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 2019

Department of Civil Engineering

CANDIDATES ADMITTED DURING 2019-2020 AND ONWARDS

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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

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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 2019 - 2020 and Onwards]

[UG Regulation-2019]

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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 "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-Electronics and Communication Engineering
2. B.E-Computer Science and Engineering
3. B.E-Electrical and Electronics Engineering
4. B.E-Mechanical Engineering
5. B.E-Civil Engineering
6. B.TECH-Bio-Technology
7. B.E – Biomedical Engineering

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, Management courses.

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

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

iv) **Professional Core (PC)** courses include the courses relevant to the chosen specialization/branch

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

vi) **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.

vii) **Project (PROJ)** Project Work as prescribed in the curriculum and syllabus

viii) **Employability Enhancement Courses (EEC)** includes Seminar, Internship in industry or elsewhere, Industrial/Practical Training, Value Added Courses.

ix) **Mandatory Courses (MC)** includes Environmental Sciences, Induction Programme, Indian Constitution, Essence of Indian Knowledge Tradition

4.2 Induction Programme

Every student admitted in to the first year of the B.E. / B.Tech programme have to undergo a three weeks mandatory induction programme of the Institution. The three weeks induction programme will cover the following as per the guidelines of AICTE and Anna University:

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations

4.3 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.

4.4 Industrial Training / Internship

The students have to undergo minimum two weeks duration Industrial Training / Internship during summer / winter vacation at Research Organizations, Industries and / or at the Institution itself with due approvals of the HOD and Principal. The duration of Industrial training / Internship may be in parts or continuously during the course of study.

4.5 **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 REGISTRATION AND REAPPEARANCE 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 / register for the course of the semester as notified by the Principal. However, the student shall confirm the enrollment by registering for the courses within the first three working days or as per the direction of the Principal 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 or as per the direction of the Principal 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 3. However the maximum number of credits the student can register in a

particular semester cannot exceed 36 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 If a student fails in a theory course, the student shall do reappearance registration compulsorily for that course in the subsequent semester. The student can optionally earn Continuous Assessment marks and attend End Semester examination, in such case latest Assessment marks will only be valid.

The student may attend the classes for the reappearance registration Courses, if the student wishes. 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.

6.10 If the theory course, in which the student has failed, is a Professional Elective or an Open Elective, the student may register for the same or any other Professional Elective or Open Elective Course respectively in the subsequent semesters. Such changes can be done only with due approval by Head of the Department.

6.11 The student who fails in any Laboratory Course/ Project work / Seminar shall register for the same in the subsequent Semester and reappear for the End Semester Examinations.

6.12 If a student is prevented from writing end semester examination of a course due to lack of attendance, the student has to register for that course again, when offered next, attend the classes and fulfill the attendance requirements as per Clause 7. If the course, in which the student has lack of attendance, is a Professional Elective or an Open Elective, the student may register for the same or any other Professional Elective or Open Elective Course respectively in the subsequent Semester of Study.

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.

7.3 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.

7.4 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 Employability 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
Theory Cum Practical Courses	30	70
Practical Courses	30	70
Project Work	30	70
Mandatory Courses (Non-Credit))	100	Nil

8.1 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 for theory part by the department / Institution. The marks obtained in best of two tests shall be reduced to 60 marks and rounded to nearest integer. 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]**

Seminar may be considered for the courses as per the feasibility and decision of the HoD. In this case, the student has to make seminar on the topics related to the course. The seminar will be assessed by the course tutor with common parameters as described by the department and included in the internal assessment. If seminar is not considered, weightage of Assignment or Mini-Project (sec 8.1 (ii)) shall be 30%.

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 Theory Cum Practical Courses**

i) **Internal Tests for Theory Part [50% weightage]**

Three tests each carrying sixty (60) marks shall be conducted for theory part by the department / Institution. The marks obtained in best of two tests shall be reduced to 40 marks and rounded to nearest integer. Retest at the discretion of the head of the department may be conducted for the deserving candidates. Assignment is allotted 10 marks.

ii) **Continuous Assessment for Practical Part [40% weightage]**

Every practical exercise / experiment shall be evaluated based on conduct of exercise / experiment and records maintained. The criteria for determining the Continuous Assessment for Practical Part are:

Observation and Record: 20% weightage

Lab Exam : 20 % weightage

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

8.4 **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 30 marks are:

Work assessed by the Project Guide:	50% weight
Assessment by an internal review committee:	50% weight

8.5 **Internal Assessment For Mini Project Works**

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.

8.6 **Internal Assessment For Mandatory Courses (Non-Credit)**

The courses under Mandatory 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** shall be reduced to **30**.

8.7 **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
50 - 59	B	6	Above Average
0 - 49	RA	0	Reappearance
Absent	AB	0	-
Shortage of	SA	0	-

Attendance			
Withdrawal	W	0	-

'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.

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,

Ci - is the Credits assigned to the course

GPi - 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.

iii) 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.

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.

iii) 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 six 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 7.00

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.

(ii) 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.

(iii) 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 / Employability 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.

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UG REGULATION-2019
CHOICE BASED CREDIT SYSTEM

B.E. CIVIL ENGINEERING
CURRICULUM
[I – VIII SEMESTERS – FULL TIME]

TOTAL CREDITS – 160

SEMESTER I

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1	191HS11	Communicative English	HSMC	2-0-0	2	-
2	191HS12	Calculus and Linear Algebra	BSC	3-1-0	4	-
3	191HS13	Engineering Physics	BSC	2-0-0	2	-
4	191HS14	Engineering Chemistry	BSC	2-0-0	2	-
5	191CSF1	Programming for Problem Solving	ESC	3-0-0	3	-
Theory cum Practical						
6	191MEF7	Mechanical Workshop	ESC	1-0-4	3	-
Practical						
7	191HS17	Physics and Chemistry Laboratory- I	BSC	0-0-2	1	-
8	191CSF7	C Programming Laboratory	ESC	0-0-2	1	-
						Total Credits - 18

SEMESTER II

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1	191HS21	Technical English	HSMC	2-0-0	2	-
2	191HS22	Differential Equations and Numerical Methods	BSC	3-1-0	4	-
3	191HS23	Physics of Material	BSC	2-0-0	2	191HS13
4	191HS24	Environmental Science	BSC	2-0-0	2	-
5	191EE11	Basic Electrical& Electronics Engineering	ESC	3-0-0	3	
Theory cum Practical						
6	191MEF1	Engineering Graphics	ESC	1-0-4	3	
Practical						
7	191HS27	Physics and Chemistry Laboratory-II	BSC	0-0-2	1	-
8	191EEF7	Basic Electrical & Electronics Laboratory	ESC	0-0-2	1	-
						Total Credits –18

SEMESTER -III

Sl. No.	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	191HS31	Transforms and Discrete Mathematics	BSC	2-1-0	3	-
2.	191BT31	Biology for Engineers	BSC	3-0-0	3	-
3.	191ME31	Engineering Mechanics	ESC	2-1-0	3	-
4.	191CE31	Surveying	PCC	3-0-0	3	-
5.	191CE32	Engineering Geology	PCC	3-0-0	3	-
Theory cum Practical						
6.	191CE33	Fluids Mechanics	PCC	3-0-2	4	-
Practical						
7.	191CE37	Computer Aided Drafting Laboratory	ESC	0-0-4	2	
8.	191CE38	Survey Practical	PCC	0-0-2	1	
9.	191HS37	Communication Skills - I*	HSMC	0-0-2	-	191HS21
						Total Credits – 22

SEMESTER –IV

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	191HS42	Probability and Statistics	BSC	2-1-0	3	191HS31
2.	191CE41	Mechanics of Solids -I	PCC	3-0-0	3	191CE31
3.	191CE42	Irrigation Engineering and Hydrology Structures	PCC	3-1-0	4	191CE32
4.	191CE43	Soil Mechanics and Foundation Engineering	PCC	3-0-0	3	-
5.	191CE44	Construction Materials and Techniques	PCC	3-0-0	3	-
Theory cum Practical						
6.	191CS46	Python Programming	ESC	3-0-2	4	-
Practical						
7.	191CE47	Strength of Materials Laboratory	PCC	0-0-4	2	-
8.	191CE48	Survey Camp	PCC	0-0-2	1	191CE33
9.	191HS47	Communication Skills - II*	HSMC	0-0-2	-	191CE41
						Total Credits – 23

SEMESTER - V

Sl. No.	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	191CE51	Mechanics of Solids - II	PCC	3-0-0	3	191CE41
2.	191CE52	Structural Analysis - I	PCC	2-1-0	3	191CE41
3.	191CE53	Environmental Engineering	PCC	3-0-0	3	191HS25
4.	191CE54	Design of Reinforced Concrete Elements	PCC	2-1-0	3	-
5.	--	Elective – I	PEC	3-0-0	3	
Theory cum Practical						
6.	191CE55	Highway And Railway Engineering	PCC	3-0-2	4	-
Practical						
7.	191CE57	Environmental Engineering Laboratory	PCC	0-0-4	2	191CE53
8.	191CE58	Soil Mechanics Laboratory	PCC	0-0-4	2	191CE43
9.	191HS57	Business English *	HSMC	0-0-2	-	-
						Total Credits – 23

SEMESTER – VI

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	191CE61	Structural Analysis – II	PCC	2-1-0	3	191CE52
2.	191CE62	Design of Steel Structures	PCC	2-1-0	3	-
3.	191CE63	Concrete Technology	PCC	3-0-0	3	191CE44
4.	--	Elective – II	PEC	3-0-0	3	
5.	--	Elective – III	OEC	3-0-0	3	
Theory cum Practical						
6.	191CE64	Design of Reinforced Concrete Structures & Detailing.	PCC	3-0-2	4	191CE56
Practical						
7.	191CE67	Concrete Laboratory	PCC	0-0-2	1	191CE44
8.	191CE68	Mini Project	PROJ-CE	0-0-2	1	
9.	191HS67	Career English	MC	0-0-2	-	-
						Total Credits – 21

SEMESTER – VII

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	191CE71	Construction Management	PCC	3-0-0	3	-
2.	191CE72	Engineering Economics, Estimation and Costing	PCC	3-0-0	3	-
3.	191BAE*	Elective – IV	OEC	3-0-0	3	
4.	--	Elective – V	PEC	3-0-0	3	
5.	--	Elective – VI	OEC	3-0-0	3	
Theory cum Practical						
6.	191CE73	Instrumentation for Civil Engineering	PCC	3-0-2	4	-
Practical						
7.	191CE77	Computer Aided Design and Analysis	PCC	0-0-4	2	
8.	191CE79	Project – I	PROJ-CE	0-0-4	2	
						Total Credits – 23

SEMESTER – VIII

Sl.No	Subject Code	Subject	Category	L-T-P	C	Pre-requisite
Theory						
1.	--	Elective –VII	PEC	3-0-0	3	--
2.	--	Elective –VIII	PEC	3-0-0	3	--
Practical						
1	191CE89	Project-II	PROJ-CE	0-0-12	6	--
						Total Credits – 12

HSMC – Humanity Science Course, BSC – Basic Science Course, ESC – Engineering Science Course, PCC – Programme Core Course, PEC – Programme Elective Course, OEC – Open Elective Course, EEC –Employability Enhancement Course,

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

I. LIST OF PROGRAMME ELECTIVES(PE)

191CEEA	Basics Dynamics and Aseismic Design	3-0-0	3
191CEEB	Concept of Finite Element Methods	3-0-0	3
191CEEC	Environmental Geotechnology	3-0-0	3
191CEED	Environmental Pollution and Control	3-0-0	3
191CEEE	Fast Track Construction Techniques	3-0-0	3
191CEEF	Ground Improvement Techniques	3-0-0	3
191CEEG	Hydraulic Structures	3-0-0	3
191CEEH	Hydrology	3-0-0	3
191CEEI	Industrial Structures	3-0-0	3
191CEEJ	Industrial Waste Treatment and Disposal	3-0-0	3
191CEEK	Prestressed Concrete Structures	3-0-0	3
191CEEL	Railways, Airport and Harbour Engineering	3-0-0	3
191CEEM	Remote Sensing & GIS	3-0-0	3
191CEEN	Repair and Rehabilitation of Structures	3-0-0	3
191CEEO	Smart Materials and Structures	3-0-0	3
191CEEP	Solid and Hazardous Waste Management	3-0-0	3
191CEEQ	Traffic Engineering and Management	3-0-0	3
191CEER	Transport Planning and Management	3-0-0	3
191CEES	Water Resource System Planning and Management	3-0-0	3

II. LIST OF OPEN ELECTIVES(OE)

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CSE				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**
1.	191OE1A	Green Computing	3–0–0	3
2.	191OE1B	Java Scripts	3–0–0	3
3.	191OE1C	Python Foundations	3–0–0	3
4.	191OE1D	Web Development using PHP	3–0–0	3
OPEN ELECTIVES OFFERED BY DEPARTMENT OF ECE				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**
1	191OE2A	Agriculture Electronics	3–0–0	3
2	191OE2B	Consumer Electronics	3–0–0	3
3	191OE2C	Medical Electronics	3–0–0	3
4	191OE2D	Multimedia Compression and Communication	3–0–0	3
OPEN ELECTIVES OFFERED BY DEPARTMENT OF EEE				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**
1	191OE4A	Domestic and Industrial Electrical Installation	3–0–0	3
2	191OE4B	Electrical Materials	3–0–0	3
3	191OE4C	Energy Auditing and Conservation	3–0–0	3
4	191OE4D	Energy Storage Systems	3–0–0	3
5	191OE4E	Renewable and Sustainable Energy	3–0–0	3
6	191OE4F	Vehicular Electric Power System	3–0–0	3
OPEN ELECTIVES OFFERED BY DEPARTMENT OF BIO-TECHNOLOGY				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**

