3	3	2	3
CO5	3	2	1	1	2				2			3	1	2	2	1
CO6	2	2	2	2	2				1			3	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE38	**HYDRAULIC ENGINEERING LABORATORY**	**L-T-P**	**C**
		0-0-4	**2**

Programme:	B.E., Civil Engineering	**Sem:**	**III**	**Category**	**PC**
Prerequisites:	Nil				
AIM:	The aim of this course is to make the student to practice and get familiar with Hydraulic Engineering concepts and equipments.				

LIST OF EXPERIMENTS

1. Calibration of orifice for flow measurement in tanks
2. Flow measurement in Open channel using various types of Notches
3. Determination of co-efficient of discharge for venturimeter
4. Calibration of orifice meter to measure the flow of liquid through pipes
5. Computation of friction factor for the given pipe to calculate the head loss in pipe networks
6. Determination of various minor losses in pipes to compute the total head loss
7. Verification of Bernoulli's theorem to apply in flow measuring devices
8. Determination of efficiency of the Francis turbine used for hydropower generation
9. Performance characteristics of Kaplan turbine
10. Performance characteristics of Centrifugal pumps (Constant speed / variable speed)
11. Determination of efficiency of the reciprocating pump to decide its suitability for specific purpose.

REFERENCE BOOK(S)

1. VenTe Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi. 2003.

Course Outcomes:

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

CO1: Estimate the co-efficient of discharge for orifice and mouth piece, Notches, Venturimeter.
CO2: Discover the various minor and major losses in pipes.
CO3: Verify the Bernoulli's theorem to apply in flow measuring devices
CO4: Assess performance characteristics of Centrifugal pump and reciprocating pump.
CO5: Evaluate the efficiency of the Francis turbine and Kaplan turbine used for hydropower generation
CO6: Discover the efficiency of the reciprocating pump to decide its suitability for specific purpose.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	1	3	2				3			2	3	2	2	3
CO2	1	1	1	3	3				2			2	3	2	3	3
CO3	1	2	1	2	2				2			3	3	3	2	2
CO4	1	1	1	2	1				3			3	3	2	3	3
CO5	2	2	2	3	3				2			1	2	1	1	2
CO6	1	1		2	2				1			2	3	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS39   **FUNCTIONAL ENGLISH-I**

L-T-P	**C**
0-0-2	**-**

Programme: B.E. Civil Engineering   **Sem: III**   **Category EEC**
Prerequisites: 161HS21

Aim: To create an Environment to improve learner's communication skill.

UNIT I

GRAMMAR: Parts of Speech, Tense- simple present, perfect, continuous, present perfect continuous.

READING: Reading different genres of text (literature, media and technical) for comprehension. Reading for making inferences, reading news bulletins and weather forecast, advertisements.

WRITING: , Writing apology letters, Writing e-mail –difference between formal and informal mails, giving information, making an enquiry, answering, announcing a job opportunity, enquiry, confirming terms, informing about a new service.

LISTENING: Telephone etiquette- types of calls, greetings, making and receiving a call, transferring information, making appointments and closing a call. Listening to telephonic conversation, listening to famous personalities' speech.

SPEAKING: **Role play**- planning a training course, phoning a hotel, enquiring about a new job, launching a new product, negotiating a deal and interviewing someone about a change in job.

Just a minute- describing a business trip, the importance of internal communication of the company, describing a product and how it is advertised.

UNIT II

GRAMMAR: Simple past, perfect, continuous, past perfect continuous.

READING: Reading technical article and making notes, Reading a technical report for gist.

WRITING: Making and taking notes, writing project introduction, Writing for giving assurance and Notice, Agenda, Minutes.

LISTENING: Listening to documentaries, listening to interviews.

SPEAKING: Small talks- introducing oneself, remembering one's childhood, describing one's positive and negative features, making comparisons, describing abilities and skills, making requests and seeking permissions.

UNIT III

GRAMMAR: Simple future, perfect, continuous, future perfect continuous. Voice. Conditional Clause.

READING: Cloze test, Reading and answering questions, reading job advertisements, job interviews,

WRITING: Memos, writing user manuals, product review.

LISTENING: Listening to group discussion

SPEAKING: Expressing personal opinion about social issues.

Course Outcomes:
At end of this course, the students will be able to

CO1. Understand the basics of Language & Grammar relating to Business Communication
CO2. Develop learners ability to understand Technical communication
CO3. Extend learners ability to understand any kind of text
CO4. Learn the nuances of effective writing by using short and crisp sentences
CO5. Listen and understand talks and lectures on technical subjects
CO6. Improve both speaking and writing skills

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2			2				3	3	2	3			2	3
CO2					2	2			3	3	2	3			3	2
CO3		2		2	2				3	3	2	3			2	2
CO4					2				3	3	2	3			3	3
CO5		2		3					3	3	2	3			2	3
CO6					2	2	2	2	3	3	2	3			2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA42	NUMERICAL METHODS	L-T-P	C
		2-1-0	3

Programme: B.E. Civil Engineering   **Sem:**   **IV**   **Category**   **BS**

Pre-requisites: 161MA21,161MA31

AIM: To achieve high accuracy, many separate operate operation must be carried out.

TESTING OF HYPOTHESIS   12

Sampling distributions – Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.

SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   12

Newton-Raphson method – Gauss Elimination method – Pivoting – Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel – Matrix Inversion by Gauss-Jordan method – Eigen values of a matrix by Power method.

INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTERGRATION   12

Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 rules.

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIALEQUATIONS   12

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge- Kutta method for solving first and second order equations – Milne's predictor-corrector methods for solving first order equations – Finite difference methods for solving second order equation.

BOUNDARY VALUE PROBLEMS OF ORDINARY DIFFERENTIAL EQUATIONS   12

Finite difference methods for solving second order ordinary differentialequation- Finite differences solution of one dimensional heat equation by explicit and implicit methods - One dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL PERIODS: 60

TEXT BOOKS
1. Johnson, R.A., and Gupta,C.B., **"Miller and Freund's Probability and Statistics for Engineers",** Pearson Education, Asia, 7th edition, 2007(For units 3, 4 and 5).
2. G. Balaji, **"Statistics and Numerical Methods",** 11th Edition, G. Balaji Publishers, (2015).

REFERENCES

1. Walpole,R.E., Myers,R.H., Myers,S.L., and KYe,**"Probability and Statistics for Engineers and Scientists",** Pearson Education, Asia, 8th edition, (2007).

2. Spiegel,M.R., Schiller,J., and Srinivasan,R.A., **"Schaum's Outlines Probability and Statistics",** Tata McGraw Hill edition, (2004)

3. Chapra, S.C., and Canale, R.P., **"Numerical Methods for Engineers",** 5th Edition, Tata McGraw-Hill, New Delhi, (2007).

4. Gerald, C.F., and Wheatley, P.O., **"Applied Numerical Analysis",** 6th Edition, Pearson Education Asia, New Delhi, (2006).

5. Grewal, B.S. and Grewal,J.S., **"Numerical methods in Engineering and Science",** 6th Edition, Khanna Publishers, New Delhi, (2004)

Course Outcomes:

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

CO1: Solve the tests for single variance and equality of variances

CO2: Solve Eigen values of a matrix by Power method

CO3: Discover Numerical integration using Trapezoidal and Simpson's 1/3 rules

CO4: Apply Newton's forward and backward difference interpolation

CO5: Analyze the ODE by Numerical method

CO6: Analyze Solve the boundary value problem by Numerical method

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1										1	2			
CO2	2	2		2									2			
CO3	2	2		3								3	2			
CO4	1	1											2			
CO5	3	2		3								1	2			
CO6	1	1		1									2			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| **161CE41** | **MECHANICS OF SOLIDS - II** | | **L-T-P** | **C** |
| | | | **3-1-0** | **4** |

| **Programme:** | B.E. Civil Engineering | **Sem:** | **IV** | **Category** | **PC** |

Pre-requisites: 161CE31
AIM: To provide adequate knowledge on engineering properties of soil.

DELECTION OF DETERMINATE BEAMS   12

Governing differential equation – Macaulay's method – Moment area method – Conjugate beam method.

STATICALLY INDETERMINATE BEAMS   12

Analysis of propped cantilever and fixed beams - Theorem of three moments – Analysis of continuous beams - slope & deflections in continuous beams.

COLUMNS AND CYLINDRES   12

Euler's theory of long columns – Rankine-Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule – Thick cylinders – Compound cylinders - Thin Cylinders and Shell.

THEORIES OF FAILURE   12

Study on maximum stress and strain – Maximum shear stress – Maximum strain energy - Maximum energy of distortion – Octahedral shear stress – Theories of failure and their importance in design.

UNSYMMTRICAL BENDING AND SHEAR CENTRE   12

Significance of shear centre – Location of shear centre for thin walled open sections with one axis of symmetry – Analysis of stresses and deflections due to unsymmetrical bending.

TOTAL PERIODS: 60

TEXT BOOK(S)
1. Rajput R.K. Strength of Materials, S.Chand&company Ltd., New Delhi – 2006.
2. Srinath, L.S. Advanced mechanics and solids, Tata-McGraw Hill publishing company ltd, 2008.

REFERENCE(S)
1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company Ltd, 2007.
3. PunmiaB.C.Theory of Structures (SMTS) Vol 1&II, Laxmi publishing PvtLtd,New Delhi, 2004.

Course Outcomes:

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

CO1: Analyze the deflection of determinate beams.
CO2: Analyze for Statically Indeterminate beams
CO3: Apply the Euler's theory of long columns and Rankine-Gordon formula for eccentrically loaded columns
CO4: Illustrate the theories of failure and their importance in design.
CO5: Analyze the shear center and Locate the shear centre for thin walled open sections
CO6: Analyze various stresses and deflections due to unsymmetrical bending

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	2								3	2		
CO2	3	3	2	2	1								2	2		
CO3	2	3	2	2	2								3	1		
CO4	3	2	2	2	1								1	2		
CO5	2	3	2	2	3								3	3		
CO6	3	3	2	2	2								2	3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE42	APPLIED HYDRAULIC ENGINEERING	L-T-P	C
		2-1-0	3

Programme: B.E. Civil Engineering   **Sem:** IV   **Category** PC
Pre-requisites: 161CE32
AIM: To impart the student aware of hydraulic engineering concepts and methodology

OPEN CHANNEL FLOW   6+6
Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Manning's and Chezy's formula – Critical flow and its computation – channel transition.

UNIFORM FLOW   6+6
Uniform flow – Velocity measurement –Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections – Non-erodible channels.

NON-UNIFORM FLOW   6+6
Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions - Hydraulic jump – Types – Energy dissipation – Surges.

PUMPS   6+6
Centrifugal pump - minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done – rotary pumps.

TURBINES   6+6
Turbines - draft tube and cavitations – Application of momentum principle – Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - axial flow turbines – Impulse and Reaction.

TOTAL PERIODS : 60

TEXT BOOK(S)
1. Bansal R.K, Fluid mechanics & Hydraulic machines, Laxmi Publications; Ninth edition (2017).

REFERENCE(S)
1. Jain A.K., "Fluid Mechanics (including Hydraulic Machines)", Khanna Publishers, 10th edition. 2010.
2. Subramanya. K , "1000 solved problems in Fluid Mechanics including Hydraulic Machines" Tata McGraw – Hill Publishing company Limited, 2005.
3. Modi, P.N, and Seth S.M. Hydraulic and Fluid Mechanics Standard Book House, 2000.

Course Outcomes:

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

CO1: Show the basic equations of motion for moving fluids in open channel.
CO2: Apply the manning equation and Chezy's equation to describe uniform flow.
CO3: Classify the types of non-uniform flow.
CO4: Demonstrate the working principles of different types of pumps.
CO5: Develop the knowledge of engineering applications on turbines.
CO6: Relate the problems on different types of turbines.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	2								3	2		
CO2	2	3	1	2	3								2	1		
CO3	3	2	3	1	2								3	2		
CO4	1	3	2	2	3								1	2		
CO5	3	2	3	1	2								3	3	3	
CO6	2	3	2	2	2								1	2	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE43	MECHANICS OF SOILS	L-T-P	C
		3-0-0	3

Programme: B.E. Civil Engineering   **Sem:** **IV** **Category** **PC**

Pre-requisites: Nil

AIM: To Provide adequate knowledge of engineering properties of soil & mechanism of stress transfer in two phase systems.

INTRODUCTION   9

Nature of Soil - Problems with soil – Three phase relation - sieve analysis - sedimentation analysis – Atterberg'slimits - classification for engineering purposes - BIS Classification system – Soil compaction – comparison of laboratory & field compaction -factors affecting compaction – field compaction methods and monitoring.

SOIL WATER AND WATER FLOW   9

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy's Law-Permeability measurement in the laboratory – quick sand condition - Seepage – Laplace Equation for two dimensional flow - Introduction to flow nets –properties and uses - Application to simple problems.

STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT   9

Stress distribution in soil media – Boussinesque formula – stress due to line load and Circular and rectangular loaded area - approximate methods - Use of influence charts – Westergaard's equation for point load – Terzaghi's one dimensional consolidation theory – governing differential equation – laboratory consolidation test – Field consolidation curve – NC and OC clays - problems on final and time rate of consolidation.

SHEAR STRENGTH   9

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory – Saturated soil - Strength parameters - Measurement of shear strength, direct shear, Tri-axial compression, UCC and Vane shear tests –Types of shear tests based on drainage and their applicability - Drained and un-drained behavior of clay and sand – Stress path for conventional tri-axial test.

SLOPE STABILITY   9

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - Stability analysis for purely cohesive and C-soils - Method of slices – Modified Bishop's method - Friction circle method - stability number – problems – Slope protection measures.

TOTAL PERIODS:45

TEXT BOOK(S)

1. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, 2013.
2. Murthy, V.N.S., "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers, 2007.

REFERENCE(S)

1. McCarthy D.F., "Essentials of Soil Mechanics and Foundations Basic Geotechniques", Sixth Edition, Prentice-Hall, New Jersey, 2002.
2. Das, B.M, "Principles of Geotechnical Engineering", (fifth edition), Thomas Books/ cole, 2002
3. Muni Budhu, "Soil Mechanics and Foundations", John Willey & Sons, Inc, New York, 2000.
4. Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.

5. GopalRanjan and Rao A.S.R., "Basic and applied soil mechanics", New Age International Publishers, New Delhi, 2000.
6. Venkataramaiah C, "Geotechnical Engineering", New Age International Publishers, New Delhi, 2006.
7. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2005.

Course Outcomes:

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

CO1: Classify the soil based on its natural availability
CO2: Determine the permeability and seepage characteristics of soil.
CO3: Examine the stress in the soil using Boussinesque formula and Westergaard's equation
CO4: Estimate the shear strength of soil using Mohr - Coulomb failure theory
CO5: Demonstarte Slope failure mechanisms
CO6: Appraise total and effective stress analysis, Stability analysis for purely cohesive and C-soils

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2							2	2	3		
CO2	3	3	2	2	3							3	1	3		
CO3	2	3	2	1	1							2	3	2		
CO4	3	2	2	1	3							3	2	3		
CO5	2	3	3	2	3							2	3	2		
CO6	3	2	3	2	2							1	2	3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE44	CONSTRUCTION TECHNOLOGY	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	**Sem:**	**IV**	**Category**	**PC**
Pre-requisites:	161CE35				

AIM: To make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.

CONSTRUCTION PRACTICES   9

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.

SUB STRUCTURE CONSTRUCTION   9

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.

SUPER STRUCTURE CONSTRUCTION   9

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 - -Erection of articulated structures, braced domes and space decks.

CONSTRUCTION EQUIPMENT   9

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 and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling.

INDUSTRIAL STRUCTURES   9

Chimneys - Cooling towers - Silos - Bunkers - High tension transmission and telecommunication towers - Support structures for heavy equipment and conveyors - Escalators - Conduits for oil and fluids conveyance.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Peurifoy, Schexnayder, Shapira, "Construction Planning, Equipment and Methods", Tata McGraw Hill Education Private Ltd-7th edition, 2013.
2. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

REFERENCE(S)

1. Gambhir, M.L, Concrete Technology, Tata McGraw – Hill Publishing Company Ltd, New Delhi, 2004.
2. Sheety, M.S, Concrete Technology, Theory and Practice, S. Chand and Company Ltd, New Delhi, 2005.
3. National Building Code of India, Part V, "Building Materials", 2005.

Course Outcomes:

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

CO1: Illustrate the various construction practices.

CO2: Invent the construction techniques used for underground and under water structures.

CO3: Outline the various construction techniques involved in super structure.

CO4: Demonstrate the suitable equipment in the mechanized construction towards speedy completion of projects.

CO5: Show the basics of industrial structures construction and their utility.

CO6: Provide the equipements used for Support structures.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	3	3							3	2	3	3	
CO2	3	2	1	2	2							2	3	2	3	
CO3	2	3	2	2	2							3	2	2	3	
CO4	3	2	2	2	3							2	3	3	3	
CO5	3	2	3	2	2							2	2	1	3	
CO6	2	3	3	2	3							2	2	3	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE45	**WATER SUPPLY ENGINEERING**		L-T-P	C
			3-0-0	3
Programme:	B.E. Civil Engineering	**Sem:** IV	**Category**	**PC**
Pre-requisites:	Nil			
AIM:	To impart the knowledge on various stages of works involved in planning, designing and execution of protected water supply system to a town/city.			