1	191OE5A	Biomaterials	3–0–0	3
2	191OE5B	Biosensors	3–0–0	3
3	191OE5C	Bioweapons and Security	3–0–0	3
4	191OE5D	Food and Nutrition Technology	3–0–0	3
OPEN ELECTIVES OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**
1.	191OE6A	Maintenance Engineering	3–0–0	3
2.	191OE6B	Non-Destructive Testing and Materials	3–0–0	3
3.	191OE6C	Operations Research and Management	3–0–0	3
4.	191OE6D	Renewable Sources of Energy	3–0–0	3
5.	191OE6E	Robotics		
OPEN ELECTIVES OFFERED BY DEPARTMENT OF CIVIL ENGINEERING				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**
1	191OE7A	Air and Noise Pollution Control	3–0–0	3
2	191OE7B	Energy Science and Engineering	3–0–0	3
3	191OE7C	Environment and Ecology	3–0–0	3
4	191OE7D	Fundamentals of Fire Safety	3–0–0	3
OPEN ELECTIVES OFFERED BY DEPARTMENT OF BIOMEDICAL ENGINEERING				
S. No.	**Course Code**	**Name of the Course**	**L-T-P**	**C**
1	191OE8A	Brain Computer Interface and its Applications	3–0–0	3
2	191OE8B	Internet of Things in Medicine	3–0–0	3
3	191OE8C	Speech Processing	3–0–0	3
4	191OE8D	Telehealth Technology	3–0–0	3
OPEN ELECTIVES OFFERED BY MBA				
1.	191BAE1	Engineering Economics & Accounting	3-0-0	3
2.	191BAE2	Entrepreneurship	3-0-0	3
3.	191BAE3	Essentials of Management	3-0-0	3
4.	191BAE4	Intellectual Property Rights	3-0-0	3
5.	191BAE5	Professional Ethics in Engineering	3-0-0	3
6.	191BAE6	Women Studies and Women Empowerment	3-0-0	3

III LIST OF MANDATORY COURSES (MC)

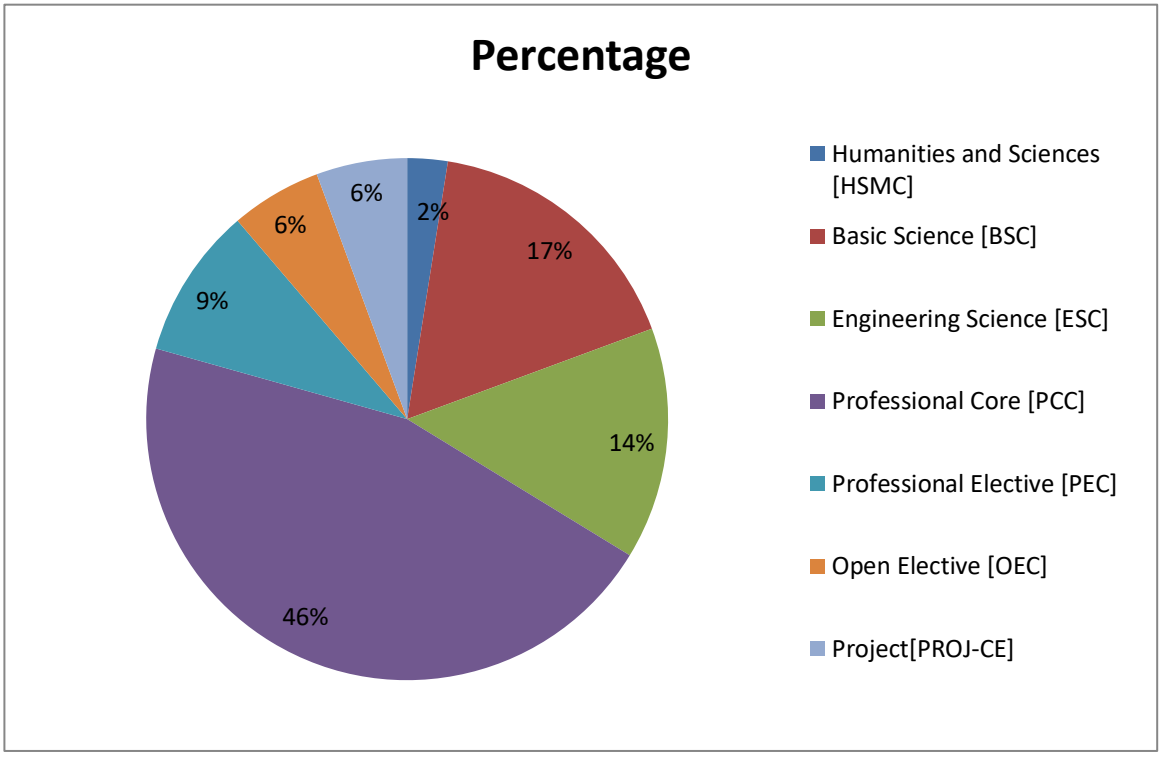
MANDATORY COURSES					
S. No.	**Course Code**	**Name of the Course**	**Category**	**L–T–P**	**Credit**
1	191MC01	Design Thinking	MC	2–0–0	0
2	191MC02	Essence of Indian Traditional Knowledge	MC	2–0–0	0
3	191MC03	Indian Constitution	MC	2–0–0	0
4	191MC04	Universal Human Values	MC	2–0–0	0
5	191MC05	Yoga	MC	2–0–0	0

VALUE ADDED COURSES				
1.	191VC01	STADD-Pro, Revit Architecture, ETABS, Primavera, Sketchup, Microsoft Project,	20-0-20	-
2.	191VC02			

3.	191VC03	FEM, GeoSoft, IoT, Cloud Computing (Infra-AWS)		

Credit Distribution

Category	No. of Credits	Percentage	Suggested As per AICTE in %
Humanities and Sciences [HSMC]	04	2.5%	7.5
Basic Science [BSC]	27	16.87%	15.63
Engineering Science [ESC]	23	14.37%	15
Professional Core [PCC]	73	45.63%	30
Professional Elective [PEC]	15	9.38%	11.25
Open Elective [OEC]	09	5.63%	11.25
Project[PROJ-CE]	09	5.63%	9.37
Total	**160**	**100**	**100**



191HS11	COMMUNICATIVE ENGLISH				L-T-P	C
					2-0-0	2
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**I**	**Category:**	**HSMC**	
Prerequisites:	Acquire Language proficiency.					
Aim:	To acquire basic Language Skills in order to communicate with English Language Speakers					

SHARING INFORMATION RELATEDTO ONESELF, FAMILY AND FRIENDS	**6**
Reading – Short comprehension passages, Practice in skimming and scanning. **Writing –** Sentence structures, Developing Hints. **Listening –** Short texts, Short formal and informal conversations. **Speaking** – Introducing oneself, Exchanging personal information. **Language Development** – WH questions, Asking and answering YES or NO questions, Parts of Speech. **Vocabulary Development –** Prefixes & Suffixes, Subject verb Agreement.	
GENERAL READING AND FREE WRITING	**6**
Reading – **Comprehension** – Pre-reading & Post-reading. Comprehension questions (Multiple choice questions, Short questions, Open-ended questions), Short narratives and Descriptions from Newspapers including Dialogues. **Writing –** Paragraph writing, Use of Phrases and Clauses in sentences, Listening Telephonic conversations. **Speaking** – Sharing information of a personal kind, Greetings. **Language Development –** Noun Pronoun agreement. **Vocabulary Development** – The Concept of Word Formation. (Norman Lewis' *Word Power Made Easy*)	
GRAMMAR AND LANGUAGE DEVELOPMENT	**6**
Reading – Short texts & Longer passages (Cloze reading). **Writing** – Importance of proper punctuation, Jumbled sentences. **Listening –** Listening to longer texts and filling up the table, Product description, Narratives from different sources. **Speaking –** Asking about routine actions and Expressing opinions. **Language Development** – Degrees of Comparison, Pronouns. **Vocabulary Development –** Misplaced modifiers, Relative clauses.	
READING AND LANGUAGE DEVELOPMENT.	**6**
Reading- Comprehension. **Reading** longer texts- reading different types of texts. **Writing**- letter Writing, informal or personal Letters-Achieving Coherence. **Listening**- listening to dialogues or conversations and completing exercises based on them. **Speaking**- Speaking about oneself- Speaking about one's friend. **Language Development**- Articles. **Vocabulary Development** – Root words from foreign languages and their use in English.	
EXTENDED WRITING	**6**
Reading-Longertexts-closereading.**Writing**-Organizingprinciplesofparagraphsindocuments.**Listening** –Listeningtotalks,conversations.**Speaking**–Participatinginconversations,shortgroupconversations. **Language Development** - Clinches, Tenses. **Vocabulary Development** - Prepositions.	
Total Periods	**30**

Text books:

1. Board of Editors. *Fluency in English: A course book for Engineering and Technology*. Orient Blackswan, Hyderabad:2016.
2. Kumar, Sanjay and Pushpa Lata. *Communication Skills: A Workbook*. New Delhi: OUP,2018

References:

1. www.oxfordonlineenglish.com
2. www.ielts.up.com
3. www.ted.com
4. www.testpreppractice.com
5. www.beccambridgeenglish.org

Extensive Reading

1. Shiv Khera, *You Can Win*, Macmillan Books, New Delhi, 2003.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Develop the basic reading and writing skills.
CO2	Listen actively and grasp the contents of the speech.
CO3	Develop their speaking skills and speak fluently in real contexts.
CO4	Develop vocabulary of a general kind by developing their reading skills.
CO5	Use the grammar effectively to exhibit their speaking and writing skill.
CO6	Speak in English with clarity.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	2	-	-	-	-	-	3	-
CO6	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-

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

191HS12	CALCULUS AND LINEAR ALGEBRA				L-T-P	C
					3-1-0	4
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**I**	**Category:**		**BSC**
Prerequisites:	Matrices, Differentiation and Integration.					
Aim:	The course is aimed at developing the basic mathematical skills of engineering students					

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.	
CALCULUS	**12**
Radius of Curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and Evolutes – Beta and Gamma functions and their properties.	
MULTIVARIABLE CALCULUS	**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.	
VECTOR CALCULUS	**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 parallelepiped.	
COMPLEX VARIABLE – DIFFERENTIATION	**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.	
Total Periods	**60**

Text books:

1. B.S. Grewal, "**Higher Engineering Mathematics**", Khanna Publishers, New Delhi, 43rd Edition,2014.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th edition, Pearson, Reprint,2002

References:

1. Veerarajan.*T.,* "**Engineering Mathematics for first year**", Fourth Edition, Tata Mc-Graw – Hill, New Delhi,2008.
2. Erwin *Kreyszig*, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons,2006.
3. G.B. Thomas and R.L. Finney, "**Calculus and Analytic Geometry**" 9th Edition, Pearson,Reprint,2002.
4. N.P. Bali and Manish Goyal, "**A textbook of Engineering Mathematics**", Laxmi Publications, Reprint,20
5. B.S. Grewal, "**Higher Engineering Mathematics**", Khanna Publishers, 36th Edition, 2010.
6. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition., Mc-Graw Hill,2004

Course Outcomes:

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

CO1	Find the inverse and the positive powers of a square matrix
CO2	Apply the concept of orthogonal reduction to diagonalize the given matrix
CO3	Estimate of curves, Beta and Gamma Functions.
CO4	Apply Lagrangian multiplier method for finding maxima and minima of an unconstrained problem
CO5	Apply the concepts of Differentiation and Integration in Vectors.
CO6	Predict an analytic function, when its real or Imaginary part is known.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	-	1	-	-	-	-	-	-	-	3	-	2	1	-
CO2	2	3	-	3	-	-	-	-	-	-	-	2	-	-	-	1
CO3	3	3	-	-	-	-	-	-	-	-	-	2	2	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO6	2	2	-	1	-	-	-	-	-	-	-	3	2	-	-	2

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

191HS13	ENGINEERING PHYSICS			L-T-P	C
				2-0-0	2
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**I**	**Category:**	**BSC**
Prerequisites:	School Level Physics				
Aim:	To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.				

SOLID STATEPHYSICS	**6**
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 Defects-point, Line and surface defects –burger vector.	
WAVE OPTICS	**6**
LASERS: Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einstein's A and B coefficients – Derivation- Types of lasers – CO_2, Nd-YAG - Industrial Applications - Lasers in welding, cutting and Soldering **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.	
PROPERTIES OF MATTER	**6**
Elasticity–Stress - strain diagram and its uses -factors affecting elastic modulus and tensile strength –torsional stress and deformations – twisting couple- torsion pendulum: theory and experiment -bending of beams - bending moment –cantilever: theory and experiment–uniform and non-uniform bending: theory and experiment – I shaped girders - stress due to bending in beams.	
QUANTUM PHYSICS	**6**
Black body radiation – Planck's theory -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.	
ACOUSTICS AND ULTRASONICS	**6**
ACOUSTICS: Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - Sabine's formula - absorption coefficient and its determination – factors affecting acoustics of buildings : focusing, interference, echo, Echelon effect, resonance - noise and their remedies. **ULTRASONICS**: Ultrasonics - production - magnetostriction and piezoelectric methods - acoustic grating - Industrial applications - NDT.	
Total Periods	**30**

Textbooks:

1. Gaur R. K., Gupta S. C., "Engineering Physics" Dhanpat Rai Publications, New Delhi(2016)
2. Avadhanulu M. N., Kshirsagar, P. G., "A Textbook of Engineering Physics", S.Chand and company, Ltd., New Delhi, 2017.