WATER SUPPLY PERSPECTIVES   9

Objectives of public water supply scheme – Components of water supply project and scheme – Planning and financial aspects – Design period – Water quality parameters: physical, chemical and biological – MTFT and MFT tests – MPN and Thomas formulae – Water analysis and drinking water standards of India – Population forecasts: short and long term methods – Water demands and variation in demand pattern – Fire demand and MUDM formulae.

SOURCES OF WATER   9

Surface and ground water sources – Factors to be considered – assessment of capacity of impounding reservoirs: Mass in-flow curve and analytical methods – Elementary ground water hydrology – Assessment of yield of wells by steady-state methods (no derivation) – Field testing of wells for the yield –Construction, development and sanitary protection of wells – Intake structures and their selection.

TRANSMISSION OF WATER   9

Different categories of pipes used in transmission – Analysis and design of pressure pipes – Application of nomograms in the design – Pipe materials and their selection – Laying, jointing and testing of pipes – Pumping of water and selection of pumps – HP requirements and operating point of pumps – Pumping station and its requirement – Various valves used in transmission.

TREATMENT OF WATER   9

Unit operations and unit processes – Conventional and unconventional treatment units – Objectives, principles, operation, analysis and design of flash mixer, flocculator. Sedimentation and rapid sand filtration units - Objectives and principles of disinfection – Chlorination and its methods – Principles, objectives and operation of aeration, water softening, iron and manganese removal and fluoride removal.

STORAGE AND DISTRIBUTION OF WATER   9

Necessity and classification of storage tanks – Ground level and elevated reservoirs – Balancing and distribution reservoirs – Location and assessment of capacity of distribution reservoirs – Methods and systems of distribution of water – Objectives, requirements and functions of a distribution network – Application, merits and demerits of various types of distribution network – Analysis and design of distribution network by equivalent pipe method and Hardy-cross method of balancing – Maintenance and leak detection – Corrosion and its control – Langelier saturation index (LSI) – Appurtenance in distribution network and in buildings.

TOTAL PERIODS:45

TEXT BOOK(S)
1. Garg, S.K., Water Supply Engineering, Vol.1 Khanna Publishers, New Delhi, 2007.
2. Punmia, B.C., Ashok K Jain and Arun K Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2005.

REFERENCE(S)

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2003.
2. Syed R.Qasim and Edward M.MotleyGuang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Private Limited, New Delhi – 2006.
3. Modi.P.N. Water Supply Engineering, Vol. I Standard Book House, New Delhi, 2005.

Course Outcomes:

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

CO1: Estimate the total water demand for a town/city
CO2: Analyze the conduits for transportation of water from the source to treatment plant and to the City
CO3: Examine the physical, Chemical and biological characteristics different source of water
CO4: Interpret an appropriate treatment system for the water available at the source
CO5: Carryout a good water distribution system for an individual building and for a community.
CO6: Identify maintenance and leak detection, Corrosion and its control

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2	2	2					3	2	2		2
CO2	3	2	2	2	2	2	2					2	3	2		3
CO3	2	2	1	3	3	2	2					1	2	2		2
CO4	2	2	3	2	2	3	2					2	2	1		2
CO5	3	3	3	3	3	3	2					1	3	1		2
CO6	2	2	3	3	3	3	2					2	2	1		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE47	**STRENGTH OF MATERIALS LABORATORY**	**L-T-P**	**C**
		0-0-4	**2**

Programme: B.E. Civil Engineering   **Sem:** **IV** **Category** **PC**

Pre-requisites: 161CE31, 161CE41

AIM: The aim of this course is to make the student to practice and get familiar with strength of materials concepts

LIST OF EXPERIMENTS

1. Test involving axial tension to obtain the stress – strain curve and the strength
2. Test involving torsion to obtain the torque vs. angle of twist and hence the stiffness
3. Test involving flexure to obtain the load deflection curve and hence the stiffness
4. Tests on springs
5. Hardness tests
6. Double Shear test
7. Izod Impact Test
8. Charpy Impact Test
9. Compression Test on wood Specimen.
10. Compression Test on Brick and Pavement block. The student should learn the use of deflectometer, extensometer, compressometer and strain gauges.

TOTALPERIODS: 45

Standard Codes:

1. ASTM Standards
2. Indian Standards
(i). IS 516-1959-Indian Standard methods of Tests for strength of Concrete
(ii).IS 5242-1979-Indian Standard method of test for determining shear strength of metals
(iii).IS 1734(part 10)-1983- Indian Standard method of test for ply wood
(iv).IS 1598-1977- Indian Standard method of test for izod impact test of metals
(v). IS 1757-1988- Indian Standard method of test for charpy impact (V-Notch) on Metallic Material
(vi).IS 1501-2002- Indian Standard method for vickers hardness test for metallic materials
(vii).IS 1500-2005- Indian Standard method for brinell hardness test for metallic materials
(ix).IS 1586-2000- Indian Standard method for rockwell hardness test for metallic materials

REFERENCE BOOK(S)

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. PunmiaB.C."Theory of Structures" (SMTS) Vol 1&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.
3. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
4. Srinath, L.S, "Advanced mechanics and solids", Tata-McGraw Hill publishing company ltd, 2005.

Course Outcomes:

The Students will be able to

CO1: Extract basic material properties of wood, aluminum and steel such as evaluate Young modulus, tensional strength, hardness and tensile strength of given specimens from simple mechanical tests

CO2: Demonstrate the major equipments such as, Universal Testing Machine, Torsion Testing Machine

CO3: Appraise the flexural behavior of simply supported beam.

CO4: Interpret stiffness of open coiled and closed coiled springs

CO5: Estimate the compressive strength of concrete cubes and bricks and Pavement block

CO6: Analyse the use of deflectometer, extensometer, compressometer and strain gauges

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	2				3			3	3		3	
CO2	3	3	2	3	2				2			2	2		2	
CO3	3	3	2	3	2				3			1	3		3	
CO4	3	3	2	3	2				2			3	3		2	
CO5	3	3	2	3	2				2			2	2		2	
CO6	3	3	2	3	2				3			2	2		3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE48		**SURVEY CAMP**			L-T-P 0-0-4	C 2

Programme:	B.E., Civil Engineering	**Sem:**	**IV**	**Category**	**PC**

Pre-requisites:	161CE33, 161CE37

AIM:	The aim of this course is to make the student aware of surveying techniques and instruments.

LIST OF EXPERIMENTS

1. Study of theodolite
2. Measurement of horizontal angles and and vertical angles by reiteration and repetition method
3. Theodolite survey traverse
4. Heights and distances - Triangulation - Single plane method.
5. Trilateration.
6. Tacheometry - Tangential system - Stadia system - Subtense system.
7. Setting out works - Foundation marking - Simple curve (right/left-handed) – Transition curve.
8. Calculation of azimuth, Latitude and Longitude
9. Calculating and plotting the given area using Total Station
10. Calculating and plotting the given area using GPS

TOTALPERIODS: 45

REFERENCE BOOK(S)

1. Arora, K.R., "Surveying", Vol. I, II and III, Standard Book House, 2010.
2. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, Standard Publishers, New Delhi 2008.
3. Duggal R.K, "Surveying", Vol. I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

Course Outcomes:

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

CO1. Use the theodolite along with chain, tape on the field.
CO2. Apply field procedures in basic types of survey.
CO3. Defend accurate measurements using different surveying instruments.
CO4. Use geometric and trigonometric calculations of basic surveying.
CO5. Build advanced surveying instruments like total station and GPS.
CO6: List the different types of surveying techniques.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				2			3	3	3		2
CO2	2	2	2	2	2				3			3	2	3		2
CO3	3	3	3	3	3				2			2	3	2		3
CO4	2	2	2	2	2				2			3	2	2		2
CO5	2	3	3	3	3				3		2		3	2		2
CO6	3	2	2	2	3				2			3	2	3		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS49	**FUNCTIONAL ENGLISH-II**	**L-T-P**	**C**
		0-0-2	**-**

Programme: B.E. Civil Engineering   **Sem: IV**   **Category   EEC**

Prerequisites: 161HS21

Aim : To Create an Environment to experiment communication skills with Intermediate resources.

UNIT I
GRAMMAR: Concord, Sentence structure,

READING: Reading a passage and finding an error, reading charts, tables, graphs and maki22ng inference.

WRITING: Creative writing-paragraph and essay writing, writing memo

LISTENING: Listening to short conversation, instructions and directions.

SPEAKING: Describing- what I enjoy about my studies, describing about the history of a company, describing various designations in the company, describing a product and how it is advertised, describing the selection process of a company.

UNIT II

GRAMMAR: If clause.

READING: Reading leaflet and pamphlets, reading for gathering information.

WRITING: Writing report, proposals. Writing blogs,

LISTENING: Listening to lectures and ted talks.

SPEAKING: Mini presentation on technical topics- English for presentations- Difference between lecture speech and presentation- what makes a good presentation-planning, purpose, audience, gathering information, using av materials, gestures, and interaction ability.

UNIT III

GRAMMAR: Reported speech.

READING: Reading and interpreting visual material, reading online content and reading technical reports.

WRITING: Writing product review, writing instructions and recommendations.

LISTENING: Listening to technical presentation, speeches and interviews.

SPEAKING: Group discussion, general interaction.

Course Outcomes:

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

CO1: Develop grasping skill to interpret the text.

CO2: Create technical communication at work place.

CO3: Distinguish sounds of English to respond any queries.

CO4: Identify vocabulary for effective communication.

CO5: Evaluate the topic and Present personal opinion using suitable verbal cues.

CO6: Evaluate the topic and Present personal opinion using suitable non-verbal cues

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	2	1				2		3	2	3	2	
CO2	3	3	2	3	2	1				2		3	2	3	2	
CO3	3	3	2	3	2	1				2		3	2	3	2	
CO4	3	3	2	3	2	1				2		3	2	3	2	
CO5	3	3	2	3	3	1				2			2	3	3	
CO6	3	3	2	3	3	1				2			2	3	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE51	STRUCTURAL ANALYSIS - I	L-T-P	C
		3-1-0	4

Programme: B.E. Civil Engineering   **Sem:** V   **Category**   PC
Pre-requisites: 161CE41
AIM: To make the students conversant with classical method of analysis.

FUNDAMENTAL OF STRUCTURAL ANALYSIS   12

Determination of static indeterminacy and kinematic indeterminacy – Deficiency for beams, frames and pin-joined trusses – Behaviour of structures – Principle of superposition – Analysis of pin-jointed space trusses by method of Tension coefficient.

ENERGY CONCEPTS   12

Energy principles – Strain energy – Complementary energy – Principe of Virtual work – Principle of virtual displacement and virtual force – Castigliano's Theorems – Engessor's Theorem – Maxwell Betti's Theorem – Applications of the above principles to find deflections of statically determinate beams and plane trusses – Theorems of least work – Analysis of statically determinate beams (Upto two degree).

MOVING LOADS AND INFLUENCE LINES   12

Moving loads – Absolute maximum shear force and bending moment in simply supported beams – Determination of equivalent UDL – Influence line for shear force, bending moment and reactions in statically determinate beams and influence lines for forces in members of statically determinate plane trusses – Reversal of forces in members of plane trusses.

Influence lines for shear force, bending moment and reactions in statically indeterminate beams by Muller-Breslau's Principle – Application of Muller Breslau Principle to beams with degree of static indeterminacy not exceeding one.

ANALYSIS OF ARCHES   12

Analysis of three hinged arches of parabolic and circular profiles – Analysis of two hinged symmetric parabolic and circular arches. Settlement and temperature effects – Influence lines for bending moment, normal thrust and radial shear at sections of an arch.

CONSISTENT DEFORMATION METHOD   12

Application of Consistent Deformation method to the analysis of statically indeterminate beams and statically indeterminate plane trusses subjected to loads, lack of fit settlement and temperature effects – Analysis of Trussed beams.

TOTAL PERIODS: 60

TEXTBOOK(S)

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004.

2. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008.

REFERENCE BOOK(S)
1. Wang C.K., "Indeterminate Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
2. DevadasMenon, "Structural Analysis", Narosa Publishing House, 2008.
3. Ghali.A.,Nebille and Brown. T.G., "Structural Analysis - A unified classical and matrix approach" Sixth Edition, SPON press, New York, 2013.
4. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.
5. Vaidyanadhan.R and Perumal.P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2003.
6. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.

Course Outcomes:

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

CO1: Apply the fundamental concepts of static indeterminacy and kinematic indeterminacy structure.

CO2: Analyze of statically indeterminate beams and plane trusses by Energy principles

CO3: Examine the concepts of ILD and moving loads on determinate structures.

CO4: Analyze three hinged arches of parabolic and circular profiles

CO5: Analyze of statically indeterminate beams and plane trusses by Consistent Deformation method

CO6: Analyze of Trussed beams

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	2	2		1					2	3	1		2
CO2	3	3	2	3	1		1					2	1	2		2
CO3	3	2	2	2	3		1					2	2	3		2
CO4	2	3	1	3	1		1					3	1	3		2
CO5	2	3	2	2	2		1					2	1	2		2
CO6	1	3		2	2		1					2	2	2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE52	**IRRIGATION ENGINEERING**	**L-T-P**	**C**
		3-0-0	3

Programme: B.E. Civil Engineering   **Sem:**   **V**   **Category**   **PC**

Pre-requisites: 161CE42

AIM: To make the students aware of irrigation engineering concepts and water management.

IRRIGATION PRINCIPLES 9

Need and mode of irrigation – Merits and demerits of irrigation – Development of irrigation –– Tamilnadu scenario - Physical properties of soil -Soil moisture characteristics – Retention of water in soils and concept of plant available water – Movement of water into and within the soils - Duty, Delta, Base Period– Factors affecting Duty-Irrigation efficiencies–Consumptive use of water-Irrigation requirements of crops - Standards for irrigation water. Irrigation methods‑ Lift irrigation – Tank irrigation – Flooding methods – Sprinkler irrigation – Drip irrigation.

HYDROLOGY & DESIGN FLOOD ESTIMATION 9

Importance of hydrology – Hydrological cycle –Types of precipitation –Measurement of rainfall by rain gauges – Mean rainfall over a drainage basin – Various methods of computing runoff from its given rainfall – Design flood -Estimating design flood and flood flows.

DIVERSION AND IMPOUNDING STRUCTURES 9

Head works –Weirs and Barrage –Types of impounding structures - Factors affecting, location of dams - Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways -Energy dissipaters.

CANAL IRRIGATION 9

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works - Canal Outlet, Escapes –Lining and maintenance of canals.

IRRIGATION WATER MANAGEMENT 9

Modernization techniques – Rehabilitation – Command Area Development -Need for optimization of water use – Minimising irrigation water losses – On farm development works - Participatory Irrigation Management - Farmer's organization and turn over – Water users associations - Economic aspects of irrigation

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Garg, S.K., "Irrigation Engineering," Laxmi Publications, New Delhi, 2008.

REFERENCE(S)

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", StandardPublishers Distributors,New Delhi, 2009.
2. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice -Hall of India, NewDelhi, 2008.

3. Punmia, B.C., "Irrigation and Water Power Engineering", Laxmi Publishers, New Delhi, 2008.
4. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2009.
5. Sharma, R.K., and Sharma, T.K., "Irrigation Engineering", S. Chand and Company, NewDelhi, 2008.

Course Outcomes:

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

CO1: Generalise on suitable irrigation system requirements

CO2: Estimate design flood and flood flows

CO3: Summarize the various impounding structures.

CO4: Design canal drop using canal irrigation.

CO5: Develope irrigation water management modernization techniques

CO6: Outline the economic aspects of irrigation

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	3		3					2	3	2	3	
CO2	3	1	2	1	3		2					2	1	3	2	1
CO3	2	3	3	2	2		1					3	2	1	3	1
CO4	1	2	3	1	3		1					1	2	2	2	1
CO5	2	2	1	1	2		1					2	2	2	3	1
CO6	3	3	2	2	2		2					2	2	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE53	SANITARY ENGINEERING	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	**Sem:**	**V**	**Category**	**PC**
Pre-requisites:	161CE45				

AIM: To impart the basic knowledge on various stages of works involved in planning, designing and execution of underground drainage system for a town/city.

CHARACTERIZATION & COLLECTION OF SEWAGE 9

Aerobic and anaerobic decomposition of sewage – Physical ,chemical & Biological quality of sewage – BOD , testing procedure and BOD equation – Sources of wastewater generation –Estimation of sanitary sewage flow – Estimation of storm runoff – System of sanitation – Effluent standards.

SEWER DESIGN 9

Hydraulic design of sewer – principle– Problems in Hydraulic design of sewer – Sewer appurtenances– Maintenance of sewer– Pumping of sewage– Sewer material, laying and testing of sewer– Computer applications.

PRIMARY TREATMENT OF SEWAGE 9

Objective – Unit Operation and Processes – Selection of treatment processes – Onsite sanitation – Septic tank, Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Operation and Maintenance aspects

SECONDARY TREATMENT OF SEWAGE 9

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units – Activated Sludge Process and Trickling filter, Hybrid system- SBR, MBR, MBBR – Natural systems – ponds and lagoons – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage – Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

DISPOSAL OF SEWAGE AND SLUDGE 9
Standards for Disposal – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sewage farming – Deep well injection – Soil dispersion system – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

TOTAL PERIODS:45

TEXT BOOK(S)
1. Metcalf &Eddy:"Wastewater Engineering Treatment and Reuse", Tata McGraw Hill Publishers, New Delhi, 2010.
2. Garg S.K. "Sewage Disposal and Air Pollution Engineering", Khanna Publishers NewDelhi, 2008.

REFERENCE(S)
1. Manual on sewerage and sewage treatment, CPHEEO, Ministry of urban affairs & employment, Govt.of India, New Delhi, 2013.

2. Peavy, Rowe, Tchobanoglous, "Environmental Engineering", McGraw Hill Publishers, New Delhi, 2013.
3. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
4. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2009.

Course Outcomes:

At end of this course, the students will be able to
CO1: Classify characterization and collection of sewage
CO2: Design sewer, principle and Problems in Hydraulic design of sewer
CO3: Analysis and design of primary treatment of sewage.
CO4: Assemble the secondary treatment of sewege
CO5: Interpret the disposal of sewage and sludge
CO6: Build Advances in Sludge Treatment and disposal.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	2	2	3	3					3	3	2	3	2
CO2	3	3	2	3	2	2	2					2	3	1	2	1
CO3	2	2	2	2	2	3	3					2	3	2	2	2
CO4	3	3	3	2	3	3	3					2	3	3	2	2
CO5	3	2	2	3	3	3	3					2	3	2	2	2
CO6	2	2	2	3	2	2	2					3	2	2	3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE54	**HIGHWAY ENGINEERING**	**L-T-P** 3-0-0	**C** 3

Programme: B.E. Civil Engineering   **Sem:** V   **Category** **PC**

Pre-requisites: Nil

AIM: To make the students familiar with principles of highway planning and design.

HIGHWAY PLANNING AND ALIGNMENT 9

Highway Development in India - Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans- Concepts of ongoing Highway Development Programmes. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) -Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements -Traffic Signals.

GEOMETRIC DESIGN OF HIGHWAYS. 9

Design of Horizontal Alignment – Horizontal Curves Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves-Sight Distances – Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] -Geometric Design of Hill Roads [IRC Standards Only].

PAVEMENT DESIGN 9

Pavement components and their functions, Design principles of Flexible and Rigid Pavements, factors affecting design of pavements, Design practice for Flexible Pavements – Problems, Design practice for Rigid Pavements – Problems, Joints in Rigid pavements.

HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9

Desirable Properties and Testing of Highway Materials: Soil – California Bearing Ratio Test, Field Density Test - Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test - Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. - Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] - Highway Drainage [IRC Recommendations].

HIGHWAY MAINTENANCE 9

Defects in flexible pavements - symptoms, causes and treatments, Failures in rigid pavements – special repairs, Pavement Evaluation – surface and structural Evaluation and strengthening.

TOTAL PERIODS:45

TEXT BOOK(S)

1.Khanna K and Justo C E G, Veeraragavan A "Highway Engineering", 10th Edition, 2015.

REFERENCE(S)
1. Papacostas C.S., Prevedouros P.D. "Transportation Engineering & Planning", Prentice Hall of India Pvt ltd, 2006.
2. IRC Standards (IRC 37 - 2001 & IRC 58 -1998).
3. Bureau of Indian Standards (BIS) Publications on Highway Materials.
4. Specifications for Road and Bridges, MORTH (India).
5. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 5th Edition.

Course Outcomes:

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

CO1: Interpret the highway planning, engineering surveys for highway alignment

CO2: Design the geometric features of highway elements

CO3: Design the flexible and rigid pavements

CO4: Identify the desirable properties of highway materials and its standards

CO5: Assess symptoms, causes and treatments in highway maintenance

CO6: Evaluate surface and structural strengthening for rigid pavements

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3							3	3	3		
CO2	3	2	2	1	2							2	2	2		
CO3	3	2	3	2	3							2	2	3		
CO4	1	3	2	2	2							3	2	3		
CO5	2	2	2	2	2							2	2	2		
CO6	2	2	1	2	2							3	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE55	**FOUNDATION ENGINEERING**	**L-T-P**	**C**

161CE55   **FOUNDATION ENGINEERING**   **L-T-P**   **C**
                                                                          3-0-0   **3**

Programme: B.E. Civil Engineering   **Sem:** **V**   **Category** **PC**
Pre-requisites: 161CE43
AIM: To make the students familiar in the concepts of Foundation Engineering.

SITE INVESTIGATION AND SELECTION OF FOUNDATION   **9**

Scope and objectives – Methods of exploration-Auguring and boring – Wash boring and rotatory drilling – Depth of boring – Spacing of bore hole - Sampling – Representative and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Data interpretation (Strength parameters and Liquefaction potential) – Selection of foundation based on soil condition-Requirements of a good foundation.

SHALLOW FOUNDATION   **9**

Introduction – Location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure, Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements – Codal provision – Methods of minimizing settlement, differential settlement.

FOOTINGS AND RAFTS   **9**

Types of foundation – Contact pressure distribution below footings and raft - Isolated and combined footings – Types and proportioning - Mat foundation– Types, applications uses and proportioning--floating foundation.

PILES   **9**

Types of piles and their function – Factors influencing the selection of pile – Load Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hiley's) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, Converse Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test – Forces on pile caps – under reamed piles – Capacity under compression and uplift.

RETAINING WALLS   **9**

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesion less and cohesive soil - Coloumb's wedge theory – condition for critical failure plane - Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann) - pressure on the wall due to line load – Stability of retaining walls.

                                                                      TOTAL PERIODS:45

TEXT BOOK(S)

1. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, 2013.
2. Murthy, V.N.S., "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers, 2007.

REFERENCE(S)

1. Das, B.M. "Principles of Foundation Engineering (Fifth edition), Thomson Books / COLE, 2003
2. Punmia, B.C, Ashok kumar jain and Arun kumar jain "Soil Mechanics and Foundations", Laxmi publications pvt. Ltd., New Delhi, 16th edition 2005.
3. Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, New Delhi, 2007.
4. Venkataramaiah, "Geotechnical Engineering", New Age International Publishers, New Delhi, 2006.
5. Gopal Ranjan and Rao A.S.R., "Basic and applied soil mechanics", New Age International Publishers, New Delhi, 2000.

Course Outcomes:

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

CO1: Inspect the site and selection of foundation based on soil condition

CO2: Summarize factors affecting bearing capacity,problems and insitu tests for shallow foundation

CO3: Examine raft and footings based on contact pressure distribution.

CO4: Develop load carrying capacity and settlement of piles and pile group

CO5: Utilize Rankine's theory for cohesion less and cohesive soil

CO6: Examine the behavior of soil behind retaining structures.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3							3	3	2		
CO2	3	2	3	2	2							2	3	2		
CO3	2	3	3	2	3							2	2	3		
CO4	3	2	1	3	2							3	3	3		
CO5	2	3	2	2	2							2	2	2		
CO6	2	2	2	3	2							3	1	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE56   **REINFORCED CONCRETE STRUCTURES - I**   **L-T-P**   **C**

                                                                              3-1-0   **4**

Programme: B.E. Civil Engineering   **Sem:** **V**   **Category** **PC**

Pre-requisites: Nil

AIM: The aim of this course is to make the students to design the RC elements in limit state method

LIMIT STATE DESIGN FOR FLEXURE   12

Fundamentals – Types of reinforcement specifications as per IS 1786:2008 – Stress-Strain curve for deformed bars – Concept of Working Stress Design (WSD) and Limit State Design (LSD) – Difference between WSD and LSD – Characteristics loads and strengths –Partial Safety factor – Various limit states. Design of singly and doubly reinforced rectangular and flanged sections – Design of Lintels – Design of continuous beams using B.M and S.F co-efficient as per IS code – detailing.

DESIGN FOR BOND, ANCHORAGE, SHEAR AND TORSION   12

Behaviour of RC members in bond and anchorage – Curtailment of reinforcement - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending, shear and torsion. I.S code provisions for the design of Beams – Detailing.

DESIGN OF SLABS   12

Types of slabs – I.S code regulations – stiffness requirements – Design of One Way simply supported and continuous slab using B.M and S.F co-efficient as per I.S code – Principles of Rankine – Grashof's method – Design of Two way simply supported and continuous slab as per IS code.

Design of waist slab for dog legged stair case – Detailing of Tread-Riser type stair case.

DESIGN OF COLUMNS   12

IS code regulations - Design of short Rectangular and circular columns subjected to axial compressive load - Design of short columns subjected to combined axial compressive load and uni axial and biaxial bending moments using Design Aids (SP16).

DESIGN OF FOOTING   12

Design of wall footing – Design of Isolated, square and rectangular footings – Combined rectangular and trapezoidal footing – Design of pile and raft foundation.

                                                                    TOTAL PERIODS: 60

TEXT BOOK(S)

1. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers &Distributors, New Delhi, 2012.
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd.,New Delhi 2014.

REFERENCE(S)

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd., New Delhi 2010.
2. UnnikrishnaPillai, S., DevdasMenon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi 2009.
3. Punmia B. C, Ashok. Kumar Jain, Arun Kumar Jain "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd, New Delhi 2007.

CODE REFERENCES

1. IS 456 – 2000 - Plain and Reinforced Concrete – CODE OF PRACTICE (Fourth Revision)
2. SP 16 - Design Aids for Reinforced Concrete to IS 456:1978.

Course Outcomes:

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

CO1: Design the reinforced concrete flexural members by limit state method.
CO2: Design the bond, Anchorage, Shear and Torsion for reinforced concrete elements.
CO3: Design the reinforced concrete slabs by limit state method
CO4: Design the reinforced concrete columns by limit state method
CO5: Design the reinforced concrete footings by limit state method
CO6: Design of pile and raft foundation.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2							3	2	3		
CO2	2	2	2	3	2							2	3	2		
CO3	2	2	2	2	3							3	2	2		
CO4	2	2	3	2	2							2	3	3		
CO5	2	2	3	2	2							3	2	3		
CO6	2	3	2	1	3							2	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE57   **CONCRETE AND HIGHWAY ENGINEERING LAB**   **L-T-P   C**
                                                                                        0-0-4   2

Programme: B.E. Civil Engineering   **Sem: V   Category   PC**
Pre-requisites: 161CE35

AIM: The aim of this course is to make the students to practice and get familiar with the properties of concrete and highway materials

LIST OF EXPERIMENTS

1. Determination of Consistency Cement.
2. Determination of Initial and final setting time of Cement.
3. Fineness test and Soundness test on Cement.
4. Determination of Specific gravity of fine and coarse aggregate.
5. Sieve analysis-fineness modulus test on fine and coarse aggregate.
6. Water Absorption
7. Mix design IS, ACI
8. Slump test
9. Compaction factor test
10. Determination of Compression strength of hardened concrete.
11. Determination of Split tensile strength of hardened concrete. flexure test
12. Determination of Flexure strength of hardened concrete.
13. Determination of Aggregate impact value
14. Aggregate crushing strength test
15. Softening point
16. Penetration test on bitumen
17. Specific gravity test on bitumen.

TOTAL PERIODS: 45

REFERENCE BOOK(S)

1. M.L.Gambhir, NehaJamwal, "Building and Construction Materials – Testing and Quality Control(LabManual)",McGraw Hill Education (India) Private Limited, New Delhi, 2014
2. M.S.Shetty, "Concrete Technology, Theory & Practice", S.Chand and Co, New Delhi, 2004.
3. Khanna,S.K, Justo,C.E.G."Highway material testing (LaboratoryManual)", NemChand & Bros, Roorkee (U.P), Revised Edition, 2009.

Course Outcomes:

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

CO1: Evaluate all the concrete materials as per IS code
CO2: Design the concrete mix dusing ACI and IS code methods
CO3: Demonstrate properties of concrete experimentally
CO4: Summarize special concretes and its specific applications
CO5: Justify quality control while testing/ sampling and acceptance criteria
CO6: Appraise the properties and characteristics of bitumen.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3				2			2	3	2	2	2
CO2	2	2	3	3	2				3			2	3	2	2	3
CO3	2	2	3	2	3				2			3	2	3	2	2
CO4	3	2	3	2	3				2			3	2	3	1	1
CO5	2	2	2	3	2				2			3	2	2	2	2
CO6	3	3	2	2	2				3			2	3	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE58	**SOIL MECHANICS LABORATORY**	**L-T-P**	**C**
		0-0-4	**2**

Programme:	B.E. Civil Engineering	**Sem:**	**V**	**Category**	**PC**

Pre-requisites: 161CE43

AIM: The aim of this course is to make the students to practice and get familiar with the properties of soil.

LIST OF EXPERIMENTS

1. Grain size distribution - Sieve analysis
2. Grain size distribution - Hydrometer analysis
3. Determination of Specific gravity of soil grains
4. Relative density of sands
5. Atterberg limits test
6. Determination of moisture - Density relationship using standard Proctor test.
7. Permeability determination (constant head and falling head methods)
8. Determination of shear strength parameters.
9. Direct shear test on cohesion less soil
10. Unconfined compression test on cohesive soil
11. Tri-axial compression test (demonstration only)
12. One dimensional consolidation test (Demonstration only)
13. Field density test (Core cutter and sand replacement methods)
14. Standard Penetration Test.

TOTAL PERIODS: 45

REFERENCE BOOK(S)

1. GopalRanjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2000.
2. Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", Newage International (P) Limited Publishers, New Delhi, 2002.

Course Outcomes:

At end of this course, the students will be able to
CO1: Classify the soil based on index and engineering characteristics
CO2: Evaluate the shear strength parameters for different types of soils
CO3: Examine the consolidation and permeability characteristics of soil
CO4: Analyze the bearing capacity of soil from field exploration
CO5: Estimate the density of soil using field test
CO6: Demonstrate one dimensional consolidation test

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3				2			2	3	2	2	2
CO2	2	2	3	3	3				3			2	3	2	2	3
CO3	2	2	2	2	2				2			3	2	3	2	1
CO4	3	2	3	2	2				3			3	1	3	1	3
CO5	2	2	2	1	2				2			3	1	2	2	2
CO6	2	2	2	2	3				2			2	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS59   **CAREER ENGLISH I**   **L-T-P**   **C**
                                                                                       0-0-3   **1**
Programme: B.E. Civil Engineering   **Sem:**   **V**   **Category**   **EEC**
Pre-requisites: 161HS41
 Aim: To Improve learner's Communication Skills in English

UNIT I   **6**
  Elements of effective presentation – Structure of presentation - Presentation tools –
  Voice   Modulation –   Audience   analysis - Body   language – Video   samples

UNIT II   **6**
  Time management – Articulateness – Assertiveness – Psychometrics –Innovation and Creativity -
  Stress Management & Poise - Video Samples.

UNIT III   **6**
  Covering letter- strategies to write, resume and it's various kinds.

                                                                   Total Periods: 18

 Course Outcomes:

At the end of the Course students will be able to,
CO1: To train the students in Language Skills, Soft Skills, Inter Personal Skills, Decision Making
and Business Communication.
CO2: Inter Personal Skills,Decision Making and Business Communication.
CO3: To be competent in Presentation skill.
CO4: To imbibe the knowledge of effective classroom speaking and presentation.
CO5: To provide opportunities to learners to practice their communicative skills to become proficient users of
English.
CO6: Write job applications

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2	2						3	3	3	3				
CO2										3		2				
CO3				2		2			1				2			3
CO4	2				2	3		2			2				2	3
CO5					2	3		2							2	3
CO6				3		3								3		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| **161HS61** | **ENGINEERING ECONOMICS AND MANAGEMENT** | **L-T-P** | **C** |
| | | **3-0-0** | **3** |

Programme: B.E. Civil Engineering   **Sem:** **VI**   **Category**   **HS**

Pre-requisites: Nil

AIM: To impart knowledge about basics of economics and cost analysis related to engineering so as to take economically sound decisions

FUNDAMENTALS OF ECONOMICS   9

Concept and scope of engineering economics - basic concepts of goods, utility, value and wealth - relation between economic decision and technical decision - Law of demand & supply – factors influencing demand - elasticity of demand – demand forecasting - Basic economic problems - causes, types and measures to control Poverty, Un employment and Inflation.

THEORY OF PRODUCTION   9

Theory of production; production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur) - Law of variable proportions & law of returns to scale - Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection - Corporate Social Responsibility; meaning, importance - Business Ethics; meaning, importance.

FUNCTIONS OF MANAGEMENT   9

Introduction to Management & administration, skill, types and roles of managers – Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory – Functions of Management – Planning, Organizing, Staffing, Directing, Controlling – Organizational Structures; meaning, principles of organization, types (explanation with merits and demerits), span of control, departmentalization.

DEPRECIATION AND REPLACEMENT ANALYSIS   9

Depreciation – various methods of depreciations – inflation adjusted decisions – procedure to adjust inflation – Types of maintenance – types of replacement problem - determination of economic life of an asset – replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender.

COST ANALYSIS   9

Types of costing – traditional costing approach – activity base costing – cost output relationship in the short run and in long run – types of pricing and its practice – appraising project profitability – internal rate of return – payback period – net present value – cost benefit analysis –feasibility reports- break even analysis - managerial uses of break even analysis.

TOTAL PERIODS: 45

TEXTBOOK(S)

1. Dewett K.K. &Varma J.D., "Elementary Economic Theory", S Chand & Co., 2006.
2. Suma Damodaran, "Managerial economics", Oxford University press 2006.