References:

1. Serway and Jewett., "Physics for Scientists and Engineers with Modern Physics",6th Edition, Thomson Brooks/Cole, Indian reprint(2016)
2. Arither Beiser, Concepts of Modern Physics, Tata Mc Graw Hill, New Delhi(2015)

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Understand the theory and various crystal structures.
CO2	Use basic configuration of a Laser, types of lasers and the industrial applications of Laser.
CO3	Apply principle behind fiber optic communication and the electronic devices involved in the transmission and reception of data.
CO4	Analyze basics of properties of matter and its applications,
CO5	Gain knowledge about basic equations of Quantum mechanics and its applications.
CO6	Understand the basic concepts of acoustics and ultrasonic.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	1	1	2	-	-	-	-	-	3	-	-	-	2	1	-	3
CO2	2	3	1	-	2	1	-	-	1	-	-	2	1	-	1	1
CO3	2	1	2	-	1	1	2	-	-	1	-	-	2	1	-	3
CO4	2	3	1	1	3	-	-	-	-	-	-	-	1	-	2	1
CO5	1	1	-	2	-	-	-	-	-	-	-	-	-	2	-	1
CO6	1	2	3	1	1	2	3	-	-	-	-	-	2	-	1	-

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

191HS14	ENGINEERING CHEMISTRY				L-T-P	C
					2-0-0	2
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**I**	**Category:**		**BSC**
Prerequisites:	Basic Science					
Aim:	To impart a sound knowledge on the principles of chemistry involving the different Application oriented topics required for all engineering branches.					

WATER TECHNOLOGY	**6**
Hardness -Types and Estimation by EDTA method- alkalinity –types of alkalinity and determination - Domestic water treatment –disinfection methods – Boiler feed water– internal conditioning– external Conditioning – desalination and reverse osmosis.	
ELECTROCHEMISTRY	**6**
Electrochemical cells – reversible and irreversible cells – EMF –measurement of emf – Single electrode potential – Nernst equation– reference electrodes –Standard Hydrogen electrode – Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series	
SPECTROSCOPIC TECHNIQUES AND APPLICATIONS	**6**
Introduction of UV-Visible and IR spectroscopy and selection rules- principles and instrumentation of UV-Visible (electronic) spectroscopy – IR (vibrational) spectroscopy - its applications. Fluorescence spectroscopy and its applications in medicine-calorimetry– estimation of iron by calorimetry .	
INORGANIC & ORGANIC COATINGS	**6**
Paint–Definition–Components of Paints and their functions–Varnish–Definition–Preparation of Oil Varnish–Differences between Paint and Varnish–Special Paints–Luminescent Paints, Fire Retardant Paints-Aluminum Paints - Distemper. Corrosion control– electroplating (Au) and electro less (Ni) plating.	
PREPARATION OF CONSUMER PRODUCTS	**6**
Washing Powder- Cleaning powder - phenoyls (white, Black & coloured)- Shampoo- liquid blue- inks - blue –red - green inks – Soap - bathing & detergent – oils - Face powder and bleaching powder.	
Total Periods	**30**

Textbooks:

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” Dhanpat Rai Pub, Co., New Delhi(2002)

References:

1. S.S. Dara, S.S. Umare, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi2010.
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

Course Outcomes:

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

CO1	Demonstrate the essential concept of water and their properties and applications.
CO2	Analyze treatment of water for potable and industrial purposes
CO3	Understand the operating principles and the reaction involved in electrochemistry.
CO4	Recall the principles and application of spectroscopy
CO5	Learn the basic ingredients required for paint formulation
CO6	Know the preparation techniques of consumer products

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	PS O1	PS O2	PS O3	PS O4
CO1	2	2	-	1	1	1	1	-	-	-	2	2	2	1	-	1
CO2	2	2	1	2	1	2	1	-	-	-	1	1	-	1	-	2
CO3	2	1	1	2	2	-	-	-	-	-	-	2	-	1	-	-
CO4	2	2	1	-	1	-	-	-	-	-	2	1	-	-	2	-
CO5	2	2	1	-	1	1	-	-	-	-	-	2	-	-	-	2
CO6	2	2	1	1	2	1	-	-	1	1	1	1	-	-	2	-

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

191CSF1	PROGRAMMING FOR PROBLEM SOLVING				L-T-P	C
					3-0-0	3
Programme:	**B.E./B.Tech. (EEE, CIVIL, MECH,BIO-TECH)**	**Sem:**	**I**	**Category:**	**ESC**	
Prerequisites:	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 –Bubble Sort – Linear Search -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 FILES	**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,2017.
2. Balagurusamy E, "Programming in ANSI C", Tata Mcgraw-Hill Education,2016
3. ReemaTheraja, "Computer Fundamentals and Programming in C", 2e, Oxford University Press,2016.

References:

1. Byron S Gottfried, "Programming with C", Schaum's Outlines, 3rdEdition, McGraw-Hill,2017.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, 4th Reprint,2007.
3. Kernighan.B.W and Ritchie, D.M, "The C Programming language", 2nd Edition, Pearson Education,2006.

Course Outcomes:

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

CO1	Understand the basic terminologies of Computer and various Problem solving techniques.
CO2	Write, compile and debug programs in C language.
CO3	Use different data types in a computer program.
CO4	Design programs involving decision structures, loops and functions.
CO5	Analyze the dynamics of memory by the use of pointers.
CO6	Use different data structures and create/update basic data files.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	2	-	-	-	-	-	3	2	-	3	3	3	-	-
CO2	3	3	3	-	-	-	-	-	2	1	-	3	3	3	3	2
CO3	-	3	2	-	-	-	-	-	2	-	-	2	3	2	-	-
CO4	-	3	3	-	-	-	-	-	3	-	-	3	3	-	3	-
CO5	2	3	2	-	-	-	-	-	-	-	-	2	-	2	-	-
CO6	-	2	3	-	-	-	-	-	2	-	-	3	2	-	-	2

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

191MEF7	MECHANICAL WORKSHOP				L-T-P	C
					1-0-4	3
Programme:	**B.E./B.Tech. (EEE, CIVIL, MECH, BIO-TECH)**	**Sem:**	**I**	**Category:**	**ESC**	
Prerequisites:	Nil					
Aim:	To Provide exposure to the students with hands on experience on various basic Engineering Practices					

FITTING OPERATIONS & POWER TOOLS	**12**
Preparation of square fitting, vee & step – fitting models	
CARPENTRY	**12**
Study of the joints in roofs, doors, windows and furniture; Hands-on-exercise: Dismantling & Assembling of various wooden furniture; Preparation of T Joint, dove tail joint	
SHEET METAL FORMING	**12**
Preparation of tray and funnel	
WELDING	**12**
Preparation of arc welding of butt joints and lap joints	
PLUMBING	**12**
Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings; Hands-on-exercise -basicpipeconnections–Mixedpipematerialconnection– Connections with different joining components	
Total Periods	**60**

LIST OF EQUIPMENTS (For a batch of 30 students)

1. Fitting vice (fitted to work bench) -15Nos
2. Fitting Tools – 15set
3. Carpentry vice (fitted to work bench) - 15Nos.
4. Models of industrial trusses, door joints, furniture joints - 5Nos.
5. Standard woodworking tools - 15Sets
6. Hand Shear -01
7. Standard tools and calipers for sheet metal work -05
8. Arc welding transformer with cables and holders -5Nos.
9. Welding booth - 5Nos.
10. Welding accessories like welding shield, chipping hammer, Wire brush, etc., -5Sets

Assorted components for plumbing consisting of metallic pipes, Plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings - 15 Sets

Course Outcomes:

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

CO1	Make the square fitting, vee & step fitting
CO2	Produce simple wooden joints using wood working tools
CO3	Fabricate tray and funnel in sheet metal
CO4	Create simple lap, butt and tee joints using arc welding equipment
CO5	Identify the various pipe joints
CO6	Make the pipe connections

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	PS O1	PS O2	PS O3	PS O4
CO1	2	-	2	1	3	1	1	-	-	-	-	2	1	-	-	1
CO2	2	1	3	2	2	1	2	-	-	-	-	1	-	2	-	2
CO3	1	-	3	2	2	-	2	-	-	-	-	1	1	-	-	-
CO4	2	2	2	1	1	1	3	-	-	-	-	2	-	-	-	-
CO5	1	-	1	2	2	-	1	-	-	-	-	2	2	-	3	-
CO6	1	2	1	1	2	1	2	-	-	-	-	3	-	-	-	2

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

191HS17	PHYSICS AND CHEMISTRYLABORATORY-I				L-T-P	C
					0-0-2	1
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**I**	**Category:**	**BSC**	
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)
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.
2. Torsional pendulum – Determination of rigidity modulus
3. Determination of Velocity of sound and compressibility of liquid –Ultrasonic Interferometer.
4. Determination of Dispersive power of a prism using Spectrometer.
5. Determination of Young's modulus of the material - Non uniform bending
6. Determination of thermal conductivity of a bad conductor - Lee's Disc method

LIST OF EXPERIMENTS – CHEMISTRY PART
NAME OF THE EXPERIMENT

1. Estimation of Total Hardness of their home town Water by EDTA method.
2. Estimation of Alkalinity of Water sample
3. Estimation of Chloride ion in water sample by Argentometric method.
4. Estimation of Ferrous Ion by Potentiometric Titrations.
5. Conductometric Titration of strong acid Vs strong base

References:

1. Text book of Quantitative Inorganic Analysis, A.I.Vogel,ELBS,London,(2006)
2. "Practical A. Ravi Krishnan Engineering Chemistry", Sri Krishna Publications, Chennai(2002)
3. Engineering Physics Laboratory Manual
4. Engineering Chemistry Laboratory Manual

Course Outcomes:

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

CO1	Understand the laser light propagation in optical fibre and the rigidity modulus of the materials
CO2	Examine the velocity of sound in liquid and propagation light in the medium
CO3	know about the stress analysis and thermal conductivity of the material
CO4	Analyze of water quality parameter of potable water
CO5	Determine the unknown concentrations of chemicals
CO6	Apply the instrumental technique for calculating the amount of unknown substance

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	1	-	2	-	1	-	-	-	-	1	1	-	-	-
CO2	1	2	2	-	-	-	1	-	-	-	-	1	1	-	-	-
CO3	2	2	2	-	-	-	1	-	-	-	-	1	1	-	-	-
CO4	2	2	1	-	1	-	2	-	-	-	-	1	1	-	-	-
CO5	3	2	1	2	2	-	1	-	-	-	-	2	1	-	-	-
CO6	2	1	3	-	2	-	2	-	-	-	-	2	1	-	-	-

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

191CSF7	C PROGRAMMING LABORATORY				L-T-P	C
					0-0-2	1
Programme:	**B.E./B.Tech. (EEE, CIVIL, MECH,BIO-TECH)**	**Sem:**	**I**	**Category:**		**ESC**
Prerequisites:	Nil					
Aim:	To provide practical knowledge in developing C Programming.					

LIST OF EXPERIMENTS:

1) Draw a flowchart for various algorithms using Raptor
2) C Programming using Simple statements and expressions.
3) Scientific problem-solving using decision making and looping.
4) Simple programming for one dimensional and two-dimensional arrays.
5) Solving problems using String functions.
6) Programs with user defined functions - Includes Parameter Passing.
7) Program using Recursive Function and conversion from given program to flowchart.
8) Programs using pointers
9) Program using structures and unions.
10) Program using files.

Total Periods **60**

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.

Course Outcomes:

At end of this course, the students will be

CO1	Able to have fundamental concept on basics commands in Linux.
CO2	Able to write, compile and debug programs in C language.
CO3	Able to formulate problems and implement algorithms in C.
CO4	Able to effectively choose programming components that efficiently solve computing problems in real-world.
CO5	Able to 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)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	3	1	2	-	-	-	-	-	2	-	-	-	3	1	1	-
CO2	3	2	2	-	-	-	-	-	2	-	-	-	3	2	2	-
CO3	3	2	3	-	-	-	-	-	2	-	-	-	3	3	2	-
CO4	2	3	2	-	-	-	-	-	2	-	-	-	3	2	2	2
CO5	3	-	2	-	-	-	-	-	2	-	-	-	3	2	1	-
CO6	2	-	2	-	-	-	-	-	-	-	-	-	2	2	1	-

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

191HS21	TECHNICAL ENGLISH				L-T-P	C
					2-0-0	2
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**II**	**Category:**	**HSMC**	
Prerequisites:	Acquire Proficiency in Technical Communication					
Aim:	To develop the students' intellectual, personal & Professional abilities					

INTRODUCTION TO TECHNICAL ENGLISH	**6**
Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises. **Speaking** – Asking for and giving directions. **Reading** – reading short technical texts, Newspapers. **Writing** - Purpose statements, Extended definitions, Writing Instructions & Recommendations, Checklists. **Vocabulary Development** - Technical Vocabulary. **Language Development** – Subject Verb Agreement.	
READING AND STUDY SKILLS	**6**
Listening - Listening to longer technical talks and completing exercises based on them. **Speaking** – Describing a process. **Reading** – Reading longer technical texts, Newspapers identifying various transitions in a text-paragraphing. **Writing** - Techniques for writing Precisely. **Vocabulary Development** -vocabulary used in formal letters/emails and reports. **Language Development** - Personal & Impersonal Passive voice, Numerical adjectives	
TECHNICAL WRITING AND GRAMMAR	**6**
Listening - Listening to classroom lectures on Engineering / Technology. **Speaking** – Introduction to Technical presentations. **Reading** – Reading longer texts both general and Technical, practice in rapid reading. **Writing**- Describing a process, Use of sequence words, Causes and Effects **Vocabulary Development** - Sequence words, Nominal compounds, Misspelled words. **Language Development** –Embedded sentences.	
REPORT WRITING	**6**
Listening- Listening to documentaries and Making notes. **Speaking** – Mechanics of presentations. **Reading** – Reading for detailed comprehension. **Writing** - Job application, cover letter, Resume preparation. **Vocabulary Development** - Finding suitable synonyms, Paraphrasing. **Language Development** – Clauses, If conditionals.	
GROUP DISCUSSION AND JOB APPLICATIONS	**6**
Listening - TED/Ink talks. **Speaking** – Participating in a Group discussion. **Reading** – Reading and Understanding Technical articles. **Writing** – Writing reports, Minutes of Meeting, Introduction and Conclusion. **Vocabulary Development** - Verbal analogies**. Language Development** –Reported speech.	
Total Periods	**30**

Text books:

1 .Sudharshana,N.P. and C.Savitha. English for Technical Communication. New Delhi: Oxford University Press, 2017.

References:

1) www.bbc.co.uk/learningenglish
2) www.bec cambridgeenglish.org
3) www.englishenglish101.com
4) www.islcollective.com

Extensive Reading

Kalam, Abdul. *The Wings of Fire*. Hyderabad: UP, 1999.Print.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Remember words and its meanings for the specific purpose.
CO2	Understand the basic nuances of language
CO3	Apply written communication methodologies at workplace.
CO4	Develop Listening skill to respond and to gather information.
CO5	Interpret the text using comprehending skill.
CO6	Involve in professional correspondences confidently.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	-	-	-	-	-	1	-	2	-	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-

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

191HS22	DIFFERENTIAL EQUATIONS & NUMERICAL METHODS			L-T-P	C
				3-1-0	4
Programme:	**B.E. / B.Tech. (Common to all branches)**	**Sem:**	**II**	**Category:**	**BSC**
Aim:	To analyze the engineering problems using the techniques and the mathematical skills acquired by studying ODE and PDE uses numerical methods.				

ORDINARY DIFFERENTIAL EQUATIONS	**12**
Higher order linear differential equations with constant coefficients – Method ofvariationof parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations withconstantcoefficients.	
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 homogenous partial differential equations of second and higher order with constant coefficients.	
SOLUTION OF EQUATION & INTERPOLATION, NUMERICAL DIFFERENTIATION	**12**
Solutions of Polynomial and transcendental equations – Newton Raphson method - Interpolation using Newton's forward and backward difference formulae - Interpolation with unequal intervals- Newton's divided difference and Lagrange's formulae - Numerical differentiation using Newton's forward and backward difference formula - Numerical Integration – Trapezoidal rule and Simpson's $1/3^{rd}$rule.	
NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	**12**
Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method – Milne's predictor – corrector methods for solving first order equations – Finite difference methods for solving Second order equation.	
BOUNDARY VALUE PROBLEMS OF PARTIAL DIFFERENTIAL EQUATIONS	**12**
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. B.S. Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi,2005.
2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi,(2004).

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. Chopra S.C. and Canale R.P., "Numerical Methods for Engineers", Tata Mc-Graw Hill, New Delhi,
5. Gerald C.F., and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi,

Course Outcomes:

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

CO1	Use suitable method to solve higher order Differential Equations
CO2	Use suitable method to solve higher order PDE
CO3	Interpolate discrete data by means of continuous function.
CO4	Discover Numerical integration using Trapezoidal and Simpson's $1/3^{rd}$ rules
CO5	Solve the solution for the IVPs in ODE using single step and Multistep methods
CO6	Solve the solution of BVPs in PDE using finite difference methods

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	-	1	-	-	-	-	-	-	-	3	-	2	1	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	2	-	-	-	-	-	-	-	1	2	-	-	-
CO4	1	2	-	3	-	-	-	-	-	-	-	2	-	-	2	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO6	3	3	-	-	3	-	-	-	1	-	-	2	2	-	-	2

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

191HS23	PHYSICS OF MATERIAL			L-T-P	C
				2-0-0	2
Programme:	**B.E/B. Tech. (MECH, CIVIL & BIO-TECH)**	**Sem:**	**II**	**Category:**	**BSC**
Prerequisites:	Engineering Physics				
Aim:	To endow the students with the fundamentals of physics, materials and apply new ideas in the field of Engineering and Technology.				

CONDUCTING MATERIALS **6**

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.

POLYMER AND CERAMIC MATERIALS **6**

Polymers–Types of polymers–Thermal, Mechanical and Electrical Properties–Conducting Polymers, Bio-Polymers and High temperature polymers - applications

Ceramics–Properties and applications–ZrO_2, Al_2O_3, SiC,

COMPOSITE MATERIALS **6**

Definition–function of matrix and reinforcement in composites–classification of composites based on reinforcement–types of composite materials–polymers, metallic and ceramic matrix composites. Law of mixtures. Comparison with conventional materials. Fabrication of metal matrix and ceramic matrix composites–properties and uses

NEW MATERIALS **6**

Metallic glasses: Preparation, properties and applications.

Shape memory alloys (SMA): Characteristics - Properties of NiTi alloy – Applications -Advantages and disadvantages of SMA.

Bio Materials : Classification – Properties – Applications

NANO MATERIALS AND CHARACTERISATION TECHNIQUES **6**

Nanomaterials: synthesis – chemical vapour deposition– ball milling - properties of nanoparticles and applications- Carbon nanotubes- types

Characterization: Principle, Characterization and applications of X- Ray diffraction – Scanning Electron Microscope – Transmission Electron Microscope.

Total Periods **30**

Text books:

1. William D. Callister, Jr., **"Material Science and Engineering",** John Wiley & Sons Inc., Seventh Edition, New Delhi (2017).
2. Ragavan, V., **"Material science and Engineering"**, Prentice Hall of India(2004).
3. Kasap, S.O. **"Principles of Electronic Materials and Devices**", McGraw -Hill Education,2016.
4. Umesh K Mishra & Jasprit Singh, "**Semiconductor Device Physics and Design**",Springer,2014.

References:

1. Koch C., **"Nanostructured materials: processing, properties and applications",** William Andrew Pub (2011).
2. Charles P. Poole and Frank J.Ownen., **"Introduction to Nanotechnology"**, Wiley India(2007)
3. Charles Kittel., **"Introduction to solid state Physics"**, John Wiley & Sons, 7th editions, Singapore(2012)

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Understand the theory and processing of conducting, superconducting materials.
CO2	Acquire knowledge of polymer and ceramic materials.
CO3	Categorize composites materials and applications.
CO4	Enhance the knowledge new materials.
CO5	Understand about some exciting properties of nanomaterials
CO6	Assess Characterization Techniques of materials

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	2	1	1	-	-	3	-	-	1	-	-	1	3	1	-	-
CO2	3	2	2	1	-	1	-	-	-	-	-	1	2	1	1	-
CO3	1	-	2	1	-	2	1	-	1	-	-	-	1	2	-	-
CO4	2	2	1	1	-	2	-	1	-	-	-	-	2	2	-	-
CO5	3	1	3	2	2	-	-	-	-	-	-	-	2	1	1	-
CO6	3	3	3	2	3	2	1	-	-	1	-	-	3	-	1	1

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

191HS24	ENVIRONMENTAL SCIENCE			L-T-P	C
				2-0-0	2
Programme:	**B.E. / B.Tech. (Common to all branches)**	**Sem:**	**II**	**Category:**	**BSC**
Prerequisites:	Basic Science				
Aim:	To Impart the social groups and individuals to acquire knowledge of pollution and environmental degradation				

ENVIRONMENT AND ENERGY RESOURCES	**6**
Environment- definition, scope and importance – Need for public awareness – Forest resources-deforestation– 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	
ECOSYSTEM	**6**
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, characteristics, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers)	
ENVIRONMENTAL POLLUTION	**6**
Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution . Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution –Disaster management: floods- landslides.	
SOCIAL ISSUES AND EARTH'S CLIMATE SYSTEM	**6**
Population-variation among nation-Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting– climate change, global warming, acid rain, Ozone layer depletion.	
GREEN CHEMISTRY	**6**
Introduction to green chemistry- 12 principles of green chemistry-toxicology and green chemistry- energy and green chemistry-education in green chemistry. Reuse and recycling technologies-material selection for green design- recycled water technology.	
Total Periods	**30**

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. Anubha Kaushik, C.P. Kaushik, "Environmental Science and Engineering", New Age International Publishers, 2016.
2. Raman Sivakumar, *Introduction to Environmental Science and Engineering,* Tata McGraw Hill Education Private Limited, New Delhi2010.
3. P.Meenakshi, Elements of Environmental Science and Engineering, PHI learning (P) Ltd., India.

Course Outcomes:

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

CO1	Understand the basic concepts of environment and energy resources
CO2	Get knowledge about the ecosystem
CO3	Identify and analyze causes, effects and control measures of various types of pollution
CO4	Classify types of disaster and mitigation measures
CO5	Understand the impact of social issues and climate change
CO6	Understand to create the green environment.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	2	-	1	1	1	1	-	-	-	2	3	2	1	-	1
CO2	2	2	1	-	1	2	1	-	-	-	1	2	-	1	-	2
CO3	2	1	1	2	2	-	-	1	-	-	-	2	-	1	-	-
CO4	2	2	1	-	1	-	-	-	-	-	2	2	-	-	2	-
CO5	2	2	1	-	1	1	-	-	-	-	-	2	-	-		2
CO6	2	2	1	-	2	1	-	-	1	1	1	2	-	-	2	-

ss1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EE11	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING			L-T-P	C
				3-0-0	3
Programme:	**B.E. (CIVIL, MECH, BIO-TECH)**	**Sem:**	**II**	**Category:**	**ESC**
Prerequisites:	Algebra, calculus and electrostatics				
Aim:	To provide comprehensive idea about AC and D C circuit analysis, working principles and applications of basic machines in electrical engineering and protection schemes in power system.				

ELECTRICAL CIRCUITS	**12**
Ohm's Law – Kirchhoff's Laws –Reduction of series and parallel circuits-Mesh and Nodal Analysis of DC circuits – Introduction to AC Circuits - RMS Value, Average value, Form factor and peak factor phasor representation – Single Phase AC series circuits with R, RL, RC - Power and Power factor. Introduction to three phase circuits- Star and delta connected balanced load.	
DC MACHINES & TRANSFORMER	**8**
DC Generators - construction, principle of operation, Types, EMF equations and applications. DC Motors - operation, Types, Speed and torque equation – speed control of DC shunt motors. Single Phase Transformer - Constructional details and operation, Types, EMF equation, transformation ratio	
AC MACHINES	**8**
Single phase induction motor - construction, operation and applications, Three phase induction motor – Types, Construction and operation, Torque equation, slip torque characteristics, Synchronous generators - construction and operation, EMF equation - Synchronous motors – principle of operation.	
SEMICONDUCTOR DEVICES	**9**
Introduction to semiconductors-PN Junction Diode – characteristics, breakdown effect and applications - Half wave and Full wave rectifiers, Zener Diode - characteristics and voltage regulator. Bipolar Junction Transistor – operation of NPN and PNP, characteristics of CB, CE, CC configurations.	
DIGITAL ELECTRONICS	**8**
Number System – Binary, octal, hexadecimal, Logic Gates, Half and Full Adders – Flip-Flops –RS, JK, T and D - Counters – synchronous up counter, synchronous down counter, asynchronous up counter, asynchronous down counter, shift registers – shift right and shift left register	
Total Periods	**45**

Text books:

1. Muthusubramanian R, Salivahanan S, "Basic Electrical, Electronics and Computer Engineering", McGraw Hill, New Delhi,2009.
2. B L Theraja, AK Theraja, "A Text book of Electrical Technology: Volume 2 AC and DC Machines",S.Chand; Twenty Third edition,2006.
3. R.S. Sedha, "A Textbook of Applied Electronics" S. Chand & Co.,2008.