REFERENCE BOOK(S)

1. Sharma,K.K , "Principle of Economics", Abishek publications,2002.
2. PanneerSelvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

Course Outcomes:

At end of this course, the students will be able to
CO1: Explain about the fundamentals of economic concepts
CO2: Describe the concept of theory of production and Human resource management
CO3: Demonstrate the Management Principles, functions of management & organizational structures
CO4: Adjust inflation and solve different types of replacement problems
CO5: Prepare internal rate of return, payback period, net present value
CO6: Estimate the cost benefit analysis

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	2			2	1		2	1	1		2	1
CO2	1	1	2	2	1			2	1		1	1	1		2	2
CO3	2	2	2	1	1			1	3		2	1	2		2	2
CO4	2	1	1	2	2			1	2		1	1	1		2	2
CO5	2	2	2	2	2			2	1		1	1	1		2	2
CO6	2	2	2	2	2			2	1		1	1	1		2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE61	**STRUCTURAL ANALYSIS - II**		**L-T-P**	**C**
			3-1-0	**4**

Programme:	B.E. Civil Engineering	**Sem:**	**VI**	**Category**	**PC**
Pre-requisites:	161CE51				

AIM: To gain knowledge about analytical skills for finding the forces and moments in the structure.

SLOPE DEFLECTION METHOD   12

Application of slope deflection method to the analysis of statically indeterminate beams and rigid jointed plane frames – Effects of settlement of supports for beams only (Examples on structures having Kinematic indeterminacy not exceeding three)

MOMENT DISTRIBUTION METHOD   12

Stiffness and carry over factors for prismatic and non prismatic members – Application of the method to the analysis of continuous beams and rigid jointed plane frames – Effects of settlement of supports – Symmetric and skew symmetric loading.

MATRIX FLEXIBILITY METHOD   12

Element flexibility – Structure flexibility – formulation of Structure flexibility matrix – Determination of forces / displacements – Application to simple determinate and indeterminate beams, frames and trusses.

MATRIX STIFFNESS METHOD   12

Element stiffness – Structure stiffness – formulation of Structure stiffness matrix – Application to simple determinate and indeterminate beams, frames and trusses.

INTRODUCTION TO FINITE ELEMENT METHOD   12

Basic steps – Concept of an element – Various element shapes – Application of FEM – Limitation – Element stiffness matrix for 1-D members – Procedure of assembly and solving equations (No Problems).

TOTAL PERIODS: 60

TEXT BOOK(S)

1. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2008.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications, 2004.

REFERENCE BOOK(S)

1. Ghali.A, Nebille,A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach" 6th edition. Spon Press, London and New York, 2013.

2. Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 2003.

3. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.

4. Pandit G.S. & Gupta S.P. "Structural Analysis – A Matrix Approach", Tata McGraw Hill 2004.

5. William Weaver Jr. & James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, Delhi, 2004.

6. Negi L.S. &Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 2003.

Course Outcomes:

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

CO1: Analyse a structure using slope deflection method

CO2: Analyse a structure using moment distribution method

CO3: Analyse a structure using matrix flexibility method

CO4: Analyse a structure using matrix stiffness method

CO5: Analyse a structure using finite element method

CO6: Identify Element stiffness matrix for 1-D members

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	2	1			1			2	2	3		1
CO2	2	2	1	2	2	1			1			3	2	1		1
CO3	2	1	2	2	1	1			1			2	2	3		1
CO4	1	2	3	2	2	1			1			1	2	1		1
CO5	2	2	2	1	3	1			1			2	3	2		1
CO6	3	1	2	2	3	1			1			2	3	1		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE62	**REINFORCED CONCRETE STRUCTURES - II**	L-T-P	C
		3-1-0	4

Programme: B.E. Civil Engineering   **Sem: VI**   **Category**   **PC**

Pre-requisites: 161CE56

AIM: To make the students familiar with the design of RC structures.

YIELD LINE THEORY   12

Introduction to yield line theory of slabs – Application to square and rectangular slabs with simply supported or fixed boundary conditions subjected to uniformly distributed and central concentrated loads (by upper bound theorem). Concept of corner lever.

BUILDIN FRAME   12

Difference between multistory load bearing and framed structures – Elastic analysis using suitable substitute frames for gravity loadings – Approximate analysis of single and two bay frames upto 3 storeys for wind loads using portal and cantilever methods.

FLAT SLABS AND WALLS   12

Design of Flat slabs using IS code – Direct design method – Detailing – Design of Reinforced concrete walls using IS code.

RETAINING WALLS   12

Design of cantilever and counterfort retaining walls for level surface filled with / without uniform surcharge – Stability requirements – Description of inclined backfill.

WATER TANKS   12

Classifications – Based on shapes, levels and functions – Principles of design – IS code provision – No tension basis – Design of underground rectangular tank – Design of overhead rectangular and circular tanks – Design of staging for rectangular tank – Descriptions of Intz type tank.

TOTAL PERIODS:60

TEXT BOOK(S)

1. Purushothamaraj.P.,"Design of RC & Brick Masonry Structures"Lakshmi Publications Chennai,2012.
2. Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, Delhi, 2006.

REFERENCE(S)

1. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company
2. Ram Chandra.N. andVirendraGehlot, "Limit State Design", Standard Book House.2004.
3. Varghese, P.C., "Limit State Design of Reinforced Concrete Structures" Prentice hall of India PvtLtd New Delhi, 2007.
4. IS456 - 2006 Code of practice for Plain and reinforced concrete code of practice.

Course Outcomes:

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

CO1: Design of slabs using yield line theory
CO2: Design of building frame using portal and cantilever methods
CO3: Design of flat slab and concrete walls using IS codes
CO4: Design the cantilever and counterfort retaining wall
CO5: Classify water tank based on shapes, levels and functions
CO6: Design of below and overhead water tank using IS code provisions

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	2	3							2	3	2		
CO2	1	2	1	1	2							3	2	2		
CO3	2	2	2	2	2							2	2	3		
CO4	1	2	2	2	2							2	2	2		
CO5	2	3	2	3	2							2	2	3		
CO6	2	1	2	2	2							2	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE63	**RAILWAY, AIRPORT AND HARBOUR ENGINEERING**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering **Sem: VI**	**Category**	**PC**
Pre-requisites:	161CE54		
AIM:	To make the students aware of railways, airports and harbor design and planning.		

RAILWAY COMPONENTS   9

Comparison of railway and highway transport – Organization of Indian railways – Railway board – Zonal railways, different production units, undertakings, organizations, divisions – Railway terminology – Wheels – Rails – Sections – Length – Failures, wear on rails – Long welded rails – Rail joints – Creep – Effects – Remedies – Sleepers – Track fitting and fastenings – Ballast – Sub grade and Embankment – Track alignment – Surveys.

RAILWAY TRACK CONSTRUCTION   9

Gradients – Speed, degree of curves, super elevation and cant deficiency – Negative super elevation – Curves – Points and crossings –Necessity – Turnouts – Switches – Types of switches crossing – Components, types – Sleeper at points and crossings.

RAILWAY OPERATION AND MAINTENANCE   9

Stations and yards – Requirements, classification, layout of station – Platform – Loops, siding and level crossing – Loco sheds – Derailing switches, Fouling marks, Butter stop – Sand hump – Signaling – Object engineering principles – Classification and types – interlocking of signals and points.

AIRPORT   9

Role of ICAO, FAA, DGCA and AAI – Aircraft characteristics – Airport site selection – Surveys – Drawings – Orientation of runway, windrose diagram – ICAO classification of Airports – Runway geometrics – Corrections for length – Taxiway geometrics – Layout of airports, Apron, Hanger – Airport marking and Lightings – Air traffic control – ILS

HARBOUR   9

Definitions: Harbor, port, marine terminal, offshore mooring, anchorage area, turning basin, length, beam, draft, load line, dead weight tonnage, warehouse, transit shed – Planning, site selection – Layout of harbours – Classification of harbours – Break water classification and sections of different types of break waters – Docks – Jetty, quay, quay wall – Dolphins – Fenders – Navigational aids – Necessity and types.

TOTAL PERIODS: 45

TEXT BOOK(S)

1. Rangwala S.C, Rangwala P.S, "Railway Engineering", Charotar Publishing House Pvt. Limited, 2008.
2. SaxenaSubhash C and Satyapal Arora, "A Course in Railway Engineering" , Dhanpat Rai and Sons, Delhi, 2006.

REFERENCE(S)

1. Rangwala S.C, Rangwala P.S, "Railway Engineering", Charotar Publishing House Pvt. Limited, 2008.
2. Khanna S K, Arora M G and Jain S "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2005.
3. J.S. Mundrey, "A course in Railway Track Engineering". Tata McGraw Hill, 2000.

Course Outcomes:

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

CO1: Explain the various concepts in railway, their functions and its geometric design

CO2: Illustrate construction, maintenance and operation of railway track

CO3: Summarize the concepts of Airport planning and design

CO4: Identify the airport layouts, visual aids and air traffic control

CO5: Explain various components of harbour, its function and layout

CO6: Outline Docks, Fenders and Navigational aids

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2							2	3	2	2	
CO2	2	2	3	2	3							3	3	1	3	
CO3	2	3	2	2	3							2	2	3	3	
CO4	2	2	1	3	2							2	2	3	2	
CO5	2	3	2	1	2							2	2	2	1	
CO6	1	2	1	2	2							2	2	3	2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE67	**STRUCTURAL DESIGN AND DETAILING LABORATORY**		**L-T-P**	**C**
			0-0-4	**2**

Programme: B.E. Civil Engineering   **Sem:** **VI** **Category** **PC**

Pre-requisites: 161CE62

AIM: To make the students familiar with the design concepts and computer aided structural drawings.

LIST OF EXPERIMENTS

1. Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details

2. Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details

3. Design and drafting of Intz type water tank, Detailing of circular and rectangular water tanks

4. Design of plate girder bridge – Twin Girder deck type Railway Bridge – Truss Girder bridges – Detailed

Drawings including connections.

5. Design and detailing of T-Beam Slab

6. Design and detailing of Column and Footing.

TOTAL PERIODS: 45

REFERENCE(S)

1. Purushothamaraj.P.,"Design of RC & Brick Masonry Structures"Lakshmi Publications Chennai,2012.
2. Krishna Raju, N., "Design of ReinforcedConcrete Structures", CBS Publishers & Distributors, New Delhi, 2012.
3. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi 2014.
4. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi 2010**.**

IS CODES:

1. IS 456:2000 - Code of Practice for Plain and Reinforced Concrete
2.IS 875(1-5):1987 - Code of Practice for Design Loads (Other than Earthquake) for Buildings andStructures.
3. SP (16): 1980 - Design Aids for Reinforced Concrete to IS: 456-1978.
4. IS 800:2007 and IS 800:1984 - Codes of Practice for General Construction in steel.
5. SP6: Part 1:1964 - Handbook for Structural Engineers.
6. IS 3370: 2009 - Concrete structures for storage of liquids – Code of practice
7. IS 804: 1967 (reaffirmed in 2008) - Specifications for Rectangular steel tanks.
8. IS 805:1968 (reaffirmed in 2008) - Code of practice for use of steel in gravity water tanks

Course Outcomes

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

CO1: Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls

CO2: Design and draw flat slab as per codal provisions

CO3: Design and draw reinforced concrete water tanks

CO4: Design and draw reinforced concrete and steel bridges

CO5: Design and detail the various types of column and footing

CO6: Design and detailing of T-Beam Slab

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	2	3				3			3	3	2	2	2
CO2	2	2	3	2	2				2			3	3	3	3	2
CO3	2	2	3	3	3				2			3	3	2	3	1
CO4	2	2	3	2	3				3			3	2	2	2	2
CO5	2	2	2	2	2				2			2	2	3	3	3
CO6	2	3	2	2	2				3			2	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE68	**ENVIRONMENTAL ENGINEERING LABORATORY**	**L-T-P**	**C**
		0-0-4	**2**

Programme:	B.E. Civil Engineering	**Sem:**	**VI**	**Category**	**PC**
Pre-requisites:	161CE45				

AIM: This laboratory course work is intended to impart hands on training in evaluating the water quality parameters, wastewater characteristics.

List of Experiments

1. Sampling and preservation methods and significance of characterization of water and wastewater.
2. Determination of i) pH and turbidity ii) Hardness
3. Determination of fluorides in drinking water - Spectro photometric analysis.
4. Determination of residual chlorine
5. Determination of Alkalinity,Chlorides.
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate in water sample.
8. Determination of Optimum Coagulant Dosage
9. Determination of Nitrates- Spectro photometric analysis.
10. Determination of chlorination of water.
11. Determination of Dissolved oxygen in drinking water.
12. Determination of Total solids,suspended solids, Dissolved solids,organic solids, inorganic solids in water and waste water samples
13. Determination of BOD.
14. Determination of COD.
15. Determination of potassium in water samples – Flame photometer
16. Determination of Sodium in water samples – Flame photometer.
17. Introduction to Bacteriological Analysis (Demonstration only)

TOTAL PERIODS:45

REFERENCE(S)

1. American Public Health Association (APHA) 2005, Standard methods for the examination of water & wastewater. 21st edition, Eaton, A.D., Clesceri, L.S., Rice, E.W., Greenberg, A.E., Franson, M.A.H. APHA, Washington.
2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi.
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6.

IS CODES

1.IS 3025 : Part 58 : 2006 Methods of sampling and test (Physical and Chemical) for water and wastewater: CHEMICAL OXYGEN DEMAND (COD).

2. IS 3025 : Part 21 : 2009 Methods of sampling and test (Physical and Chemical) for water and wastewater : Hardness

3. IS 3025 : Part 23 : 1986 Methods of sampling and test (Physical and Chemical) for water and wastewater : Alkalinity

4. IS 3025 : Part 32 : 1988 Methods of sampling and test (Physical and Chemical) for water and wastewater : Chloride

5. IS 3025 : Part 34 : 1988 Methods of sampling and test (Physical and Chemical) for water and wastewater : Nitrate

5. IS 3025 : Part 24 : 1986 Methods of sampling and test (Physical and Chemical) for water and wastewater : Sulphate

6. IS 3025 : Part 60 : 2008 Methods of sampling and test (Physical and Chemical) for water and wastewater : Fluoride

7. IS 3025 : Part 10 : 1984 Methods of sampling and test (Physical and Chemical) for water and wastewater : Turbidity

8. IS 3025 : Part 16 : 1984 Methods of sampling and test (Physical and Chemical) for water and wastewater : FILTERABLE RESIDUE (TOTAL DISSOLVED SOLIDS)

9. IS 3025 : Part 11 : 1983 Methods of sampling and test (Physical and Chemical) for water and wastewater : pH VALUE

10. IS 3025 : Part 44 : 1993 Methods of sampling and test (Physical and Chemical) for water and wastewater : BIOCHEMICAL OXYGEN DEMAND (BOD)

12. IS 3025 : Part 58 : 2006 Methods of sampling and test (Physical and Chemical) for water and wastewater: CHEMICAL OXYGEN DEMAND (COD).

Course Outcomes:

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

   CO1: Examine optimize coagulant dosage for turbidity removal and to optimize chlorine dosage for disinfection of water.

   CO2: Evaluate the water quality parameters

   CO3: Estimate the BOD and COD of water sample

   CO4: Inspect the chemical characteristics of Water and Wastewater

   CO5: Carry out Sodium in water samples usingFlame photometer

   CO6: Demonstrate Introduction to Bacteriological Analysis

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	2	3	3	2	2		3			3	3	2		3
CO2	3	2	3	2	3	3	2		2			2	2	3		2
CO3	2	3	2	3	2	2	3		2			3	2	2		2
CO4	2	2	3	2	2	2	2		3			2	2	3		3
CO5	3	2	2	3	2	2	3		2			3	2	2		2
CO6	2	3	2	2	2	3	2		2			3	3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS69   **CAREER ENGLISH II**   **L-T-P**   **C**
                                                                          0-0-2   **-**
Programme: B.E. Civil Engineering   **Sem:**   **VI**   **Category**   **EEC**
Pre-requisites: 161HS51

Aim: To practice English for Enhancing Employability skills.

Verbal analogy, verbal reasoning, error spotting, sentence completion.   6

Why is GD part of selection process? - Structure of GD – Moderator – led and   6
other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video
samples.
1. Resume / Report Preparation /
2. Presentation Skills: Students make presentations on given topics. (8)   6
3. Group Discussion: Students participate in group discussions. (6)
4. Interview Skills: Students participate in Mock Interviews (8)

Course Outcomes:

At the end of the Course students will be able to,
CO1: To enlarge the students' aptitude and reasoning skills.
CO2: To acquire knowledge about the various principles of communication, understand its
various stages and the role of audience and purpose, deal with the barriers that affect
communication in a professional set up.
CO3: To practice English for Enhancing Employability skills
CO4: To develop students job prospects through oral communication.
CO5: To enhance the performance of learners at placement interviews
CO6: To encourage the group discussions and other recruitment procedures.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1					2				3	3		3				
CO2					2				2	3		3				
CO3					2				3	3		3				
CO4					3				3	3		3				
CO5					3				3	3		3				
CO6					3				3	3		3				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE71	CONSTRUCTION MANAGEMENT	L-T-P 3-0-0	C 3
Programme:	B.E. Civil Engineering **Sem:** **VII**	**Category**	**ES**

Pre-requisites: Nil

AIM: To impart the students as a decision maker in the construction industry.

INTRODUCTION   9

Importance – Scope of construction Management – Principles – Classification of construction work – Construction stages – Construction Team –Management Functions – Types of firms – Government – Private – Public sector – Planning for materials – Machines – Men and Organization.

PLANNING AND SCHEDULING   9

Construction Planning: Need – Collection of field data – Approval and sanction of estimates – Budget – Scheduling.
Project planning: Forms of scheduling – Bar charts – Milestone charts –Network analysis – CPM and PERT – Numbering events – Time calculations – Floats – Critical path – Time estimates – Time cost optimization – Resource leveling.