References:

1. V N Mittle, Arvind Mittle "Basic Electrical Engineering", McGraw Hill, New Delhi,2005.
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford University press(2012).
3. V K Mehta, Rohitmehta "Principles of Electronics", S.Chand& Company Ltd,(2015).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw-Hill, (2014).
5. NPTEL Video Lecture Notes on "Basic Electronics " by Prof. M.B Patil, IITBombay

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Analyze DC and AC circuits using basic laws.
CO2	Understand the operation of measuring instruments.
CO3	Apply the basic laws governing the operation of the instruments.
CO4	Demonstrate about DC machines, AC machines and its applications.
CO5	Analyze and compare the construction, theory and characteristics of the semiconductor devices.
CO6	Design basic combinational and sequential logic circuits.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	3	3	3	1	-	-	-	-	-	-	3	-	3	3	2	3
CO2	3	2	-	-	-	-	-	-	-	-	2	-	3	2	1	3
CO3	3	3	-	1	-	-	-	-	-	-	2	-	3	2	-	3
CO4	3	2	-	-	-	-	-	-	-	-	2	-	3	3	2	3
CO5	3	2	-	1	-	-	-	-	-	-	3	-	3	3	-	3
CO6	3	3	3	2	-	-	-	-	-	-	3	-	3	2	-	3

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

191MEF1	ENGINEERING GRAPHICS			L-T-P	C
				1-0-4	3
Programme:	**B.E. / B.Tech. (EEE, CIVIL, MECH, BIO-TECH)**	**Sem:**	**II**	**Category:**	**ESC**
Prerequisites:	Nil				
Aim:	To develop graphic skills in students				

Concepts and conventions (Not for Examination)	**12**
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	**12**
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 Points in all four quadrants - 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 ORTHOGRAPHIC PROJECTIONS	**12**
Principles of isometric projection – isometric scale – isometric projections of truncated Prisms, Pyramids, Cylinder and Cone; Conversion of Isometric Views to Orthographic Views and Vice-versa.	
Total Periods	**60**

Text books:

1. Natrajan K.V., **"A text book of Engineering Graphics",** Dhanalakshmi Publishers, Chennai(2015)
2. Basant Agarwal and Agarwal C.M., **"Engineering Drawing",** Tata McGraw Hill Publishing Company Limited, New Delhi,(2016)

References:

1. Venugopal K. and Prabhu Raja V., **"Engineering Graphics",** New Age International (P) Limited (2016)
2. Shah M.B. and RanaB.C., **"Engineering Drawing",** Pearson Education(2009)
3. John K.C., **"Engineering Graphics for degree"** PHI Learning Pvt. Ltd., New Delhi,(2015)
4. KumarM.S., **"Engineering Graphics",** D.D. Publications,(2015)

Course Outcomes:

At end of this course, 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)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	3	-	3	-	3	-	-	-	-	1	-	-	1	2	-	1
CO2	3	-	2	-	2	-	-	-	-	1	-	-	-	1	2	2
CO3	3	-	2	-	3	-	-	-	-	1	-	-	1	2	2	-
CO4	3	-	3	-	2	-	-	-	-	1	-	-	1	-	2	-
CO5	3	-	3	-	3	-	-	-	-	1	-	-	-	2	1	-
CO6	2	-	2	-	3	-	-	-	-	1	-	-	1	-	3	-

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

191HS27	PHYSICS AND CHEMISTRYLABORATORY-II				L-T-P	C
					0-0-2	1
Programme:	B.E/B.Tech (Common to all Branches)	**Sem:**	**II**	**Category:**	**BSC**	
Prerequisites:	Engineering Physics & Engineering Chemistry					
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)
NAME OF THE EXPERIMENT

1. Determination of thickness of thin wire – Air wedge method
2. Determination of Young's modulus of the material – Uniform bending
3. Determination of viscosity of liquid – Poiseuille's method.
4. Determination of wavelength of mercury spectrum- Spectrometer Grating.
5. Determination of Band Gap of a semiconductor material.
6. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

LIST OF EXPERIMENTS – CHEMISTRY PART
NAME OF THE EXPERIMENT

1. Estimation of HCl by pH metry
2. Estimation of Copper in brass by EDTA method.
3. Estimation of iodine in iodized salt with thiosulfate
4. Determination of percentage of calcium in limestone by EDTA method
5. Determination of DO in water (Winkler's method)

References:

1) Textbook of Quantitative Inorganic Analysis, A.I.Vogel, ELBS, London,(2006).
2) "Practical A. Ravi Krishnan Engineering Chemistry", Sri Krishna Publications, Chennai(2002)
3) Engineering Physics Laboratory Manual
4) Engineering Chemistry Laboratory Manual

Course Outcomes:

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

CO1	Learn the interference of light and young's modulus of the materials
CO2	Understand the properties of flow of the liquid.
CO3	Know the band gap of material and resistance of the given coil.
CO4	Determine the quantity of unknown solution by instrumental technique.
CO5	Determine the concentration of an identified analyte by volumetric analysis
CO6	Analyze the characteristics of water.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	2	1	1	1	-	1	-	-	-	-	1	1	1	2	1
CO2	2	-	1	1	1	-	1	-	-	-	-	1	-	2	1	-
CO3	2	2	-	1	1	-	1	-	-	-	-	1	-	2	-	3
CO4	2	2	1	-	2	-	1	-	-	-	-	-	-	1	1	-
CO5	3	2	2	-	2	-	-	-	-	-	-	2	-	2	-	2
CO6	3	2	2	2	-	-	2	-	-	-	-	2	-	1	2	-

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

191EEF7	BASIC ELECTRICAL AND ELECTRONICS LABORATORY			L-T-P	C
				0-0-2	1
Programme:	**B.E. ,(CIVIL, MECH, BIO-TECH)**	**Sem:**	**II**	**Category:**	**ESC**
Prerequisites:	Nil				
Aim:	To provide comprehensive idea about AC and D C circuit analysis, working principles and applications of basic machines in electrical engineering and protection schemes in power system.				

Course Outcomes:

The Students will be able to

CO1: Apply the circuit theory concepts and analyze the outcome.

CO2: Examine the characteristics of diodes.

CO3: Analyze characteristics of transistor.

CO4: Explain the operation of rectifiers.

CO5: Obtain various characteristics of DC Machines.

CO6: Obtain various characteristics of AC Machines.

LIST OF EXPERIMENTS

1. Verification of Ohmslaw
2. Verification of Kirchhoff's voltage and currentlaws
3. V – I characteristics of P-N Junction Diode and ZenerDiode
4. Input and Output characteristics of CE configuration of NPNtransistor
5. Half waveRectifier
6. Full waveRectifier
7. Speed Control of D.C. Shunt Motor
8. Load Test on Single phasetransformer
9. Load Test on three phase squirrel cage inductionmotor
10. Open Circuit characteristic of anAlternator

Total Periods	**30**

Text books:

1. Muthusubramanian R, Salivahanan S, "Basic Electrical, Electronics and Computer Engineering", McGraw Hill, New Delhi, 2009.

2. B L Theraja, Theraja, "ATextbook of Electrical Technology: Volume 2 AC and DC Machines",S.Chand. Twenty Third editions, 2006.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	1	-	-	-	3	-	3	-	3	2	2	2
CO2	3	2	-	2	1	-	-	-	3	-	2	-	3	2	-	2
CO3	3	2		2	1	-	-	-	3	-	2	-	3	2	-	3
CO4	3	3	2	2	1	-	-	-	3	-	2	-	3	2	-	3
CO5	3	2	-	2	1	-	-	-	3	-	3	-	3	2	1	2
CO6	3	2	-	2	1	-	-	-	3	-	3	-	3	2	1	2

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

191HS31	TRANSFORMS AND DISCRETE MATHEMATICS			L-T-P	C
				2-1-0	3
Programme:	**B.E. / B.Tech. (Common to all branches)**	**Sem:**	**III**	**Category:**	**BSC**
Prerequisites:	NIL				
Aim:	To introduce basic mathematical ideas such as reasoning techniques, basic counting techniques and their applications .				

LAPLACE TRANSFORMS	**6+3**
Laplace transform —Properties of Laplace Transforms – Laplace Transform of periodic functions –Inverse Laplace transforms by partial fraction method and Convolution theorem (excluding proof) – Solving ODE using Laplace transformation techniques.	
FOURIER TRANSFORMS	**6+3**
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.	
Z-TRANSFORMS	**6+3**
Z-transforms – Elementary properties – Inverse Z-transform – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transform.	
INTRODUCTION TO COUNTING	**6+3**
Decision problems on Propositional logic – Basic counting techniques – inclusion &exclusion- Pigeonhole principle –Permutations and combinations-Recurrence relations-Solving Linear recurrence relations and generating functions	
INTRODUCTION TO GRAPHS	**6+3**
Graphs and their basic properties – Graph terminology and special types of graphs - Representing graphs and graph isomorphism – Euler and Hamilton paths.	
Total Periods	**45**

Text books:

1. B.S. Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi, 2005.
2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi,(2004).

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. Trembly J. P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, NewDelhi, 30th Re-print (2007).

4 Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy, **"**Transforms and Partial Differential Equation**",** S.Chand & Company Ltd. Ram Nagar, New Delhi.

Course Outcomes:

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

CO1	Solve problems in LaPlace transforms equations.
CO2	Solve the problems related to Fourier integral theorem a n d Fourier transform
CO3	Solve the problems related to Z-transforms and Inverse Z-transform
CO4	Solve the problems related to Permutations and combinations Linear recurrence relations functions
CO5	Explain the Graphs and their basic properties
CO6	Solve problems Representing graphs and graph isomorphism – Euler and Hamilton paths.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	1	2	-	-	-	-	-	-	-	-	-	1	-	2	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	1	-	3	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-	1	-	2	2
CO4	3	2	1	-	-	-	-	-	-	-	-	-	2	-	1	-
CO5	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO6	1	2	2	-	-	-	-	-	-	-	-	-	2	2	-	-

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

191BT31	BIOLOGY FOR ENGINEERS				L-T-P	C
					3-0-0	3
Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**III**	**Category:**		**BSC**
Prerequisites:	Basic science					
Aim:	To understand basic and fundamental engineering knowledge from biology.					

INTRODUCTION.	**9**
Biological analogy in engineering science, Biological elements-Carbohydrate, protein, amino acids, lipids and nucleic acids structure and function. Primary, secondary, tertiary and quaternary structure of protein. Protein as enzymes, transporter, receptors and structural elements.	
METABOLISM AND ENGINEERING	**9**
Engineering aspects in thermodynamics of energy transactions, exothermic and endothermic versus endergonic and exergonic reactions. ATP as an energy source, glycolysis, Krebs cycle and photosynthesis. Energy yielding and energy consuming reactions. Enzymes classification, mechanism of enzyme action, enzyme kinetics and kinetic parameters	
GENETICS AND TRANSFORMATION TECHNOLOGY	**9**
Molecular basis of information transfer. DNA as a genetic material. Concept of genetic code. Mendel's laws, concept of segregation and independent assortment. Concept of allele, Gene mapping, Gene interaction, Epistasis, concepts of recessiveness and dominance and their relativeness to programming. Cell multiplication. Phenotype and genotype. Single gene disorders in humans and human genetics.	
CLASSIFICATION AND SYSTEM ENGINEERING	**9**
Structure, function and relativeness to engineering of prokaryotes and eukaryotes. Habitats- aquatic or terrestrial. Molecular taxonomy-three major kingdoms. Microbial species and strains. Identification and classification of microorganisms. Industrial application of microorganisms. Sterilization and media compositions. Growth kinetics.	
SENSOR BIOLOGY AND COMMUNICATION SYSTEMS	**9**
Sensory system, circulatory system and excretory system and their relativeness to communication engineering. Hormonal regulation. General defense mechanism in human. Major human disorder and diseases.	
Total Periods	**45**

Text books:

1. Arthur T. Johnson, CRC Press, NewYork2011
2. Thyagarajan.S., Selvamurugan. N., Rajesh.M.P., Nazeer.R.A., Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K., "*Biology for Engineers"*, Tata McGraw-Hill, New Delhi,2012

References:

1. Rajiv Singal, Gaurav Agarwal, Ritu Bir, Biology for Engineers, CBSPublisher,2019
2. Charles Molnar and Jane Gair, Concepts of Biology-1st Canadian Edition, OpenStax Publication,2013.
3. Raven Johnson, Biology, 11th Edition, Mc Graw Hill Publication,2017

Course Outcomes:

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

CO1	Comprehend various biochemical interactions and the structure and function of various biological molecules
CO2	Explain basic concepts of thermodynamics and energy transactions
CO3	Classify different aspects of molecular computing
CO4	Demonstrate an understanding of Mendelian laws of inheritance
CO5	Describe cellular architecture and utilize these concepts to design an engineering system
CO6	Recognize fundamental concepts in sensory physiology analogy with communication systems

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	-	-	-	-	-	-	-	-	-	2	1	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	2	1	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	1	-	-	-
CO6	2	2	-	-	-	-	-	-	-	-	-	2	1	-	-	-

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

191ME31	ENGINEERING MECHANICS			L-T-P	C
				2-1-0	3
Programme:	B.E. Civil Engineering	**Sem:**	**III**	**Category:**	**ESC**
Prerequisites:	Nil				
Aim:	To impart a sound knowledge on the applied physics laws in different engineeringapplications.				

BASICS & STATICS OF PARTICLES	**6+3**
Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.	
EQUILIBRIUM OF RIGID BODIES	**6+3**
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 representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples.	
PROPERTIES OF SURFACES AND SOLIDS	**6+3**
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 using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia.	
DYNAMICS OF PARTICLES	**6+3**
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	**6+3**
Frictional force – Laws of Coulomb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.	
Total Periods	**45**

Text books:

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. Kodeeswaran. N., "Engineering Mechanics statics & dynamics", Sri Balaji Publications(2013)

References:

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

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Recite the laws of mechanics, Lame's theorem, parallelogram law, triangular law of forces and principle of transmissibility
CO2	Classify types of supports and equilibrium of rigid bodies in three dimensions
CO3	Explain the parallel axis theorem and perpendicular axis theorem
CO4	Analyze moment of inertia and polar moment of inertia of various sections
CO5	Analyze the displacement, velocity and acceleration problems and their relationship with work energy equation of particles
CO6	Analyze the various Frictional forces and general plane motion of rigid bodies

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
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)

191CE31	SURVEYING			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To make the student aware of various surveying methods and applications to Civil Engineering fields.				

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.	
TRIANGULATION AND TRILATERATION	**9**
Theodolitesurvey:Instruments,Measurementofhorizontalandverticalangle;Horizontalandverticalcontrol - methods -triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single corrections. Curves. Elements of simple and compound curves – Method ofsettingout–ElementsofReversecurve-Transitioncurve–lengthofcurve–Elementsoftransitioncurve-Vertical curves.	
TACHEOMETRIC SURVEYING	**9**
Tacheometry principle systems - Tangential-stadia methods - Horizontal and inclined sights – Staff vertical and normal - Fixed and movable hairs - Stadia constants – Anallatic lens - Subtense bar.	
REMOTE SENSING & PHOTOGRAMMETRY	**9**
Introduction –Electromagnetic Spectrum - interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition - platforms and sensors - visual image interpretation; digital image processing. Basic concepts of photogrammetry - perspective geometry of aerial photograph - relief and tilt displacements – terrestrialphotogrammetry, flight planning - Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	
Total Periods	**45**

Text books:

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, New Delhi2008.

Course Outcomes:

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

CO1	Carry out preliminary surveying to prepare a layout of a given area.
CO2	Plot LS, CS and Contouring using leveling applications.
CO3	Execute a theodolite traverse and set out different types of curves.
CO4	Determine heights and distances using tacheometry surveying
CO5	Understand the importance of advanced techniques involved in surveying such as Total station and GPS.
CO6	Explain techniques used in hydrographic surveying with theoretical background

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	PS O3	PS O4
CO1	3	2	2	-	3	-	-	3	3	3	-	1	1	-	2	1
CO2	3	2	-	-	2	-	-	1	3	3	-	1	3	1	-	1
CO3	3	2	-	1	2	-	-	2	2	2	-	1		3	2	-
CO4	3	2	2	-	2	-	-	2	2	2	-	1	3	-	1	-
CO5	2	-	-	3	2	-	-	1	3	2	2	2	2	1	2	1
CO6	2	1	-	1	2	-	-	1	1	1	-	2	2	1	2	1

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

191CE32	ENGINEERING GEOLOGY			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**PCC**
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 books:

1. Parbin Singh, “Engineering and General Geology”, S.K.Kataria& Sons, 2012.
2. DuggalS.K., H.K.Pandey and N.Rawal, “Engineering geology”, McGraw Hill EducationPrivate limited,2013.

References:

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, gradational activities and weathering
CO2	Interpret minerals and rocks and assess its physical, mechanical and engineering properties
CO3	Determine geological structures and its relevance in civil projects
CO4	Analyze the surface and subsurface geological structures of the crust, soil and weathered thickness through geophysical exploration and report writing aspects with relevance to civil engineering projects
CO5	Explain about fault, folds, unconformity and joints which are present in the strata of the earth crest, by which they can able to compare the particular area with their construction site or engineering projects
CO6	Assess the geological aspects of the site suitability with relevance to the design of civil structures and vice-versa.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	1	1	-	1	1	2	3	-	-	-	2	1	-	-	2
CO2	2	1	1	-	1	2	2	3	-	-	-	3	1	2	2	2
CO3	1	1	1	-	1	2	2	3	-	-	-	2	1	-	2	2
CO4	1	1	1	-	1	2	2	3	-	-	-	1	1	2	2	2
CO5	2	-	1	-	1	2	1	3	-	-	-	1	2	-	2	2
CO6	2	1	1	-	-	2	1	2	-	-	-	1	2	-	1	1

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

191CE33	FLUIDS MECHANICS	L-T-P	C
		3-0-2	4

Programme:	B.E. Civil Engineering	Sem:	III	Category:	PCC
Prerequisites:	Nil				
Aim:	To provide knowledge in the field of Mechanics of Fluids and related areas.				

FLUID PROPERTIES AND HYDROSTATICS	**9+6**
Density – Viscosity – Surface tension – compressibility – capillarity – Hydrostatic forces on plane – inclined and curved surfaces – buoyancy – Centre of buoyancy – metacenter.	
FLUID KINEMATICS &DYNAMICS	**9+6**
Control volume – Fluid Kinematics - Types of flows; Steady flow, Unsteady flow, Uniform and Non Uniform flow, Rotational flow, Irrotational flow, 1-D, 2-D, 3-D flows– Boundary layer- Laminar & Turbulent flow - Streamline and Velocity potential lines- Euler and Bernoulli's equations and their applications – moment of momentum	
OPEN CHANNEL FLOW	**9+6**
Open channel flow – Types and regimes of flow - Velocity distribution in open channel – Wide open channel - Specific Energy – Critical flow concept – specific force – Hydraulic jump – uniform flow and gradually varying flow concepts.– Measurement of pressure – flow – velocity through pipes and open channels.	
DIMENSIONAL ANALYSIS	**9+6**
Dimensional homogeneity – RaleighandBuckingham theorems – Non-dimensional numbers – Modellaws and distorted models-Unit quantities-Specific quantities.	
TURBINES & PUMPS	**9+6**
Turbines - Classification - Reaction turbines - Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbine - Performance of turbine - Specific speed - Centrifugal pumps - Minimum speed to start the pump - Operating characteristics – Reciprocating pump (working principle only).	
Total Periods	**45+30**

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 forventurimeter
4. Calibration of orifice meter to measure the flow of liquid throughpipes
5. Computation of friction factor for the given pipe to calculate the head loss in pipenetworks
6. Determination of various minor losses in pipes to compute the total headloss
7. Verification of Bernoulli's theorem to apply in flow measuringdevices
8. Determination of efficiency of the Francis turbine used for hydropowergeneration
9. Performance characteristics of Kaplanturbine
10. Performance characteristics of Centrifugal pumps (Constant speed / variablespeed)
11. Determination of efficiency of the reciprocating pump to decide its suitability for specificpurpose.

Text books:

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.

References:

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:

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

CO1	Understand the basic properties of fluids
CO2	Compute the friction loss in laminar and turbulent flows.

CO3	Apply the principle of Euler and Bernoulli's equations in measurement of discharge in pipe.
CO4	Acquire the knowledge about Hagen Poiseuille equation and Hydraulic jump
CO5	Understand the fundamentals of dimensional analysis and applicationofBuckinghamtheoremsin fluid flow problems
CO6	Analyze optimize operational parameters of turbines and pumps.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	3	2	2	1	2	1	-	-	-	-	-	1	3	-	2	-
CO2	3	2	2	1	1	1	-	-	-	-	-	2	-	1	3	1
CO3	3	3	3	2	1	1	-	1	-	-	1	2	3	-	1	-
CO4	2	2	2	1	1	2	-	-	-	-	1	2	3	1	2	1
CO5	3	3	3	2	2	-	-	-	-	-	-	1	3	1	3	1
CO6	3	2	2	2	1	-	-	-	-	-	1	1	3	1	3	1

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

191CE37	COMPUTER AIDED DRAFTING LABORATORY			L-T-P	C
				0-0-4	2
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**ESC**
Prerequisites:	NIL				
Aim:	To gain more knowledge in 2D, 3D drawings by using relevant software				

List of Exercises using software capable of Drafting and Modeling

1. 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
2. Drawing of a Title Block with necessary text and projection symbol
3. Drawing of curves like parabola, spiral, involute using B-spline or cubic spline
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and dimensioning
5. Drawing front view, top view and side view of objects from the given pictorial views (e.g., V-block, Base of a mixie, Simple stool, Objects with hole and curves)
6. Drawing of a plan of residential building (Two bedrooms, kitchen, halletc.,)
7. Drawing of a simple steel truss
8. Drawing sectional views of prism, pyramid, cylinder, cone,etc,
9. Drawing isometric projection of simple objects
10. Creation of 3-D models of simple objects
11. Drawing of Building with load bearing walls
12. Drawing of R.C.C framed structures

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

Total Periods 60

List Of Equipment for A Batch Of 30 Students

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

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	Plot plan of residential building
CO5	Draw sectional views and Isometric projection of simple objects and create 3D models for simple objects
CO6	Draw the R.C.frame Structures.

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	PS O1	PS O2	PS O3	PS O4
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	-	2	2	1	-	-	-	-	-	-	3	2	1	2	1

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

191CE38	SURVEY PRACTICAL			L-T-P	C
				0-0-3	1
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**PCC**
Prerequisites:	Nil				
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**

References:

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

Course Outcomes:

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

CO1	Use conventional surveying tools such as chain/tape, compass, plane table, level in the field of Civil Engineering applications such as structural plotting and highway profiling.
CO2	Apply the procedures involved in field work and to work as a surveying team.
CO3	Plan a survey appropriately with the skill to understand the surroundings.
CO4	Take accurate measurements, field booking, plotting and adjustment of errors
CO5	Plot traverses / sides of building
CO6	Predict the location of points present in the field and to transfer the same on paper

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	2	-	-	-	-	-	2	-	3	3	3	-	2	1
CO2	1	2	1	3	2	-	-	1	2	2	-	3	3	1	2	1
CO3	1	3	1	2	2	-	-	-	2	-	-	3	1	3	-	-
CO4	3	2	1	-	2	-	-	-	2	1	-	3	-	3	-	3
CO5	3	2	1	1	2	-	-	-	2	2	-	3	1	2	2	1

CO6	2	1	1	1	2	-	-	1	2	1	-	3	1	2	1	2

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

191HS37	COMMUNICATION SKILLS I*				L-T-P	C
					0-0-2	-
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**HSMC**	
Prerequisites:	191HS21					
Aim:	To create an Environment to improve learner's communication skill using Professional English module					

Language & Grammar

1. Use of Verb, Article, Adjectives,Adverbs,Preposition,Conjunction,Comparative Superlative,
2. Noun –Antecedent & Precedent
3. Spelling &Punctuation
4. Concord
5. Use of Active & Passive voice
6. Use of Conditional Sentence & Reported speech

Reading

1 Reading technical reports for Gist
2 Reading Technical Article, Graphs, Charts, Adverts, Notices & Proposals for Structure and detail

Writing

1 Writing E-mails for giving Instruction/ Summarizing/Persuading/Giving assurance/asking a comment
2 Writing an Introduction to Report/Proposal/Technical Description
3 Writing Instructions & Recommendations for User manuals/Equipment/devices/New Inventions

Listening

1 Listening to Technical News for Gist
2 Listening to Technical Interviews for gathering information
3 Listening to a Presentation for inferring meaning

Speaking

1 Self-Introduction
2 Have your say- Recent gadgets/Technical Innovations/ Scientific Inventions

TEXT BOOKS

1. Technical Writing: Process and Product, Gerson, Pearson Education India, 2007 ISBN: 8131709280, 9788131709283
2. Business Benchmark Pre-Intermediate to Intermediate: Student's Book BEC Preliminary Edition, Norman Whitby, PB + 2 Audio CDs,ISBN: 9780521759397

Course Outcomes:

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

CO1	Impart basics of Language relating to Business Communication
CO2	Impart basics of Grammar relating to Business Communication
CO3	Imbibe the spirit of accurate and appropriate Basic Communication
CO4	Familiarize with the Professional Communication Module
CO5	Improve learners ability to understand Technical Communication

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	PS O1	PS O2	PS O3	PS O4
CO1	-	-	-	-	-	2	-	-	-	3	-	2	-	-	-	3
CO2	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	3
CO3	-	-	-	-	-	-	-	2	1	2	-	1	-	2	2	3
CO4	1	-	-	-	-	3	-	-	1	2	2	2	-	-	-	-
CO5	1	-	-	-	-	3	1	-	1	2	-	1	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

191HS42	PROBABILITY AND STATISTICS			L-T-P	C
				2-1-0	3
Programme:	**B.E. / B.Tech. (CIVIL, CSE, EEE, MECH, BIO-TECH & BIO-MEDICAL)**	**Sem:**	**III**	**Category:**	**BSC**
Prerequisites:	191HS31				
Aim:	To analyze the engineering problems using the techniques and the mathematical skills acquired by studying ODE and PDE uses numerical methods.				

PROBABILITY AND RANDOM VARIABLES	**9**
Probability spaces – Conditional probability – Bayes rule - Discrete and continuous random variables – Moments - Moment generating functions and their properties.	
DISCRETE AND CONTINOUS PROBABILITY DISTRIBUTION	**9**
Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and normal distributions – Function of Random Variable	
TWO DIMENSIONAL RANDOM VARIBLES	**9**
Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem (for 2-D random variables)	
STATISTICS	**9**
Curve fitting by the method of least squares – fitting of Straight lines , Second degree parabolas and more general curves – Test of significance – Large sample test for single proportion , difference of proportions, single mean, difference of means and difference of standard deviations.	
TESTING OF HYPOTHESIS	**9**
Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.	
Total Periods	**45**

Text books:

1. Greenberg. *M.D*. "Advanced Engineering Mathematics, Second Edition, Pearson Education NC. (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. Chopra S.C. and Canale R.P., "Numerical Methods for Engineers", Tata Mc-Graw Hill, New Delhi, (2007).
5. Gerald C.F., and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, (2006).

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).

Course Outcomes:

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

CO1	Solve Probability and discrete and continuous random variables problems
CO2	Solve problems related to binomial,Poisson, geometric and normal distributions
CO3	Solve problems related to correlation and regression
CO4	Solve problems related to curve fitting methods
CO5	Solve problems related to proportions, single, mean and standard deviations
CO6	Solve the problems related to sampling distributions , testing of hypothesis for mean.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO2	2	1	-	-	1	-	-	-	-	-	-	-	2	-	1	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO4	1	1	-	-	1	-	-	-	-	-	-	-	2	-	-	-
CO5	2	2	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO6	1	1	-	-	1	-	-	-	-	-	-	-	2	-	-	-

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

191CE41	MECHANICS OF SOLIDS-I			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**IV**	**Category:**	**PCC**
Prerequisites:	191CE31				
Aim:	To provide knowledge in the field of Mechanics of Solids.				