EXECUTION OF WORKS   9

Execution of work – Departmental execution – Contract system – Calling of tenders – Tender documents – Types of contracts – Contracting firms – Specifications, quality control – Legal implications – Penalties – Arbitration.

STORES AND ACCOUNTS   9

Measurements of works – Recording – Checking – Types of bills – Modes of payment – Cash Book – Imprest account – Temporary advance – Revised estimate – Completion report – Classification of stores – Maintenance – Inspection – Transfers – Surplus and shortage.

INDUSTRIAL MANAGEMENT   9

Relationship between management and labour – Industrial psychology – Motivating – Merit rating – Incentive plans – Leadership – Importance – Styles – Communication – Types – Methods – Process – Time and motion studies.

                                                                TOTAL PERIODS: 45

TEXT BOOK(S)
1. Kumar Neeraj Jha, "Construction Project Management,: Theory and Practices" Pearson Education India; 2 edition (2015).
2. Srinath,L.S., "Pert and CPM Priniples and Applications ", Affiliated East West Press,2001

REFERENCE(S)

1. Moder.J.,C.Phillips and Davis, "Project Management with CPM, PERT and Precedence Diagramming", Van Nostrand Reinhold Co., Third Edition, 1983.
2. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons 1986.
3. Halpin,D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 1985.
4. Subramanian.K., "Construction Management", M/s. Anuratha Agencies, Kumbakonam, 1992.
5. Seetharaman.S, "Construction Engineering and Management" Umesh Publications, New Delhi, 1997.

Course Outcomes:

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

CO1: Apply the basic functions and planning of various resources in construction organization.

CO2: Demonstrate the fundamental techniques in planning and schedule.

CO3: Evaluate the tendering process and contracting issues.

CO4: Apply the accounting system and inventory control.

CO5: Assess the labour activities and improvement by industrial management system.

CO6: Improve the functions of Industrial Management.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2		2	3		2			3	3				2	3
CO2		2		3	3								3		2	
CO3				3	3		2		2	3	2		2	2	3	
CO4		2		3	3						2		3	2	2	
CO5								2	3	3		2			1	3
CO6								2	3	3		2			1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE72   **BASICS OF DYNAMICS AND ASEISMIC DESIGN**   **L-T-P**   **C**
                                                                                          3-0-0   3

Programme: B.E. Civil Engineering   Sem: VII   Category   PC
Pre-requisites: Nil

AIM: To study dynamic and seismic forces due to earthquake and corresponding design of structures

THEORY OF VIBRATIONS   9

Concept of inertia and damping – Types of Damping – Difference between static forces and dynamic excitation – Degrees of freedom – SDOF idealization – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation – Impulse and response to unit impulse – Duhamel integral.

MULTIPLE DEGREE OF FREEDOM SYSTEM   9

Two degree of freedom system – Normal modes of vibration – Natural frequencies – Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

ELEMENTS OF SEISMOLOGY   9

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – Primary, shear and Raleigh waves – Seismogram – Magnitude and intensity of earthquakes – Magnitude and Intensity scales – Spectral Acceleration - Information on some disastrous earthquakes.

RESPONSE OF STRUCTURES TO EARTHQUAKE   9

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra – Lessons learnt from past earthquakes.

DESIGN METHODOLOGY   9

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993- Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Later load analysis – Design and detailing as per IS:13920 – 1993.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Anil K Chopra "Dynamics of Structures: Theory and Applications to Earthquake Engineering" (Prentice-Hall International Series I Civil Engineering and Engineering Mechanics), 4th edition 2011.
2. Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007.

REFERENCE(S)
1. Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 2009.
2. Paz, M.,"Structural Dynamics – Theory & Computation", CSB Publishers & Distributors, Shahdara, Delhi, 2000.

Course Outcomes:

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

CO1: Examine the response of linear and nonlinear SDOF system

CO2: Examine the response of linear and nonlinear MDOF system

CO3: Illustrate the fundamentals of seismology

CO4: Intrepret the response of structures due to earthquake

CO5: Outline the methodology for asesismic design

CO6: Analyze the structures using lateral load analysis

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3		2		2						3		2	3
CO2	3	3	1	2	2		2						3		2	2
CO3				3	3		2			2			2		2	3
CO4	2	3	2	3	2		2						3		3	3
CO5	3	3	3	2	2					3			3		3	2
CO6	3	3	3	2	2					3			3		3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE73	QUANTITY SURVEYING AND VALUATION	L-T-P 3-0-0	C 3

Programme:	B.E. Civil Engineering	**Sem:**	**VII**	**Category**	**PC**
Pre-requisites:	Nil				

AIM: To make the students to estimate any building through the quantity surveying and valuation.

ESTIMATE OF BUILDINGS   9

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

ESTIMATE OF OTHER STRUCTURES   9

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

SPECIFICATION AND TENDERS   9

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

VALUATION   9

Purpose of valuation – Types – Book value – Market value – Salvage value – Scrap value – Depreciation – Obsolescence – Sinking fund – Land valuation – Mortgage & Lease – Problems on valuation – Annuity – Definition & types only - Fixation of rent – Outgoing – Gross & Net income – Years' Purchase – Capital cost – Standard rent.

REPORT PREPARATION   9

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Dutta .B.N, "Estimating and Costing in Civil Engineering Theory and Practice," UBS Publishers Pvt. Ltd., 2009.
2. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand& Company Ltd., 2004.

REFERENCE(S)
1. Patil .B.S , "Civil Engineering Contracts and Estimates", Universities press(India) Pvt. Ltd., 2006.
2. Birdie .G.S, "A Text Book on Estimating and Costing", DhanpatRai Co. Pvt. Ltd., New Delhi, 2013.
3. Chakraborti .M,"Estimating ,Costing, Specification and Valuation in Civil Engineering", M.Chakraborty Publication,2006.

4. Course notes on "Estimation and costing", State Institute of Vocational Education Andhra Pradesh,
5. Hyderabad. First Edition: 2006.
6. PWD Data Book.

Course Outcomes:

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

CO1: Apply different types of estimates in building

CO2: Solve the different quantity surveying methods for various civil engineering structures

CO3: Justify the estimate corresponding to the required specification for bidding process.

CO4: Predict the value of properties considering various influencing factors

CO5: Compose the importance and preparation of report for various structures

CO6: Generate the report for tube and open wells

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	3						3		2	2	3	
CO2	3	2		3	3						3		2	2	3	
CO3	3	1		3	3					2	3		2		1	
CO4	3	1	2	3	3					3	3		3	2		
CO5						2		2		3	1				2	1
CO6						2		2		3	1				2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE74	**DESIGN OF STEEL STRUCTURES**	**L-T-P**	**C**
		3-1-0	**4**

Programme: B.E. Civil Engineering   **Sem:** **VII**   **Category**   **PC**

Pre-requisites: Nil

AIM: To make the students familiar with the design of steel members

DESIGN OF CONNECTIONS   12

Limit State Design Concepts–Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – Unstiffened and stiffened seated connections.

COMPRESSION MEMBERS   12

Types of compression members – Basis of current codal provision for compression member design –Design of built-up compression members – Design of lacing and battens type columns – Design of column bases for axial and eccentric loads.

BEAMS AND WELDED PLATE GIRDER   12

Design of built up beams – Beams with unrestrained compression flange – Design of welded plate girders – Intermediate and bearing stiffeners – Web splices – Design of beam columns

INDUSTRIAL STRUCTURES AND ROOF TRUSSES   12

Requirements of industrial structures – Design of gantry girders – Analysis and design of single bay gable frame with Knee bent – Design of Roof trusses for dead, live and wind loads – Design of purlins.–

CHIMNEY   12

Design of self-supporting steel chimney – Chimney base.

TOTAL PERIODS: 60

TEXT BOOK(S)

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013.
2. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi,2013.

REFERENCE(S)

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.

3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009.

4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800– 2007 Structures Publications, 2009.

5. IS800:2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007.

CODE REFERENCES

1. IS 800 – 2007 - Indian Standard General Construction in Steel – Code of Practice.
2. IS 800 – 1984 - Indian Standard General Construction in Steel – Code of Practice.
3. SP (6) - ISI Handbook for Structural Engineers – Structural Steel Sections (1964)
4. IS 875 – 1987 Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures.
     a) IS 875 (Part 1) 1987 (Dead Loads - Unit Weights Of Building Materials And Stored Materials)
     b) IS 875 (Part2) 1987 (Imposed Loads)
     c) IS 875 (part – 3) 1987 (Wind Loads)
     d) IS 875 (Part – 4)1987 (Snow Loads)
     e) IS 875 (Part – 5) 1987 (Special Loads and Combination

Course Outcomes:

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

CO1: Examine the Design of bolted, welded and riveted connections

CO2: Analyze and design of compression members

CO3: Design of beams and plate Girder

CO4: Design of industrial building and roof trusses

CO5: Summarize terminology about self-supporting steel chimney

CO6: Design of steel stack and base

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3		3							3	3	3		2
CO2	3	3	3		2							3	3	2		3
CO3	3	3	3		2							3	3	2		2
CO4	3	2	3		2							2	3	3		3
CO5	3	2	3		3							1	3	2		2
CO6	3	3	3		2							1	3	1		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE77	**COMPUTER APPLICATIONS LABORATORY**			**L-T-P**	**C**
				0-0-4	**2**
Programme:	B.E. Civil Engineering	**Sem:**	**VII**	**Category**	**PC**
Pre-requisites:	Nil				
AIM:	To familiarize and give hands-on training to students in the following areas of civil engineering application software				

ANALYSIS AND DESIGN PACKAGES

Introduction to Design packages – Need for computer analysis – Analysis of basic structural elements like simply supported beams, cantilever beams, propped cantilever beams, continuous beams and fixed beams. Analysis and design of 2D & 3D frames – Analysis and design of 2D & 3D trusses – Analysis and design of space frame subjected to wind force – Sinking of supports – Analysis, design and modeling of 2D frames and bridge deck with moving loads – Analysis and design of rectangular and circular – Ground level, underground and elevated water tank bracings.

Design of structural elements like slab, beams, columns and footings using Excel.

PLANNING TOOLS

Introduction to project planner and project management – Defining administrative categories – Setting up OBS, WBS and EPS – Creating calendars - Defining activity duration – Predecessor – Successor – Positive and negative lag – relationships – Float – Defining resources and roles – Managing base lines – Preparing activity areas and bar/Gantt chart areas – Updating and tracking projects using base line – producing reports – Layout – Filter – Formatting, printing layout and reports.

TOTAL PERIODS: 45

Course Outcomes:

At end of this course, the students will be able to
CO1: Modeling, analysis and design of various types of beams using STAAD.pro packages
CO2: Carryout the Modeling, analysis and design of 2D & 3Ds frames using modern tool
CO3: Modeling, Analysis & design of space frame subjected to wind force
CO4: Modeling, analysis and design of various water tanks provisions
CO5: Design of structural elements like slab, beams, columns and footings using Excel
CO6: Working with planning tools in civil engineering works

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3								3	2		1
CO2	3	3	2	3	3								3	2		1
CO3	3	3	2	3	3								3	2		1
CO4	3	3	2	3	3								3	2		1
CO5	3	3	2	3	1								3	2		1
CO6				3	3					2	3				3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE78	**DESIGN PROJECT**	**L-T-P**	**C**
		0-0-4	**2**

Programme:	B.E. Civil Engineering	**Sem:**	**VII**	**Category**	**EEC**

Pre-requisites: Nil

AIM: To make the students to improve the design principles in any of the civil engineering discipline.

OBJECTIVES

The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

TOTAL PERIODS: 60

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks: 20 marks (Decided by conducting 3 reviews by the guide appointed by the Institution)

2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark

3. Viva voce examination: 50 marks (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal Weightage)

Course Outcomes:

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

CO1: Apply the knowledge to analyse the feasibility study of choosen project

CO2: Draw a create plan for various structure of proposed project

CO3: Locate the various structural elements in detailed drawing and calculate with various load calculation using standard Indian codes

CO4: Analysis and design of various structural elements as per the requirement

CO5: Modeling, analysis and design of various structural elements using modern tool

CO6: Demonstrate their work in review and presentation

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1			2	2		3	2		3	3					3	2
CO2			3	3					3				2	3	2	
CO3	3	2	1	2	3				3	3			3	3		
CO4	3	3	3		3				3				3	3		
CO5	3	3	3	2	3				3				3	3		
CO6				3	3				3	3		3			3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CE87	**PROJECT WORK**		**L-T-P**	**C**
			0-0-12	6
Programme:	B.E. Civil Engineering	**Sem:**	**VIII** **Category**	**EEC**
Pre-requisites:	Nil			
AIM:	To make the students to conceive knowledge in various civil engineering streams through experiments and computer applications.			

OBJECTIVES

The objective of the project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering. Every Project Work shall have a Guide who is a member of the faculty of Civil Engineering of the college where the student is registered. The hours allotted for this course shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis or field work and also to present in periodical seminars the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions. This experience of project work shall help the student in expanding his / her knowledge base and also provide opportunity to utilise the creative ability and inference capability.

TOTAL PERIODS: 60

EVALUATION PROCEDURE

1. Internal Marks: 30 marks (decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark
3. Viva voce examination: 40 marks (evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal Weight age.

Course Outcomes:
At end of this course, the students will be able to
> CO1: Create new ideas for solving a critical problems
> CO2: Use of new material or tools and apply it.
> CO3: Schedule the works to complete the project within stipulated time (Project Management skills).
> CO4: Develop the skill to communicate effectively and demonstrate the work.
> CO5: Develop and analyze solutions for critical real-world Problem.
> CO6: Work as an individual and as a team

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3			2	2	3	2		3	3	2	2	2	3
CO2	3	2	3	3	3				3		3	2	3	2		2
CO3		2		2	2				3			2			3	2
CO4	3	2	3	2	2			2	2	3	3	2			3	2
CO5	2	3	2	2	3				1	1	3		3	3	2	
CO6									3	3	2	3			3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE03	**PREFABRICATED STRUCTURES**	**L-T-P**	**C**
		3-0-0	3
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To get familiar with the design principles of prefabricated units		

INTRODUCTION   9

Modular co-ordination – Components - Prefabrication systems and structural schemes - Types of foundation - Design considerations - Economy of prefabrication - Prefabrication of load-carrying members - Disuniting of structures - Structural behavior of precast structures.

HANDLING AND ERECTION STRESSES   9

Handling and erection stresses - Application of pre stressing of roof members – Floor systems - Two way load bearing slabs - Wall panels

DIMENSIONING AND DETAILING OF JOINTS   9

Dimensioning and detailing of joints for different structural connections – Construction joints and expansion joints.

ERECTION OF STRUCTURES   9

Production - Transportation and Erection - Organizing of production - Storing and erection equipment - Shuttering and mould design - Dimensional tolerances, Erection of R.C. structures -Total prefabricated buildings

DESIGN OF PRE FABRICATED UNITS   9

Prefabricated units for Industrial structures, Multi-storied buildings and Water tanks etc., Application of pre stressed concrete in prefabrication.

TOTAL PERIODS:45

TEXT BOOK(S)

1. Hubert Bachmann, Alfred Steinle, "Precast Concrete Structures", Ernst and Sohn GMBH & Co., K.G., 2011.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

REFERENCE(S)

1. Levit, M., (2000), Precast concrete materials, Manufacture properties and usage, Applied Science Publishers, London.
2. Kim S. Elliott, "Precast Concrete Structures" Butter – Heinemann, 2002.

Course Outcomes:

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

CO1: Illustrate the principles and systems of prefabrication in the field

CO2: Interpret knowledge about components in industrial building.

CO3: Outline handling and erection stresses.

CO4: Classify various connections in prefabricated structures

CO5: Summarize the erection of prefabricate structure

CO6: Build various pre-fabricated units.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2		3							1	3		2	2
CO2	2		2		3	1						3	3		2	2
CO3	3	2			3							3	1		3	2
CO4	3	2	2		3							3	2		3	3
CO5	2	2	2		3				1			1	2		2	3
CO6	2	2	3		3							2	2		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE04	**PRESTRESSED CONCRETE STRUCTURES**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To develop an advanced understanding of the behavior, analysis and design of prestressed concrete structures.		

INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – advantages – materials required – systems and methods of prestressing – analysis of sections – stress concept – strength concept – load balancing concept – effect of loading on the tensile stresses in tendons – effect of tendon profile on deflections – factors influencing deflections – calculation of deflections – short term and long term deflections - losses of prestress – estimation of crack width.

DESIGN CONCEPTS 9

Flexural strength – simplified procedures- codal provision – strain compatibility method – basic concepts in selection of cross section for bending – stress distribution in end block - design of anchorage zone reinforcement – limit state design criteria – partial prestressing – applications.

CONTINUOUS BEAMS 9

Analysis – incorporation of moment due to reactions- pressure line due to prestressing force – principle of linear transformation – concordant tendon profile – partially continuous beams – analysis for ultimate strength – moment redistribution.

CIRCULAR PRESTRESSING 9

Introduction – General features of prestressed concrete tanks –Analysis and Design of prestressed concrete tanks – Design of cylindrical and non-cylindrical pipe.

PRESTRESSED COMPOSITE BEAMS 9

Composite prestressed concrete beans – Design procedure – Calculation of stresses at important stages both for propped and impropped constructions – Design of shear connectors – Shrinkage stresses.