CONCEPT OF STRESS AND STRAIN	**9**
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.	
COMPLEX STRESSES	**9**
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.	
SHEAR FORCE AND BENDING MOMENT	**9**
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	**9**
Theory of simple bending – Stress distribution due to shear force and bending moment – Design of beams – Beams of uniform strength – Flitched beams	
TORSION AND SPRINGS	**9**
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 – Leaf spring, Buffer Spring.	
Total Periods	**45**

Text books:

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.

References:

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 and strain relationship
CO2	Analyze the components of complex stress in all the planes
CO3	Analyze the shear force and Bending moment for all type of beams
CO4	Apply theory of simple bending in design of beams
CO5	Apply theory of torsion in spring and its properties
CO6	Explain thermal stress in compound bars

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	2	3	1	1	-	-	-	1	-	-	2	1	-	1
CO2	2	2	1	2	1	1	-	-	-	1	-	-	1	1	-	1
CO3	2	1	1	2	1	2	-	-	-	1	-	-	2	1	-	1
CO4	1	2	1	2	1	1	-	-	-	1	-	-	1	1	-	1
CO5	2	1	1	2	1	2	-	-	-	1	-	-	2	1	-	1
CO6	2	1	2	1	2	1	-	-	-	1	-	-	1	1	-	1

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

191CE42	IRRIGATION ENGINEERING AND HYDROLOGY STRUCTURES			L-T-P	C
				3-1-0	4
Programme:	**B.E. Civil Engineering**	**Sem:**	**IV**	**Category:**	**PCC**
Prerequisites:	191CE32				
Aim:	To impart the student aware of hydraulic engineering concepts and methodology				

IRRIGATION PRINCIPLES	12
Need for irrigation – Advantages and ill effects – 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.	
HYDROLOGY & DESIGN FLOOD ESTIMATION	12
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	12
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	12
Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories - Canal Head works– Canal regulators - Canal drops – Cross drainage works – Canal Outlet, Escapes –Lining and maintenance of canals – Other methods of Irrigation – Surface and Subsurface methods – Merits and Demerits.	
IRRIGATION WATER MANAGEMENT	12
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 of irrigation.	
Total Periods	60

Text books:

1. Sharma, R.K., and Sharma, T.K., "Irrigation Engineering", S. Chand and Company,NewDelhi,2008.
2. Garg, S.K., "Irrigation Engineering," Laxmi Publications, NewDelhi,2008.

References:

1. Arora, K.R., "Irrigation, Waterpower and Water Resources Engineering" Standard Publishers Distributors, New Delhi,2009.
2. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India,NewDelhi,2008.
3. Punmia, B.C., "Irrigation and Waterpower Engineering", Laxmi Publishers,NewDelhi,2000.
4. Asawa, G.L., "Irrigation Engineering", New Age International Publishers,NewDelhi,2009

Course Outcomes:

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

CO1	Apply principles of irrigation system and standards of irrigation water
CO2	Explain importance of hydrology and design of flood estimation
CO3	Discover details of headwork and different types of dams
CO4	Design canal irrigation and other methods of irrigation
CO5	Explain modern irrigation techniques and water delivery system
CO6	Apply modernization techniques in rehabilitation work

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	-	-	-	2	2	2	-	-	-	1	2	2	-	1
CO2	3	2	1	1	1	2	1	1	-	-	-	1	1	2	-	1
CO3	1	2	1	2	1	1	2	1	-	-	-	1	2	2	-	1
CO4	1	2	1	2	1	2	1	2	-	-	-	1	2	2	-	1
CO5	1	1	1	1	1	2	2	2	-	-	-	1	2	2	-	1
CO6	1	2	1	2	1	1	2	1	-	-	-	1	2	2	-	1

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

191CE43	SOIL MECHANICS AND FOUNDATION ENGINEERING			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**IV**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To Provide adequate knowledge of engineering properties of soil &foundation Engineering.				

INTRODUCTION TO SOIL AND WATER FLOW	**9**
Nature of Soil - Problems with soil – Three phase relation - classification for engineering purposes - BIS Classification system – Soil compaction and consolidation concepts –factors affecting compaction – field compaction methods and laboratory compaction methods. Soil water – Various forms –Capillary rise – Suction – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil –- quick sand condition - Seepage - Introduction to flow nets –properties and uses	
STRESS DISTRIBUTION AND SHEAR STRENGTH	**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 –Terzaghi's one dimensional consolidation theory – governing differential equation problems on final and time rate of consolidation. 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 Suitability and applications.	
SOIL EXPLORATION AND SELECTION OF FOUNDATION	9
Scope and objectives – Methods of exploration- Bore log report – Penetration tests (SPT and SCPT) – Introduction – Location and depth of foundation – codal provisions Data interpretation (Strength parameters and Liquefaction potential) – Selection of foundation based on soil condition-Requirements of a good foundation. Types of foundation – Contact pressure distribution below footings and raft - floating foundation	
SHALLOW FOUNDATION	9
Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems - Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits–Allowablesettlements–Codalprovision– Methodsofminimizingsettlement,differential settlement. - Isolated and combined footings – Types and proportioning - Mat foundation– Types, applications uses and proportioning	
PILE FOUNDATION	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) – Negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, Converse Labarra formula and block failure criterion) – Settlement of pile groups – Forces on pile caps – under reamed piles – Capacity under compression and uplift.	
Total Periods	**45**

Text books:

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

References:

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	Explain the behavior of soil with water and water flow
CO2	Identify the stress distribution and settlement in soil
CO3	Apply theory of shear strength and its uses
CO4	Analyze and design of various types of footings and rafts
CO5	Examine the soil exploration and types of foundation
CO6	Summarize factors affecting bearing capacity, problems and in-situ tests for shallow and pile foundation

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	1	2	1	2	1	2	-	-	-	-	-	1	2	2	-	1
CO2	2	1	2	2	3	1	-	-	-	-	-	1	1	2	-	2
CO3	3	2	1	2	1	2	-	-	-	-	-	1	2	2	2	1
CO4	2	1	2	1	2	1	-	-	-	-	-	1	1	2	2	2
CO5	2	3	1	3	1	1	-	-	-	-	-	1	2	2	-	1
CO6	2	1	2	1	2	1	-	-	-	-	-	1	1	2	-	2

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

191CE44	CONSTRUCTION MATERIALS AND TECHNIQUES			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**IV**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.				

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.
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.

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 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.

INTRODUCTION TO MATERIAL TESTING 9

Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics.

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 –Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms –laying brick — weather and water proof – roof finishes – acoustic and fire protection.

SUB STRUCTURE AND SUPER 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. Launching girders, bridge decks, off shore platforms — 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.

Total Periods 45

Text books:

1. Varghese .P.C, "*Building Materials"*, Prentice HallIndia,2005.
2. Rangwala .S.C, "*Engineering Materials"*, Charotor Publishing House, New Delhi,2012.
3. Peurifoy, Schexnayder, Shapira, "Construction Planning, Equipment and Methods", Tata McGraw Hill Education Private Ltd-7th edition,2013.

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.Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi,2007.
3. Gambhir, M.L, Concrete Technology, Tata McGraw – Hill Publishing Company Ltd, New Delhi, 2004.
4. Shetty, M.S, Concrete Technology, Theory and Practice, S. Chand and Company Ltd, New Delhi,2005.
5. National Building Code of India, Part V, "Building Materials",2005.

Course Outcomes:

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

CO1	Classify Load bearing materials and applications
CO2	Classify Non load bearing materials and compositions
CO3	Categorize types of tests available for different materials
CO4	Practices that are followed in construction site
CO5	Design Substructure construction and dewatering methods
CO6	Create Special structures like articulated structures, braced domes and special decks

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	PS O1	PS O2	PS O3	PS O4
CO1	1	2	1	2	1	1	2	1	1	1	1	1	1	2	2	1
CO2	1	2	1	2	1	1	2	1	2	1	1	1	2	2	1	1
CO3	3	2	1	2	1	2	1	2	1	1	1	1	1	3	2	2
CO4	2	1	3	1	2	3	1	3	1	1	1	1	2	2	1	1
CO5	2	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2
CO6	2	1	2	1	1	1	1	2	1	1	1	1	2	3	1	1

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

191CS46	PYTHON PROGRAMMING				L-T-P	C
					3-0-2	4
Programme:	CIVIL/EEE	**Sem:**	**IV**	**Category:**	ESC	
Prerequisites:	Nil					
Aim:	To review the ideas of computer science, programming, and problem-solving ability in python.					

INTRODUCTION	9+3
Python Overview - Comments - Identifiers - Keywords - Variables - Data types - Operators -Statement and Expressions - String Operations - Boolean Expressions - Control Statements -Iterations - Input from Keyboard.	
FUNCTIONS IN PYTHON	9+3
Built-in Functions - Composition of Functions - User defined functions - Parameters and Arguments - Function calls - The return statement - Python recursive function - Anonymous Functions.	
STRINGS AND LISTS	9+3
Strings - Compound Data Types - String slices - String Traversal - Escape Characters - String formatting operator, functions - Lists-Traversing a List - Built-in list operators, methods.	
CLASSES AND OBJECTS	9+3
Class, Objects in python - Built-in Class attributes - Inheritance - Method Overriding - Data Encapsulation - Data hiding.	
DICTIONARIES AND FILES	9+3
Tables-Values - Operations - Functions - Dictionaries - Values - Update - Properties Operations - Files - Text Files - Exceptions - Exception with arguments - User defined Exceptions.	
Total Periods	60

Lab Component:

Write the programs for the following topics using python:

1. Operators
2. Control Statements
3. Built-In and User defined functions
4. String functions
5. List functions.
6. Classes and their attributes.
7. Inheritance and method overriding.
8. Data Encapsulation and hiding.
9. File Operations and Exception handling.

Text books:

1. E.Balagurusamy, “Introduction to Computing and Problem-Solving Using Python”, McGraw-Hill Education (India) Private Ltd.,2016.
2. Dr.R.Nageswara Rao, “Core Python Programming”, Dream tech Press, 2nd Edition,2018.
3. Jason R. Briggs, “Python for kids”, no strach press,2013.
4. Allen B. Downey, ``Think Python: How to Think like a Computer Scientist’’, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/).

Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

1. MarkLutz, “Programming Python”, Fourth Edition,2010.
2. John V.Guttag, “Introduction to Computation and Programming using Python”, 2nd Edition,2016.
3. John Paul Mueller, “Beginning Programming with python For DUMMLES”, 2014.

Course Outcomes:

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

CO1	Understand Introduction of python programming.

CO2	Develop functions in python
CO3	Understand strings and lists in python programs
CO4	Analyze OOPS Concept in python
CO5	Demonstrate tuples and dictionaries in python
CO6	Handle files and exceptions in python

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	PS O1	PS O2	PS O3	PS O4
CO1	3	-	3	1	2	-	2	-	-	-	-	-	3	-	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-	-	3	2	-
CO3	3	-	2	2	-	-	3	-	-	-	3	-	2	2	3	-
CO4	2	3	-	3	-	-	-	-	-	-	-	-	-	3	-	3
CO5	3	2	-	2	2	-	-	-	-	-	-	-	-	-	-	-
CO6	3	3	-	3	3	-	-	-	3	3	-	-	-	-	2	2

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

191CE47	STRENGTH OF MATERIALS LABORATORY			L-T-P	C
				0-0-4	2
Programme:	**B.E. Civil Engineering**	**Sem:**	**IV**	**Category:**	**PCC**
Prerequisites:	Nil				
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.

Total Periods **45**

Standard Codes:

1. ASTMStandards
2. IndianStandards

(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

References:

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 Delhi2004.
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:

At end of this course, 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 equipment 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	Analyze the use of deflectometer, extensometer, compressometer and strain gauges

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	PS O1	PS O2	PS O3	PS O4
CO1	1	2	2	2	2	-	-	-	1	-	-	1	-	-	2	-
CO2	2	1	2	3	1	-	-	-	1	-	-	2	-	-	1	-
CO3	3	2	2	1	2	-	-	-	1	-	-	1	-	-	2	-
CO4	1	1	2	3	1	-	-	-	1	-	-	2	-	-	1	-
CO5	2	2	1	1	2	-	-	-	1	-	-	2	-	-	2	-
CO6	3	2	2	3	2	-	-	-	1	-	-	1	-	-	2	-

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

191CE48	SURVEY CAMP			L-T-P	C
				0-0-2	1
Programme:	**B.E. Civil Engineering**	**Sem:**	**VII**	**Category:**	**PCC**
Prerequisites:	191CE47				
Aim:	To make the student capable of drawing site plans and maps independently of a chunk of land of earth surface.				

LIST OF EXPERIMENTS

1. Study of theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
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. Field observation for and Calculation of azimuth, Latitude and Longitude
9. Calculating and plotting the given area using Total Station
10. Calculating and plotting the given area usingGPS.
11. Building Plan and Foundation Marking.