TOTAL PERIODS:45

TEXT BOOK(S)

1. Krishna Raju N., "Prestressed concrete", Tata McGraw Hill Company, New Delhi, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

REFERENCE(S)

1. Rajagopalan, N, "Prestressed Concrete", Alpha Science, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.

CODE REFERENCES

1. IS: 1343 – 1980 Prestressed concrete – Code of Practice
2. IS: 784 - 2001 - IS Specification for Prestressed Concrete Pipes.IS: 6006-1983 Uncoated Stress relieved Strand for Prestressed concrete

1. IS: 3370 - 1999 - Part IV - IS Code of Practice for Concrete Structures for the storage of liquids.

Course Outcomes:
At end of this course, the students will be able to

CO1: Apply the basic terminology related to pre-stressing and post-stressing systems
CO2: Analyse the sections using strength, stress load balancing concept and losses of prestressing
CO3: Design the flexural member and stress distribution in the end block
CO4: Analyze the continuous beam
CO5: Design a prestress concrete pipes and tanks
CO6: Analyze the stress and estimate the deflection for composite construction

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2		3							1	3		3	3
CO2	3	3	2	3	3							3	3		3	2
CO3	3	2	3		3							3	3		2	2
CO4	3	2	3		3							3	2		3	2
CO5	2	2	3		3							1	2		3	3
CO6	2	3	2	3	3							1	1		2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE05	**INDUSTRIAL STRUCTURES**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To impart a board knowledge in the area of planning and designing concept and functional requirements for industrial structures.		

PLANNING 9

Classification of Industries and Industrial structures – General requirements for industries – Planning and layout of buildings and components.

FUNCTIONAL REQUIREMENTS 9

Lighting – Ventilation – Acoustics – Fire safety – Guidelines from factories act.

DESIGN OF STEEL STRUCTURES 9

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos.

DESIGN OF R.C. STRUCTURES 9

Corbels, Brackets and Nibs - Silos and bunkers –Principles of folded plates and shell roofs.

PREFABRICATION 9

Principles of prefabrication – Prestressed precast roof trusses - Functional requirements for Precast concrete units - Construction of roof and floor slabs - Wall panels.

TOTALPERIODS: 45

TEXT BOOK(S)
1. Ramamrutham.S, Design of Reinforced Concrete Structures, DhanpatRai Publishing Company, 2007.
2. Bhavikatti.S.S, Design of Steel Structures, J.K. International Publishing House Pvt. Ltd., 2009.

REFERENCE(S)
1. Varghese.P.C., Limit State Design of Reinforced Concrete, PHI, Eastern Economy Editions, Second Edition, 2003.
2. Pasala Dayaratnam – Design of Steel Structure – 2000.

Course Outcomes:
At end of this course, the students will be able to
CO1: Construct the planning aspects of the Industrial Buildings
CO2: Interpret design concepts and constructional aspects of Industrial structures
CO3: Analyse and evaluate the importance of various construction materials for Industrial constructions
CO4: Design portal frames, tower cranes and bracing system in Industrial buildings
CO5: Analyse and design structural elements used in pre-cast construction
CO6: Illustrate the principles of prefabrication and prestressing

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		3		3							1	3		1	1
CO2	3		3									3	3		1	2
CO3	3	2	3		2							3	1		3	3
CO4	3	2	3	1	2							3	2		3	3
CO5	3	2	3	1								3	2		2	2
CO6	2	3	3	1	2							1	2		2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE06	**REPAIR AND REHABILITATION OF STRUCTURES**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To make the students to assess the distressed building and find out the method of rehabilitation.		

GENERAL ASPECTS   9

Performance of construction materials and components in services for strength permeability, thermal properties and cracking effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, Effects of cover thickness.

MAINTENANCE AND DIAGNOSIS OF FAILURE   9

Definitions **:** Maintenance, Repair and rehabilitation, Facets of Maintenance, Importance of Maintenance, Preventive measures based on various aspects of inspection- Assessment procedure for evaluating a damaged structure. Diagnosis of construction failures.

DAMAGES AND THEIR REMEDIES   9

Corrosion damage of reinforced concrete, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection, rust eliminators. Causes of deterioration of concrete, steel, masonry and timber structures, surface deterioration, efflorescence, causes, prevention and protection.

REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES   9

Repairs to overcome low member strength – deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

NON-DESTRUCTIVE TESTING   9

Non-destructive testing: Ultrasonic and sonic tester – Flaw detectors – Rebound test – Hammer strength evaluation of existing structures.

TOTAL PERIODS: 45

TEXT BOOK(S)

1. Dr.B.Vidivelli, "Rehabilitation of Concrete Structures", Standard Publishers Distributors, 2007.

REFERENCE(S

1. Guha, P.K, "Maintenance and Repairs of Buildings", New Central Book Agency (P) Ltd, Calcutta, 2011.
2. Macdonald, S, "Concrete - Building Pathology", Blackwell Science Limited, Oxford, 2008.
3. Shetty, M.S, "Concrete Technology – Theory and Practice", S. Chand and Company Ltd, New Delhi, 2012.
4. Chudley, R, "The Maintenance and Adaptation of Buildings", Longman Group Ltd, New York, 2002.

Course Outcomes:
At end of this course, the students will be able to
CO1: Estimate causes of deterioration of concrete and steel structures.
CO2: Improve knowledge about Maintenance And Diagnosis of Failure.
CO3: Classify the different methods of repairing concrete and steel structures

CO4: Classify different methods of corrosion protection, corrosion resistant steels

CO5: Relate the engineered demolition techniques for Retrofitting structures

CO6: Use the different NDT for assessment of structures

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2		3		2					1	3		2	2
CO2	3	1	2				3					3	3		3	2
CO3	3	2	2		3		3					3			3	2
CO4	3	2	2				2					3	2		2	2
CO5	2	2	2		3		3					1	2		2	2
CO6	2	2	3		3		3					2	2		2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE07	**SMART MATERIALS AND STRUCTURES**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To give an insight into the latest developments regarding smart materials and their use in structures.		

INTRODUCTION   9
Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

MEASURING TECHNIQUES   9
Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

SENSORS   9
Sensing Technology–Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fiber Optic Chemical Sensing Systems and Distributed measurement.

ACTUATORS   9
Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magne to structure Material – Shape Memory Alloys – Electro orheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

SIGNAL PROCESSING AND CONTROL SYSTEMS   9
Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non- Linear.

                                                                       TOTAL PERIODS: 45

TEXT BOOK(S)
1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-2006.

REFERENCE(S)
1. Srinath L. S. – Experimental Stress Analysis – Tata McGraw-Hill, 2005.
2. Srinivasan A.V and Michael McFarland D, "Smart Structures-Analysis and Design, Camridge University Press, 2001.
3. Mel.M.Schwartz, Encylopedia of Smart Materials, John Wiely and Sons Inc., 2002.

Course Outcomes:
At end of this course, the students will be able to
   CO1: Explain the role of smart materials and its response in instrumented structures
   CO2: Illustrate the techniques used to measure strain in smart structures.
   CO3: Relate the applications of sensing technology in smart structures
   CO4: Infer the actuator techniques and materials for structural assessment
   CO5: Construct Signal Processing and Control for Smart Structures.
   CO6: Apply the data acquisition and data processing techniques for a sensor

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1				2							1			1	1
CO2		3	2		3							2		2		
CO3	1	2	2		2							1	2	2	2	2
CO4		3		3	2							2	1	2	1	1
CO5	2	2		3	2							1	1	1	1	2
CO6	3	2			2							1			3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE08	**HYDRAULIC STRUCTURES**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Civil Engineering   **Category**   **PE**

Pre-requisites: Nil

AIM: To impart knowledge of various structures for storage and distribution of water.

HYDROLOGY & DESIGN FLOOD ESTIMATION   9

Importance of hydrology – Hydrological cycle – Types of precipitation – Measurement of rainfall by rain gauges – Mean rainfall over a drainage basin – Various methods of computing runoff from its given rainfall – Design flood – Estimating design flood and flood flows.

DIVERSION AND IMPOUNDING STRUCTURES   9

Weirs and Barrage – Types of impounding structures – Dams – Gravity dams – Earth dams and Arch dams – Spillways – Intake structures – Trash Racks – Energy dissipaters.

HYDRAULIC STRUCTURES FOR CANALS   9

Classification of canals – Alignment of canals – Regime theories – Canal Head works – Canal regulators – Canal drops – Cross drainage works – Canal falls and escapes – Lining and maintenance – Other methods.

GATES AND VALVES   9

Lift gates – Necessity and types of Lift gates – Flow induced forces and vibration on vertical lift gates – Valves – Layout of Power Houses – Stilling basins and Drainage galleries.

WATER MANAGEMENT   9

Modernization techniques – Rehabilitation – Command Area Development – Systems of rice intensification – Water delivery systems – Participatory Irrigation Management – Farmer's organization and turn over – Water users associations - Economic aspects.

TOTALPERIODS: 45

TEXT BOOK(S)

1. Punmia, B.C., Pande. B.B Lal., "Irrigation and Water Power Engineering", Lakshmi Publications, New Delhi, 2001.

REFERENCE(S)

1. Garg S.K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi, 2001.
2. Sahasra Budhe S.R., "Irrigation Engineering and Hydraulic Structures Including Hydrology and Water Power Engineering", S.K. Kataria Publications, Sixth Edition, 2000.
3. Sharma R.K, Sharma T.K., "Irrigation Engineering", S.Chand Publishers, New Delhi, 2001.

Course Outcomes:

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

CO1: Apply Various components of hydrologic cycle that affect the movement of water in the earth
CO2: Illustrate diversion And types of impounding Structures
CO3: Summarize canal classification and maintenance
CO4: Explain the necessity of lift gates and valves
CO5: Illustrate water management systems
CO6: Understand the water delivery system

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2		3							1	3	3	1	1
CO2	3	1	2		2							3	3	3	1	1
CO3	3	2	1	2								1	3	3	1	2
CO4	3	2	1				2				1	3	2	3	1	2
CO5	2	2	1	2		3		1			2	3	2	3	1	3
CO6	2	2	1	2		3		1			2	3	2	3	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE09	**WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To make the students to have knowledge about water resources and its management.		

GENERAL   9
Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National Water Policy – Collection of meteorological and hydrological data for water resources development.

HYDROLOGIC CYCLE   9
Components of Hydrological cycle -system representation–Historical development of hydrology – Weather system –cloud and cloud seeding -General atmospheric circulation –Types and forms of precipitation –measurement of rainfall –optimum rain gauge network design

WATER RESOURCE NEEDS   9
Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.

RESERVOIR PLANNING AND MANAGEMENT   9
Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity –Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls - Channel improvement.

ECONOMIC ANALYSIS   9
Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors – Discounting techniques – Computer Applications**.**

TOTAL PERIODS:45

TEXT BOOK(S)
1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2007.
2. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 2008.

REFERENCE(S)
1. Douglas J.L. and Lee R.R., "Economics of Water Resources Planning", Tata McGraw-HillInc. 2000.
2. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers.
3. Loucks, Daniel P.; van Beek, Eelco; Stedinger, Jery R.; Dijkman, Jozef P.M.; Villars, Monique T., "Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications" (Paris : UNESCO, 2005)

Course Outcomes:

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

CO1: Collect all kinds of hydrological data and perform the analysis

CO2: Design the optimum rain gauge network

CO3: Prepare the water budget and development plan

CO4: Estimate the sediment load in reservoirs

CO5: Perform economic analysis of water resource projects

CO6: Estimate the cost and Evaluation of cost

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1			1		2		1	1	1	1	1
CO2		2	1	1			1	1	1	2	1	1	1	2		
CO3	2	1		2				1		1		1	2	2		
CO4	1	2	1		2							1	1	1	1	1
CO5	2	3	2		2			2		2	1	1	1	1	1	1
CO6																

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE11	INDUSTRIAL WASTE WATER TREATMENT AND DISPOSAL	L-T-P	C
		3-0-0	3
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	This course facility the students about the various aspects of treatment and disposal of industrial waste water treatment.		

INTRODUCTION TO INDUSTRIAL WASTEWATER   9

Industrial scenario in India – industrial activity and environment, uses of water by industry, sources and types of industrial wastewater. Regulatory requirements for treatment of industrial waste water, industrial waste survey, industrial waste water generation rates, characterization and variables, population equivalent.

INDUSTRIAL POLLUTION PREVENTION   9
Prevention Vs Control of industrial pollution – benefits and barriers. Source reduction techniques – waste audit, evaluation of pollution prevention options, environmental statement as a tool for pollution prevention, waste minimization circles.

INDUSTRIAL WASTEWATER TREATMENT   9
Equalization – neutralization, oil separation, flotation, precipitation, Aerobic and anaerobic biological treatment – sequencing batch reactors, high rate reactors(Recall) Advanced Chemical oxidation – Electro chemical oxidation, wet air oxidation, ozonation, photocatalysis, Other Treatment Processes Heavy metal removal, Refractory organics separation by adsorption. ion exchange, membrane technologies, nutrient removal.

WASTEWATER REUSE AND RESIDUAL MANAGEMENT   9
Evaporation- Evaporators types and classification. Zero effluent discharge systems - Quality requirements for wastewater reuse, industrial reuse, disposal on water and land. Residuals from industrial wastewater treatment units - quantification and characteristics of sludge – thickening, digestion, conditioning, dewatering and disposal of sludge. Management of RO rejects. Individual and common effluent treatment plants – combined treatment of industrial waste water and domestic/municipal wastewater**.**

CASE STUDIES   9
Industrial manufacturing process description – waste water characteristics - source reduction options and waste treatment flow sheet for textiles – tanneries - pulp and paper, metal finishing - sugar and distilleries.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Metcalf and Eddy, "Waste water Engineering Treatment, Disposal and Reuse", McGraw – Hill publishing Co, Indian Edition, New Delhi, 2005.

REFERENCE(S)

1. Frank Woodard, Industrial Waste Treatment Handbook, Butterworth Heinemann, New Delhi, 2001.
2. Paul L. Bishop "Pollution Prevention: - Fundamentals and Practice", McGraw – Hill International, 2000.
3. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw – Hill, 2000.

Course Outcomes:

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

CO1: Classify wastewater generated from a specific industry and possible impacts on the environment

CO2: Summarize prevention and Control of industrial pollution

CO3: Design appropriate treatment systems for the wastewater generated from the industries

CO4: Apply possible recycling and reuse opportunities for the wastewater and residuals by suitable treatment units.

CO5: Outline the feasibility and benefits of individual, common and joint treatment of industrial wastewater.

CO6: Analyze the waste water treatment through case studies.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2		1		2	3					2	1			3
CO2	1	2		2		1	3					2	1			3
CO3	1	2	3		2	2	3					3	2			3
CO4	1	2			3		2					3	1	1	1	3
CO5	1	1			2	2	3					3	1		1	3
CO6	1	2			2	2	3					2	1		1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE12	**AIR POLLUTION MANAGEMENT**	**L-T-P**	**C**
		3-0-0	**3**

Programme:	B.E. Civil Engineering	**Category**	**PE**

Pre-requisites: Nil

AIM: To make the students aware of air pollution and its management.

INTRODUCTION – AIR POLLUTANTS   9

Structure and composition of Atmosphere – Sources and classification of Air pollutants – Effects of air pollutants – Global Climate Change – Ozone layer Depletion – Sampling and Analysis.

DISPERSION OF POLLUTANTS   9

Effects of meteorology on Air Pollution – Transport & Dispersion of Air Pollutants – Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants – Wind profiles and stack plume patterns – Atmospheric stability and turbulence.

AIR POLLUTION CONTROL   9

Concepts of control – Principles and design of control measures – Particulates control – Selection criteria for equipment – Gaseous pollutant control – Control Technologies – Pollution control for specific major industries.

AIR POLLUTION MONITORING AND MODELLING   9

Modeling Techniques - Process Control and Air quality monitoring – Zoning – Legislation and enforcement -Air Pollution Climatology – Environmental Impact Assessment and Air quality.

AUTOMOBILE AND NOISE POLLUTION   9

Vehicular Pollution: Automobile emission - Types of emissions - Prevention and control of vehicular pollution. **Noise Pollution**: Sources and Effects of Noise Pollution – Measurement and Standards – Control and Preventive measures.

TOTAL PERIODS:
45

TEXT BOOK(S)
1. Rao M.N., and Rao H. V. N., "Air Pollution Control", Tata-McGraw-Hill, New Delhi, 2005.

REFERENCE(S)
1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Heumann W.L., Industrial Air Pollution Control Systems, McGraw-Hill, New Yark, 2003.
3. Lawrence K. Wang, Norman C. Pereira, Yung-Tse Hung, Air Pollution Control Engineering, Humana Press, 2004.

Course Outcomes:

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

CO1: Classify the sources of air pollutants and methods of controlling

CO2: Identify the sources of sampling and dispersion of pollutants

CO3: Examine the gaseous pollutant control by adsorption, absorption, condensation and combustion

CO4: Summarize the environmental impact assessment and air quality

CO5: Explain about the sources and control method of noise pollution

CO6: Interpret the air pollution monitoring with modern techniques

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2				2	3					2	1			3
CO2	2	2			1	1	3					1	1		1	3
CO3	2		2			3	2		1			2	1			3
CO4	1					2	2		1			2	1		1	3
CO5	1					3	2		1			3	1			3
CO6	1						3					3	1		1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE13	**MUNICIPAL SOLID WASTE MANAGEMENT**	L-T-P	C
		3-0-0	3

Programme: B.E. Civil Engineering   **Category   PE**
Pre-requisites: Nil
AIM: To make the students, understand the method of managing the solid waste.

SOURCES AND TYPES OF MUNICIPAL SOLID WASTES   9

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

ON-SITE STORAGE & PROCESSING   9

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

COLLECTION AND TRANSFER   9

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

OFF-SITE PROCESSING   9

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

DISPOSAL   9

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment, Land fill remediation.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. George Tchobanoglouset.al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 2004.

REFERENCE(S)

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.

2. Bilitewski B, HardHe G, Marek K, Weissbach A., and Boeddicker H., "Waste Management", Springer, 2001.

Course Outcomes:

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

CO1: Infer the waste generated by the community and its effects on environment

CO2: Outlines the collection methods, collection vehicles and man power requirement

CO3: Identify the optimum collection routes

CO4: Explain the details of processing of solid waste

CO5: Evaluate the various options for disposal of wastes and their selection criteria.

CO6: Design and operation for sanitary landfills

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2					3	2					3				3
CO2	2		2			2	3			1		3	2		1	3
CO3	2		1			2	3			1		3	1		1	3
CO4	1					2	3			1		3	1		1	3
CO5	1		2		1	3	2					3	2		1	3
CO6	1		2			3	1			1		3	2			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE14	**CLIMATE CHANGE AND ADAPTATION**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Civil Engineering   **Category   PE**
Pre-requisites: Nil
AIM: To familiarize the students about earth's climate system.

EARTH'S CLIMATE SYSTEM   **9**

Introduction - Climate in the spotlight - The earth's climate machine - Climate Classification - Global wind systems, Trade Wind Systems and the Hadley Cell - The Westerlies - Cloud formation and Monsoon Rains, Storms and Hurricanes - The Hydrological Cycle - Global Ocean Circulation, EI Nino and its Effect, Solar Radiation - The Earth's Natural Green House Effect - Green House Gases and Global Warming - Carbon Cycle.

OBSERVED CHANGES AND ITS CAUSES   **9**

Observation of Climate Change - Changes in pattern of temperature, precipitation and sea level rise - Observed effects of Climate changes - Climate Sensitivity and Feedbacks - The Montreal Protocol - UNFCCC - IPCC - Evidences of Changes in Climate and Environment - Global Scale and in India - Climate Change modeling.

IMPACTS OF CLIMATE CHANGE   **9**

Impacts of Climate Change on various sectors - Agriculture, Forestry, Ecosystem, Water resources, Human Health and Industries - Settlement and Society - Methods and Scenarios - Projected Impacts for different regions - Uncertainties in the Projected Impacts of Climate Change - Risk of irreversible changes.

CLIMATE CHANGE ADAPTATION AND MITIGATION MEASURES   **9**

Adaptation Strategies in various sectors - Water - Agriculture - Infrastructure and Settlement including coastal zones - Human Health - Tourism - Transport - Energy - Key Mitigation - Technologies and practices - Energy supply - Transport - Buildings - Industry - Agriculture - Forestry - Carbon sequestration - Carbon Capture and Storage (CCS) - MSW & Bio waste, Biomedical Waste - Industrial waste - International and Regional co-operation.

CLEAN TECHNOLOGY AND ENERGY   **9**

Clean Development Mechanism - Hydrogen - Bio-fuels - Solar Energy - Wind - Hydroelectric Power - Mitigation Efforts in India and Adaptation funds - Carbon Trading - Examples of future Clean Technology - Biodiesel - Natural Eco-friendly Plastic Compost - Alternate Energy Hydrogen - Bio-fuels - Solar Energy - Wind - Hydroelectric Power - Mitigation Efforts in India and Adaptation funding.

TOTAL PERIODS:45

TEXT BOOK(S)

1. Venketaramana, P.Sharma,S.K. & Shukla,P.R., "Climate change and India: Issues, concerns and opportunities", Tata McGraw Hill, New Delhi, 2002.

REFERENCE(S)

1. "CDM country guide for India" by Institute for Global environmental strategies, second edition, 2005.
2. "Clean Development Mechanism in china – Taking a proactive and sustainable approach", second edition, The World bank, 2004.
3. "Asian Least Cost Greenhouse gas abatement strategy", Asian Development Bank, Manila, 1998.

Course Outcomes:

At end of this course, the students will be able to
CO1: Illustrate the concept of climate change and its consequences
CO3: Identify the effect of climate change in national and global level.
CO4: Outline the impact of climate change on manmade society and natural environment.
CO4: Develop the mitigation methods over the effect of climate change.
CO5: Explain awareness in clean development mechanism.
CO6: Discover the energy conservation resources.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		2		2							2	3	1	2	1
CO2	2		2		2							3	3	1	2	3
CO3	2	2		2				2				3	2			
CO4	2	2					2				1	3		3	3	3
CO5	2	2		2		3		1				1	1	2	2	1
CO6		2	3		1	3	3					2			1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE16	**TRAFFIC ENGINEERING AND MANAGEMENT**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Civil Engineering   **Category PE**

Pre-requisites: Nil

AIM: To impart the students familiar with the principles in managing the quality.

INTRODUCTION   9

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics.

TRAFFIC SURVEYS AND ANALYSIS   9

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Basic principles of Traffic Flow.

TRAFFIC CONTROL   9

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design.

GEOMETRIC DESIGN OF INTERSECTIONS   9

Conflicts at Intersections, Classification of 'At Grade Intersections, - Channallised Intersections - Principles of Intersection Design, Elements of Intersection Design, Rotary design, Grade Separation and interchanges - Design principles.

TRAFFIC MANAGEMENT   9

Traffic Management- Transportation System Management (TSM) - Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, Oneway Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes, Introduction to Intelligent Transportation System (ITS).

TOTALPERIODS: 45

TEXT BOOK(S)

1. SubhashSaxena, "A Course in Traffic Engineering and Design", DhanpatRai& Sons, 2010.

REFERENCS

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2006.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2004.
3. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
4. Guidelines of Ministry of Road Transport and Highways, Government of India.

Course Outcomes:

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

CO1: Explain the fundamental characteristics of road, traffic and land use

CO2: Apply appropriate techniques of traffic surveys and analysis

CO3: Design various methods of traffic control measures

CO4: Design elements of traffic intersections.

CO5: Apply the concept of traffic management system.

CO6: Summarize various methods of traffic management.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1			1		2		1	1			1
CO2		2	1	1			1	1	1	2	1	1			2	
CO3	2	1		2				1		1		1	2	2	2	2
CO4	1	2	1		2							1	1	1	1	1
CO5	2	3	2		2			2		2	1	2	1	1	1	1
CO6	3	2		3	1		1	1	2	2	1	2	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE17	**TOWN PLANNING & ARCHITECTURE**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		
AIM:	To impart the students familiar with the principles and application of architecture in buildings.		

ELEMENTS OF ARCHITESTURE   **9**

Introduction of architecture – Evaluation of geometric forms – Function and history – Sphere, Cube, Pyramid, Cylinder and cone – Aesthetic qualities of architecture – Proportion, Scale, Balance, Symmetry, Rhythm and axis – Contrast in form – Harmony.

PRINCIPLES OF OPERATION AND PLANNING OF BUILDINGS   **9**

Factors affecting orientation – Sun-Wind-Rain – Orientation criteria for Indian conditions – Principles governing the theory of planning – Planning of residential buildings.

DEVELOPMENT PLAN   **9**

Principles of city planning –levels of planning – scope and contents of regional plan, master plan, detailed development plan and structure plan – preparation and implementation – planning of new towns – slum clearance and urban renewal.

PLANNING LEGISLATION   **9**

Planning legislation and administration - review of planning legislation relating to
city planning and housing in India - Tamil Nadu Town and Country planning Act,
Tamil Nadu Housing Board Act, Tamil Nadu Slum clearance and Improvement Act.

DEVELOPMENT CONTROL RULES   **9**

Zoning regulations – sub division regulations – building regulations – Floor Space Index - minimum plot sizes and building frontage – open spaces – minimum standard dimensions of building elements - organisation and administration of Planning agencies at national, state, regional, local and metropolitan levels.

TOTALPERIODS: 45

TEXT BOOK(S)
1. Rangwala, "Town Planning" Charotar Publishing House pvt. Ltd.; 28 edition (2015).
2. Biswas Hiranmay, "Principles Of Town Planning And Architecture" VAYU Education of India; (2012).

REFERENCE(S)
1. Francis D.K. Ching, "Architecture: Form, Space and Order", VNR, N.Y., 2006.
2. Givoni B., "Man Climate and Architecture", Applied Science, Barking ESSEX, 2000.

Course Outcomes:

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

CO1: Explain about the basics of architectural design
CO2: Plan for buildings and site development
CO3: Summarize about the building types and rules and regulations
CO4: plan for interior design and green building concepts
CO5: Explain about the concept of urban planning standards regulations.
CO6: Demonstrate the concept of planning and infrastructure under legislations.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2			1	1	2		1	1	2		2	1		1	2
CO2	2			1	1	2		1	1	2	1	2	1		1	2
CO3	2			1	1	2		1	1	2	1	2	1		1	2
CO4	2			1	1	2		1	1	2		2	1		1	2
CO5	2			1	1	2		1	1	2	1	2	1		1	2
CO6	2			2	1	1		2	2	1	2	1	2		2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE18	**REMOTE SENSING AND GIS**	**L-T-P**	**C**
		3-0-0	**3**

Programme:	B.E. Civil Engineering	**Category**	**PE**
Pre-requisites:	Nil		

AIM:	To introduce the students to the basic concepts and principles of various components of remote sensing. To provide an exposure to GIS and its practical applications in civil engineering.

EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL   9

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

PLATFORMS AND SENSORS   9

Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space borne TIR and microwave sensors.

IMAGE INTERPRETATION AND ANALYSIS   9

Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

GEOGRAPHIC INFORMATION SYSTEM   9

Introduction – Maps– Map projections – map analysis – GIS definition – basic components of GIS – standard GIS software's – Data type – Spatial and non-spatial (attribute) data – measurement scales – data models – various data inputs – digitization and scanning.

APPLICATION OF REMOTE SENSING AND GIS   9

Data Base Management Systems (DBMS) –Remote sensing data –attribute data analysis-integrated data analysis-data compression. Applications -Transport, Water resources, Land information system and Disaster management.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Peter M. Atkinson and Nicholas Tate, "Advances in Remote Sensing and GIS Analysis" Wiley India Pvt Ltd, (2012).

REFERENCE(S)
1. Anil K. Jamwal, "Remote Sensing and Gis" Jnanada Prakashan , 2008.
2. Thomas.M.Lillesand and Ralph.W.Kiefer, "Remote Sensing and Image Interpretation"John Wiley and Sons, Inc, 2003.

Course Outcomes:
At end of this course, the students will be able to
CO1: Use the concepts of the remote sensing.
CO2: Identify the types of platforms and sensors in remote sensing.

CO3: Interpret and enhance the image for analysis.
CO4: Identify the types of map analysis and GIS.
CO5: Apply the concept of GIS in various civil engineering fields.
CO6: Understand the knowledge about sensors and practical applications.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1			1	2	1	1	1		1		2	1			
CO2	1				2	1	1	1		1		2	1			
CO3	1	2		1	2	1	1	1		1		2	1			
CO4	1			1	2	1	1	1		1		2	1			
CO5	1				2	1	1	1		1		2	1			2
CO6	1				2	1	1	1		1		2	1			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE19	**GROUND IMPROVEMENT TECHNIQUES**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Civil Engineering   **Category**   **PE**
Pre-requisites: Nil
AIM: To gain knowledge about techniques to improve the strength of the soil to the building.

INTRODUCTION   9
Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

DRAINAGE AND DEWATERING   9
Drainage techniques - Well points - Vaccum and electroosmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

IN-SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS   9
In-situ densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

EARTH REINFORCEMENT   9
Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.

GROUT TECHNIQUES   9
Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilization with cement, lime and chemicals - Stabilisation of expansive soils.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Purushothama Raj, P. "Ground Improvement Techniques", Firewall Media, 2005.
2. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 2002.

REFERENCE(S)
1. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002
2. Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.
3. Buddhima Indraratna and Jian Chu, "Ground Improvement Case Histories: Chemical, Electrokinetic, Thermal and Bioengineering" Butterworth-Heinemann (22 May 2015).

Course Outcomes:
At end of this course, the students will be able to
CO1: Identify basic deficiencies of various soil deposits& Select suitable improvement methods
CO2: Choose suitable drainage methods and dewatering technique
CO3: Analyze in-situ treatment of cohesive & cohesion less soil
CO4: Develop earth reinforcement materials and methods
CO5: Utilize grouting materials and methods
CO6: Use techniques for improving the soil condition

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2				1	1	1	1				2	2	2	1	1
CO2	2	2			1	1	1	1				3	2	2	1	1
CO3	2		1		2	1	1	1				1	2	3	1	1
CO4	2		1					1				1	2	3	1	1
CO5	1				2			1				2	2	3	1	1
CO6	2		1		3	1	1	1				2	2	2	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CEE20	**CONTRACT LAWS AND REGULATIONS**	L-T-P	C
		3-0-0	3

Programme: B.E. Civil Engineering   **Category** PE
Pre-requisites: Nil
AIM: To impart the knowledge about laws and regulations on contracts.

CONSTRUCTION CONTRACTS   9
Indian Contracts Act – Elements of Contracts – Features –Design of Contract Documents – International Contract Document – Standard Contract Document –Torts Law.

TENDERS   9
Prequalification – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Transparency in Tenders Act.

ARBITRATION   9
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

LEGAL REQUIREMENTS   9
Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

LABOUR REGULATIONS   9
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration– Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamil Nadu Factory Act – Child Labour Act - Other Labour Laws.

TOTAL PERIODS: 45

TEXT BOOK(S)
1. Jimmie Hinze, Construction Contracts, Second Edition, McGraw Hill, 2010.

REFERENCE(S)
1. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, Sixth Edition, McGraw Hill, 2000.
2. Web Reference: http://theconstructor.org/?s=construction+law

Course Outcomes:
At end of this course, the students will be able to

CO1: Define the Indian contracts Act and types of contract.
CO2: Evaluate the tender for Technical, Contractual and commercial point of view.
CO3: Explain the arbitration and the legal requirements for planning.
CO4: Examine the use of urban and rural land, land revenue codes and tax laws.
CO5: Describe the various labour acts.
CO6: Know the concept of laws and regulations on contracts.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		2	1			1	2		2	2	3	2			1
CO2	2			1			1	2		2	2	3	2		1	1
CO3	2			1			1	2		2	2	1	2		1	1
CO4	2			1			1	2		2	2	3	2		1	1
CO5	2			1			1	2		2	2	3	2		1	1
CO6	2			2			2	2		2	2	3	2		1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE701	**DISASTER MANAGEMENT SYSTEM**	**L-T-P**	**C**
		3-0-0	3

Programme: B.E. Civil Engineering   **Category   OE**
Pre-requisites: Nil
AIM: To aware the failure of the structures due to any disasters and their risk management.

INTRODUCTION TO DISASTERS   9

Disasters - Hazard, Vulnerability, Resilience, Risks –Types and Causes of disasters – Impacts of disasters on social, economic, political, environmental, health, psychosocial, etc.- Differential impacts in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies - Dos and Don'ts during various types of Disasters.

APPROACHES TO DISASTER RISK REDUCTION   9

Disaster cycle, Phases, Culture of safety, prevention, mitigation and preparedness communitybased DRR, Structural, nonstructural measures - Roles and responsibilities of community- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

INTER-RELATIONSHIP   BETWEEN   DISASTERS AND   9
DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such asdams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

DISASTER RISK MANAGEMENT IN INDIA   9

Hazard and vulnerability profile of India -components of disaster Relief: Water, Food, Sanitation, Shelter, Health and Waste Management - Institutional arrangements (Mitigation, Response and Preparedness - Disaster Management Act and Policy - other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in preparedness, risk assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

APPLICATIONS, CASE STUDIES AND FIELD WORKS   9

Landslide Hazard Zonation: Case Studies - Earthquake Vulnerability Assessment of Buildings and Infrastructure, Case Studies - Drought Assessment: Case Studies - Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; - Forest Fire: Case Studies - Man Made disasters: Case Studies - Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTALPERIODS: 45

TEXT BOOK(S)

1. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011.
2. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers,New Delhi, 2010.

REFERENCE(S)

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005.
2. Government of India, National Disaster Management Policy, 2009.

3. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427; ISBN13: 978-9380386423.
4. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

Course Outcomes

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

CO1. Analyze the various types of disasters.

CO2. Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3. Classify the hazard and vulnerability profile of Indian scenarios

CO4: Examine the disaster risk management system.

CO5: Demonstrate the applications and case studies about the disaster risk management.

CO6: Create the Reporting, Information and Documentation in Disasters/PROJECT

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		1	2	2		3	2					1	2		3	2
CO2		1	1	2		2	3				1	1	2		3	2
CO3	1	1	2		2	2	2		2		2	1	1		2	2
CO4	1	2	1		2	2	2	3	2		2	1	1	1	2	3
CO5	1	1			2	1	1					1	2		3	1
CO6	1	1			2	1	1					1	2		3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE702	**FUNDAMENTALS OF FIRE SAFETY ENGINEERING**	**L-T-P** 3-0-0	**C** 3
Programme:	B.E. Civil Engineering	**Category**	**OE**
Pre-requisites:	Nil		
AIM:	To provide an in depth knowledge about the fundamentals of fire and explosion and their prevention techniques.		

FUNDAMENTALS OF FIRE   9

Combustion process & concepts, combustion in solids, liquid, gases- smouldering fires- Spontaneous combustion - rapid fire progress phenomena- Properties influencing fire hazard – properties of solid, liquid and gaseous fuels - classification of fires.

FIRE CONTROL   9

Fire extinguishers – Location and operation of extinguishers - Extinguishing methods- extinguishing agents: water, foam, chemical powder, CO2, sand, steam, saw dust – Fire detectors – Fire tender - Automatic fire extinguishing system - Fixed fire fighting installations - Risk analysis: risk assessment, consequence analysis, risk reduction – Fire drill – Emergency procedures.

PRODUCTS AND EFFECTS OF COMBUSTION   9

Heat: Conduction, convection, radiation- effects of heat, flames and smoke – different fire gases and their effects – Smoke movement control and venting - Negative pressure wave – Fragmentation – case studies.

BUILDING FIRE SAFETY   9

Objectives of fire safe building design, Fire load, fire resistant material and fire testing – concept of egress design - exits – width calculations – fire safety requirements for high rise buildings – Behavior of materials & structures in fire – Concrete and steel. Flame spread in high rise building – Statutory requirements.

FUNDAMENTALS OF EXPLOSION   9

Introduction – Explosion fundamentals – Types – Physical, BLEVE, Chemical explosion – Vapour cloud explosion – Dust explosion – Explosion prevention – Explosion mitigation.

TOTALPERIODS: 45

TEXT BOOK(S)

1. Das a K, " Principles of Fire Safety Engineering: Understanding Fire and Fire Protection", Prentice Hall India Learning Private Limited (2014).
2. Gupta, R.S., "Hand Book of Fire Technology" Orient Longman, Bombay, 2010.

REFERENCE BOOK(S)

1. Jain V.K., Fire Safety in Building, New Age International (P) Ltd. Publishers, 2001.
2. Rao S, "Electrical Safety Fire Safety Engineering And Safety Management PB" Khanna Publishsers-delhi (2012).
3. Lees F.P., "Fire Prevention and firefighting", Loss prevention Association, India.
4. Purandare D.D., Abhay D. Purandare, "Hand Book on Industrial Fire Safety", 1st Edition, P & A Publications.
5. B. M., "Fire Protection and Prevention: The Essential Handbook" UBS Publishers (19 June 2013).

Course Outcomes:
At end of this course, the students will be able to
CO1: Analysis the basic concepts of fire and explosion science
CO2: Assess the different causes and effects of fire and explosion
CO3: Apply the of various types of firefighting equipment in field
CO4: Assess the behavior of materials & structures in fire explosion
CO5: Provide various fire prevention techniques to be followed in a building
CO6: Choose the prevention methods of explosion.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2		2	3	2						2	1	2	1
CO2	3	1	2	1	2	3			1	1		1	2		3	
CO3	2	1			3	2	3			1			2		3	1
CO4		2		1		2	3			2			3		2	2
CO5	1	2		3		2	2			2			3	2		1
CO6	1	2		3		2	2			2			3	2		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE704	**RENEWABLE ENERGY SOURCES**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**OE**
Pre-requisites:	Nil		
AIM:	To make the students familiar with advanced concepts of renewable energy system.		

ENERGY PERSPECTIVES   9

Conventional and non-conventional energies – Global energy perspectives – Energy and sustainable development – Current energy scenario in India – Energy consumption pattern in rural and urban regions – Energy efficiency and economy – Energy losses and its control – Future of energy in India.

SOLAR ENERGY   9

Concept of solar energy – Solar energy to light and to thermal conversions – total energy and necessary infrastructure – Units and measurement of solar radiation – Temperature dependent collecting devices and their efficacies – Design aspects – Typical applications: heating, cooling, lighting, power generation and cooking.

WIND ENERGY   9

Wind potential in India – Wind machines and their types – Merits and demerits – Wind power and appropriate coefficient – Efficiency and performance of wind machines – Energy conversion and storage – Synchronous invertors – Various storage aspects: battery, fly wheel, hydrogen and compressed air.

BIOMASS ENERGY   9

Biomass potential in India – Gobar gas producer gas – Characteristics of biomass – Operation and design of biogas plants – Objectives, principles and operational aspect of biogassifiers–Pyrolysis and incineration – Incineration of MSV and industrial Sludges – Application of biodiesel plants – Fuel cells.

OTHER RENEWABLE ENERGY SOURCES   9

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage – Fuel Cell Systems – Hybrid Systems.

TOTAL PERIODS:45

TEXT BOOK(S)

1. John Twidell, Tony Weir, "Renewable Energy Resources" Routledge, 2015.

REFERENCE(S)

1. George Tchobanoglouset.al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 2004.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, "Waste Management", Springer, 2001.
3. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.

Course Outcomes:

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

CO1: Aware about renewable Energy Sources and technologies

CO2: Analyze the solar energy perspectives and design aspects

CO3: Build the importance of wind energy systems

CO4: Develop the concepts of Biomass energy

CO5: Classify energy conservation techniques such as tidal, wave energy system

CO6: Develop knowledge in capturing and applying other forms of energy sources

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1		2			3	2					1	1	1	2	2
CO2	1	1		2	2	2	3					1	2		3	3
CO3	1	1		2	2	2	3					1	2	1	2	2
CO4	1	1		2	2	2	3					1	3		3	3
CO5	1	1		2		2	3					1			3	2
CO6	1	1		2		2	3					2		1	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE705	ENVIRONMENTAL IMPACT AND RISK ASSESSMENT	L-T-P	C
		3-0-0	3
Programme:	B.E. Civil Engineering	**Category**	**OE**
Pre-requisites:	Nil		
AIM:	To expose the students to the need, methodology, documentation and application of Environmental Impact Assessment and to develop the skill to prepare Environmental Management Plan.		

BASIC FUNDAMENTA LS   9

Historical Development of Environmental ImpactAssessment-EIA in Project Cycle-Legal and Regulatory Aspects in India-Types and Limitations of EIA-Cross Sectoral Issues and terms of references in EIA

COMPONENTS OF EIA ENVIRONMENTAL RISK ASSESSMENT & METHODOLOGY   **9**

EIA Process -Screening and Scoping-PublicParticipation in EIA-Mitigation. Methods for Environmental assessment-Matrices &Networks-Checklists-Cost benefit analysis-Analysis of Alternative-Software Packages for EIA and Expert Systems in EIA.

PREDICTION AND ASSESSMENT   **9**

Prediction tools for EIA-Mathematical modeling for impact prediction- Assessment of Impacts on Air and Water-Assessment of Impacts on Soil and Noise -Assessment of Impacts on Biological Community-Cumulative Impact Assessment-Documentation of EIA Findings &Report Preparation.

SOCIO-ECONOMIC IMPACT ASSESSMENT   **9**

Definition of Social Impact Assessment-Social Impact Assessment model and the --planning process-Relationship between social impacts and change in community and institutional arrangements-Individual and family level impacts -Communities in transition.

ENVIRONMENTAL MANAGEMENT PLAN & ENVIRONMENTAL RISK ASSESSMENT   **9**

Environmental Management Plan – Preparationand implementation and Rehabilitation plans-Policy and guidelines for planning and monitoring programmes-Post Project Audit-Ethical and Quality aspects of Environmental Impact Assessment—case studies – Environmental risk assessment framework-Hazard identification - Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods Risk Characterization Risk communication - Emergency Preparedness Plans –Design of risk management programs.

TOTAL PERIODS: 45

TEXT BOOK(S)

1. Lawrence, D.P., Environmental Impact Assessment – Practical Solutions to recurrent problems, Wiley-Interscience, New Jersey, 2003.

REFERENCE(S)

1. Charles H. Eccleston, "Environmental Impact Assessment: A Guide to Best Professional Practices" CRC Press; 1 edition (29 March 2011).
2. Michael F. Dallas, "Value and Risk Management: A Guide to Best Practice" WB; 1 edition, 2011.
3. World Bank – Source Book on EIA.

Course Outcomes:

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

CO1: Examine the impacts and risks that will be caused by projects or industries

C02: Analyze the Components of EIA & Understand The Software

CO3: Interpret the legal requirements of environmental and risk assessment for projects

CO4: Improve the environmental and socio- economic impact for any developmental project.

CO5: Design environmental management plan and risk mitigation plan by considering environmental aspects

CO6: Utilize HAZOP and FEMA Risk Characterization methods.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1	3	3						1		1	3
CO2	1	3	1	1		1	3						1		3	1
CO3	1	1		3	1	2	3						1		2	2
CO4	2	1		3	2	2	3						2		3	2
CO5	2	1		2	1	2	3						1		1	3
CO6	2	1		2	1	2	3						2		1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE706	ENVIRONMENT AND ECOLOGY	L-T-P	C
		3-0-0	3
Programme:	B.E. Civil Engineering	**Category**	**OE**
Pre-requisites:	Nil		
AIM:	To impart the basic knowledge about Environment & Ecology.		

FUNDAMENTALS OF ENVIRONMENT & ECOLOGY   **9**

Environment - Ecology and Ecosystem - Food chain - Food web - Trophic level - Energy flow – Introduction, types, characteristic features, structure and function - Forest - Grassland, Desert and Aquatic ecosystems - Effects of human activities on environment, Agriculture, Housing, Industry, Mining and Transportation activities.

NATURAL RESOURCES   **9**

Water Resources - Mineral Resources - Soil, Material cycles - Carbon, Nitrogen and Sulphur Cycles - Energy - Different types of energy - Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas.

ENVIRONMENTAL POLLUTION & CURRENT ENVIRONMENTAL ISSUES OF IMPORTANCE   **9**

Air Pollution, Water pollution, Land pollution, Noise pollution - Causes, effects and control measures Climate Change and Global warming effects - Acid Rain, Ozone Layer depletion, Photochemical Smog, Solid waste management and Waste water treatment.

ENVIRONMENT QUALITY STANDARDS   **9**

Ambient air quality standards - Water quality parameters and standards - Turbidity, pH, Suspended solids, hardness, residual chlorine, sulphates, phosphates, iron and manganese, DO, BOD and COD.

ENVIRONMENT IMPACT ASSESSMENT   **9**

Introduction to EIA-Screening, Scoping, Public Participation. EIA for infrastructure projects – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage - Case studies.

                                            TOTAL PERIODS:45

TEXT BOOK(S)

1. PANDEY SN & MISRA SP, "Environment and Ecology", Ane Books Pvt. Ltd, New Delhi, 2011.
2. Sharma P.D., "Ecology and Environment", Rastogi Publication, 2007.

REFERENCE(S)

1. Shukla, S.K. and Srivastava, P.R., "ConceptsNin Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.
2. Canter, R.L., "Environmental Impact Assessment", McGraw-Hill Inc., New Delhi, 1997.
3. S. S. Dara, "A Text Book of Environmental Chemistry & Pollution Control", S. Chand and Co.
4. Samir K. Banerjee, "Environmental Chemistry", Prentice Hall of India Pvt. Ltd. New Delhi.

Course Outcomes:

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

CO1: Classify the various ecosystem and effects of human activities on environment

CO2: Classify the types of natural resources and the sources of energy produced

CO3: Analyze the environment issue based on environmental pollution.

CO4: Apply the Environment Quality Standards according to pollution types.

CO5: Build Environment Impact Assessment for Highways & Dams

CO6: Formulate the EIA for Water Supply and Drainage Projects

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3			3	3					1	2			3
CO2	1	2	3		2	3	3					1	2			2
CO3	2	2	1		3	2	2				2	1	3			3
CO4	1	3	1	2	2	3	2	2				2	1			2
CO5	2	1	2	1	2	1	3	3			3	1	2			3
CO6	2	1	2	1	2	1	3	3			3	1	2			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE707	**TECHNOLOGY MANAGEMENT**	**L-T-P**	**C**
		3-0-0	**3**
Programme:	B.E. Civil Engineering	**Category**	**OE**
Pre-requisites:	Nil		
AIM:	To familiar the students with technology strategies formulation		

TECHNOLOGY MANAGEMEN T   9

Introduction to technology management - Concept and meaning of technology - Evolution and growth of technology - Role and significance of management of technology - Impact of technology on society and business - Forms of technology: process technology and product technology.

TECHNOLOGY DEVELOPMENT   9

Competitive advantages through new technologies: product development – from scientific breakthrough to marketable product - Role of Government in Technology Development -Linkage between technology, development and competition, Managing research and development (R&D) and Intellectual Property.

TECHNOLOGICAL FORECASTING   9

Technological Forecasting - Exploratory-Intuitive - Extrapolation - Growth Curves -Technology Monitoring, Normative: Relevance Tree, Morphological Analysis - Mission Flow Diagram.

TECHNOLOGY ACQUISITION   9

Technology Assessment - Technology Choice - Technological Leadership and Follower ship - Technology Acquisition - Meaning of Innovation and creativity - Innovation management.

TECHNOLOGY DIFFUSION   9

Technology strategy - Concept - Types - Key principles - Framework for formulating technology strategy, Technology forecasting - Techniques and application - Technology diffusion and absorption - Rate of Diffusion -Innovation Time and Innovation Cost - Speed of Diffusion - Project management in adoption and implementation of new technologies.

TOTAL PERIODS:45

TEXT BOOK(S)

1. Betz. F., "Strategic Technology Management", Tata McGraw Hill, 2004.
2. TarekKhalli, "Management of Technology", Tata McGraw Hill, 2001.

REFERENCE(S)

1. Schilling, "Strategic Management of Technological Innovation", Tata McGraw Hill, 2nd edition.2006.
2. Kathleen R Allen, "Bringing New technology To Market", Prentice Hall India, 2005.
3. Gaynor, "Handbook Of Technology Management", Tata McGraw Hill, 2001.

Course Outcomes:

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

CO1: Apply the dynamics of technological innovation.

CO2: Build new technology strategies

CO3: Formulate Technological Forecasting,Exploratory,Intuitive and Extrapolation

CO4: Classify Technology Assessment ,Technology Choice,Technological Leadership and Follower ship

CO5: Categorize Framework for formulating technology

CO6: Invent Project management in adoption and implementation of new technologies

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			3			1	3	3	1		3	1	2		2	
CO2	1		3			1	1	3	2	3	2	1	3		2	
CO3	2		3			2	3	3	2	2	3		2		3	
CO4	2		2			2	3	3	2	1	2	2	2		1	
CO5			2			1	2	3	2	1	2	1	3		2	
CO6	2		2			2	3	1	2	1	3		2		2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE708   **SUSTAINABLE MANAGEMENT OF URBAN ECOLOGY**   **L-T-P**   **C**
                                                                          3-0-0   **3**

Programme: B.E. Civil Engineering   **Category**   **OE**
Pre-requisites: Nil

AIM: This course provides an overview of, and engagement with, various theoretical perspectives, debates and research practices in urban ecology, urban ecosystems, and urban sustainability.

INTRODUCTION TO SUSTAINABLE DEVELOPMENT   9

Definitions and principles of Sustainable Development –Environment and Development linkages – Millennium Development Goals.

ENVIRONMENTAL SUSTAINABILITY   9
Planning, Measuring Sustainability - Carrying Capacity and its limits - Social Capital and its limits- Urban sustainability, Social, Economic, Ecological dimensions Concept of Ecological Foot print.

URBAN ECOSYSTEM   9
Concepts and theories of urban ecology-Linkages with sustainable urbanism – Concepts of Eco cities, smart cities, compact cities- Urban Ecosystem Challenges and opportunities – Urban areas and ecological services, Urban Ecological Frameworks.

URBAN WATER RESOURCES MANAGEMENT   9
Water in urban ecosystem – Urban Water Cycle - storm water management practices – Water harvesting Structures – IWRM concepts and applications to Urban Water management - Integrated urban water planning– Water Resources management models and Water policy of Developed nations- National water Policy -Conflicts on water between Interstate and country – water Pricing – Case studies.

URBAN WASTEWATER MANAGEMENT & FUTURES OF URBAN ECOSYSTEMS   9
Status of Wastewater treatment and disposal, pollution in India – Impacts on ecosystem, Eco friendly treatment systems- concept of decentralization – Bio remediation, Phytoremediation- Wastewater management policy and models of Developed nations– eco restoration of rivers – Case studies.Scenario Planning and Adaptive Management, Ecological Design, Emerging Trends and Technologies, Integrated Models, Climate modifications and managing climate change challenges in cities, Adaptation and mitigation measures to make cities resilient Future proofing of cities.

TOTAL PERIODS:45

TEXT BOOK(S)

1. Philip James, JariNiemelajurgenH .Breuste "Urban Ecology:Patterns, Processesand applications", OUP Oxford, 2011.

2. Zhifeng Yang "Eco- Cities: A Planning Guide (Applied Ecology and Environmental Management)" CRC Press, 2012.

REFERENCE(S)

1. Tracer Strange and Anne BAley ,"Sustainable Development –Linking economy,Society, environment" , StatLink from OECD Publishing 2008.

2. UNU/IAS Report ,"Defining an Ecosystem Approach to Urban Management and Policy Development" March 2003.

Course Outcomes:

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

CO1: Develop Environment linkages in the urban perspective

CO2: Invent Urban sustainability, Social, Economic, Ecological dimensions

CO3: Apply the Urban water management tools and models

CO4: Assess the present scenario and introduce eco friendly techniques to manage the wastewater

CO5: Design the future urban ecosystems keeping the climate change as a constraint

CO6: Classify various methods of analysing and estimating pollution, clean energy technologies
     to have a sustainable ecosystem

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3						3	3	1	2	3		2			3
CO2	1		1			3	2	2	1	2			1		1	2
CO3	1		2			2	3	3	1	1	3		2		3	2
CO4	3		2			3	2	2	2	1	3		1			3
CO5	2	1	2			2	2	3	2	1	2		2		2	1
CO6	1	2	1			2	1	2	2	1	2		2		3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)