Total Periods **45**

References:

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 Delhi2008.
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)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	3	2	2	1	-	2	2	-	1	-	-	1	3	-	2	-
CO2	3	2	2	1	-	2	2	-	1	-	-	1	3	-	2	-
CO3	1	2	2	-	1	-	-	2	3	1	-	1	2	2	-	1
CO4	1	1	2	-	3	1	1	3	3	-	-	1	1	-	2	2
CO5	1	1	2	-	3	1	1	3	3	-	-	1	1	-	2	2

CO6	3	2	-	-	2	2	-	-	3	-	2	1	3	-	-	3

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

191HS47	Communication Skills – II* (Common to All B.E./B.Tech Degree Programmes)				L-T-P	C
					0-0-2	-
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**HSMC**	
Prerequisites:	191HS31					
Aim:	To create an Environment to improve learner's communication skill using Professional English module					

Reading

1. Reading Technical Articles, Reports, Proposals for gathering information
2. Reading Technical Journals, User manuals, annual reports for matching information

Writing

1. Writing E-mail to inform/respond/Insist/Convince/comment
2. Writing Technical Report (Format, Types, Abstract)
3. Writing Project Introduction/Website/Product
4. Writing User Manuals/Guidelines
5. Writing Product Reviews
6. Writing Useful Expressions for Persuading, Summarizing, gathering information

Listening

1. Listening to Telephonic conversation for filling the gaps
2. Listening to Group discussion to gather information
3. Listening to Interviews for writing short answers
4. Listening to Technical Presentation for evaluation

Speaking

1. Mini-Presentation on Technical Themes (Samples):

a) Cloud computing b) 4g c) Mission to Mars
d) Water Resource e) Sixth Sense Technology

2. Group Discussion on Social and Technical issues

TEXT BOOKS

1. Technical Communication: Principles and Practice, 2/e,Meenakshi Raman; Sangeeta Sharma ISBN: 0198065299, 9780198065296
2. Business Benchmark Pre-Intermediate to Intermediate: Student's Book BEC Preliminary Edition, Norman Whitby, PB + 2 Audio CDs, ISBN: 9780521759397

Course Outcomes:

At end of this course, the students will be able

CO1	To be competent in Presentation skill
CO2	To develop students' accuracy in Written Communication
CO3	To improve learner's ability to understand Technical Presentations
CO4	To Improve their ability to understand Conversations
CO5	To give the exposure with Internal workplace Communication
CO6	To give the exposure with External workplace Communication

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	PS O1	PS O2	PS O3	PS O4
CO1	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	3	-	3	-	1	-	-
CO3	-	-	-	-	-	-	-	-	2	3	1	-	-	-	3	-
CO4	1	-	-	-	-	-	-	-	2	3	-	3	-	1	3	-
CO5	-	-	-	-	-	-	-	1	2	3	-	-	-	-	-	2
CO6	-	-	-	-	-	-	-	1	2	3	-	-	-	-	-	2

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

191CE51	MECHANICS OF SOLIDS - II				L-T-P	C
					3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**		**PCC**
Prerequisites:	191CE41					
Aim:	To provide adequate knowledge on engineering properties of solids					

DELECTION OF DETERMINATE BEAMS	**9**
Governing differential equation – Macaulay's method – Moment area method – Conjugate beam method.	
STATICALLY INDETERMINATE BEAMS	**9**
Analysis of propped cantilever and fixed beams - Theorem of three moments – Analysis of continuous beams - slope & deflections in continuous beams.	
COLUMNS AND CYLINDRES	**9**
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	**9**
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	**9**
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	**45**

Text books:

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.

References:

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	Examine the determinate beams for their deflection.
CO2	Analyse the Statically Indeterminate beams to interpret the slope and deflection
CO3	Explain the behavior of column for combined bending and axial loading and to analyze the thin & thick cylinders.
CO4	Examine the different failure criterion and predict failure given the stress state of a body.
CO5	Identify the shear center and to analyze stresses due to unsymmetrical bending.
CO6	Inspectstrain energy and impact loading

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	2	3	-	-	-	1	-	-	-	2	3	-	-	2
CO2	3	3	2	3	-	-	-	1	-	-	-	2	3	-	-	2
CO3	3	3	2	3	-	-	-	1	-	-	-	2	3	-	-	2
CO4	3	3	2	3	-	-	-	1	-	-	-	2	3	-	-	2
CO5	3	3	2	3	-	-	-	1	-	-	-	2	3	-	-	2
CO6	3	3	2	3	-	-	-	1	-	-	-	2	3	-	-	2

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

191CE52	STRUCTURAL ANALYSIS - I			L-T-P	C
				2-1-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**	**PCC**
Prerequisites:	191CE41				
Aim:	To make the students conversant with classical method of analysis.				

FUNDAMENTAL OF STRUCTURAL ANALYSIS	**6+3**
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.	
STRAIN ENERGY METHOD	**6+3**
Static indeterminacy - Strain energy method - analysis of indeterminate structures, beams, pin jointed and rigid jointed structures - temperature effect - bending moment and shear force diagram.	
SLOPE DEFLECTION METHOD	**6+3**
Kinematic indeterminacy- Slope deflection method - analysis of continuous beams and portals - bending moment and shear force diagram.	
MOMENT DISTRIBUTION METHOD	**6+3**
Moment distribution method - analysis of continuous beams and portals - bending moment and shear force diagram.	
THEOREM OF THREE MOMENTS	**6+3**
Static indeterminacy - Theorem of three moments- analysis of propped cantilevers- fixed & continuous beam- bending moment and shear force diagram.	
Total Periods	**45**

Text books:

1. Vazirani & Ratwani (2003), Analysis of Structures, Vol. 1 & II , Khannapublishers.

References:

1. S.Ramamrutham (2004), Theory of structures, Dhanpat Raipublications.
2. C.S.Reddy (2002), Structural Analysis, TataMc-GrawHill.
3. L.S.Negi (2003), Structural Analysis, Tata Mc-GrawHill.
4. Rajasekharan & Sankarasubramaniam (2000), Computational Structural Mechanics, Prentice-Hall of India.
5. B.C.Punnia, Ashok kumar Jain & Arun Kumar Jain (2005), Theory of Structures, LaxmiPublications,India.

Course Outcomes:

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

CO1	Apply the fundamental concepts of static indeterminacy and kinematic indeterminacy of Structure.
CO2	Analyze the beams, pin jointed and rigid jointed structures using Strain energy method
CO3	Analyze a structure using slope deflection method
CO4	Analyze a structure using moment distribution method
CO5	Apply the concepts of influence line diagrams and moving loads on determinate structures.
CO6	Analyze the beams by making use of theorem of three moments

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	-	2	3	-	-	1	-	-	-	2	3	-	-	2
CO2	3	2	-	2	3	-	-	1	-	-	-	2	2	-	-	1
CO3	3	2	-	2	3	-	-	1	-	-	-	2	2	-	-	2
CO4	3	2	-	2	3	-	-	1	-	-	-	2	1	-	-	1
CO5	3	2	-	2	3	-	-	1	-	-	-	2	2	-	-	3
CO6	3	2	-	2	3	-	-	1	-	-	-	2	2	-	-	2

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

191CE53	ENVIRONMENTAL ENGINEERING				L-T-P	C
					3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**		**PCC**
Prerequisites:	191HS25					
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.					

INTRODUCTION **6+3**

Objectives & Components of public water supply scheme – Design period – Water quality parameters– analysis and standards – Population forecasts – Water demands and its variation –Sewage and sullage - Physical chemical & Biological quality of sewage – Sources of wastewater generation –Estimation of sanitary sewage flow & storm runoff – Effluent standards.

TRANSMISSION OF WATER AND SEWAGE **6+3**

Different categories of pipes & materials used in transmission – Application of nomograms in the design – 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 - Hydraulic design of sewer – Sewer appurtenances– Maintenance of sewer– Computer applications.

TREATMENT AND DISTRIBUTION OF WATER **6+3**

Unit operations and unit processes –Objectives, principles, operation, analysis and design of flash mixer, flocculator. Sedimentation and rapid sand filtration units - Objectives and principles of disinfection – Chlorination, aeration, water softening, iron and manganese removal and fluoride removal. Methods and systems of distribution of water – different types of distribution network – Analysis and design of distribution network – Maintenance and leak detection – Corrosion and its control

TREATMENT OF SEWAGE **6+3**

Selection of treatment processes – Onsite sanitation – Septic tank, Grey water harvesting –Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks -Activated Sludge Process and Trickling filter – ponds and lagoons – Oxidation ditches, UASB – Waste Stabilization Ponds – Recent Advances in Sewage Treatment

DISPOSAL OF SEWAGE AND SLUDGE **6+3**

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 books:

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.

References:

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”, Mc Graw Hill Publishers, New Delhi,2013.
3. Dilip Kumar Majumdar, “Irrigation Water Management”, Prentice-Hall of India, NewDelhi,2008.
4. Asawa, G.L., “Irrigation Engineering”, New Age International Publishers, NewDelhi,2000

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Explain the transmission of water and sewage
CO2	Illustrate the treatment and distribution of water
CO3	Analyse and design primary treatment of sewage
CO4	Design the necessary treatment units for disposal of sewage and sludge
CO5	Identify the suitable mode of environmental sanitation
CO6	Analyze the concepts of biogas recovery, dewatering technique

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	2	2	2	-	3	1	1	3	1	-	-	3	2	-	2	-
CO2	1	3	3	1	2	-	2	1	-	-	-	2	1	-	3	-
CO3	1	3	3	1	2	-	2	1	-	-	-	2	2	-	2	-
CO4	1	2	3	2	2	3	1	1	-	-	-	2	1	-	2	-
CO5	2	3	2	-	2	2	2	-	-	-	-	1	3	-	2	-
CO6	2	2	3	2	2	2	3	-	-	-	-	2	2	-	2	-

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

191CE54	DESIGN OF REINFORCED CONCRETE ELEMENTS				L-T-P	C
					2-1-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**		**PCC**
Prerequisites:	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	**6+3**
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 anddoublyreinforcedrectangularandflangedsections–DesignofLintels–Designofcontinuousbeams using B.M and S.F co-efficient as per IS code – detailing.	
DESIGN OF SLABS	**6+3**
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 staircase – Detailing of Tread-Riser type staircase.	
DESIGN FOR BOND, ANCHORAGE, SHEAR AND TORSION	**6+3**
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 COLUMNS	**6+3**
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 uniaxial and biaxial bending moments using Design Aids (SP16).	
DESIGN OF FOOTING	**6+3**
Design of wall footing – Design of Isolated, square and rectangular footings – Combined rectangular and trapezoidal footing –Design of pile and raft foundation.	
Total Periods	45

Text books:

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 Delhi2014.

References:

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 Delhi2009.
3. Punmia B. C, Ashok. Kumar Jain, Arun Kumar Jain "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd, New Delhi 2007.

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	Analyze and design slabs with reinforcement detailing
CO3	Design the bond, Anchorage, Shear and Torsion for reinforced concrete elements
CO4	Design the reinforced concrete columns by limit state method
CO5	Design the reinforced concrete footings by limit state method

CO6	Design pile and raft foundations

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	2	2	-	-	-	-	-	-	3	2	-	2	-
CO2	2	3	2	2	3	-	-	-	-	-	-	2	2	-	3	-
CO3	2	2	2	2	2	-	-	-	-	-	-	2	1	-	2	-
CO4	2	2	2	1	3	-	-	-	-	-	-	3	3	-	1	-
CO5	2	2	3	2	3	-	-	-	-	-	-	2	2	-	2	-
CO6	2	1	2	2	2	-	-	-	-	-	-	1	2	-	2	-

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

191CE55	HIGHWAY AND RAILWAY ENGINEERING			L-T-P	C
				3-0-2	4
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To make the students familiar with principles of highway and Railway Planning and Design.				

HIGHWAY PLANNING AND ALIGNMENT **9+ 3**

Highway Development in India - Jayakar Committee Recommendations and Realizations, 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+ 3**

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].

HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE **9+ 3**

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].

RAILWAY COMPONENTS AND TRACK CONSTRUCTION **9+ 3**

Comparison of railway and highway transport – Organization of Indian railways- Railway terminology – Wheels – Rails – Sections – Length – Failures, wear on rails – Long welded rails – Rail joints – Creep – Effects – Remedies – Sleepers – Track fitting and fastenings – Ballast- Gradients – Speed, degree of curves, super elevation and cant deficiency – Negative super elevation – Curves – Points and crossings–Necessity.

RAILWAY OPERATION AND MAINTENANCE **9+ 3**

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.

Total Periods **60**

List of Experiments

1. Softeningpoint
2. Penetration test onBitumen
3. Specific gravity test on Bitumen
4. Determination of Aggregate impact value
5. Aggregate crushing strength test

Text books:

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

References:

1. PapacostasC.S., PrevedourosP.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 HighwayMaterials.
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	Examine the highway planning and alignment.
CO2	Analyze and design the geometric design of highway alignment.
CO3	Explain the properties and characteristics of bitumen.
CO4	Analyze and design the various pavement sections.
CO5	Illustrate railway components and track construction
CO6	Infer various railway operation and maintenance

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	3	1	1	-	3	-	-	-	-	1	-	3	2	3	-	1
CO2	2	2	3	1	2	-	-	-	-	-	-	2	2	2	-	1
CO3	2	2	3	-	1	1	1	-	-	-	-	3	1	2	-	1
CO4	1	3	1	3		1	1	-	-	-	-	2	3	2	-	1
CO5	2	3	3	-	2	1	-	-	-	-	-	2	2	2	-	1
CO6	2	3	3	-	2	-	-	-	-	-	-	2	3	2	-	1

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

191CE57	ENVIRONMENTAL ENGINEERING LABORATORY			L-T-P	C
				0-0-4	2
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**	**PCC**
Prerequisites:	191CE53				
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 andwastewater.
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 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 wastewater samples
13. Determination of BOD.
14. Determination of COD.
15. Introduction to Bacteriological Analysis (Demonstrationonly)

Total Periods 45

References:

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
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. IS3025:Part10:1984Methodsofsamplingandtest(PhysicalandChemical)forwaterandwastewater: 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 : pHVALUE
10. IS3025:Part44:1993Methodsofsamplingandtest(PhysicalandChemical)forwaterandwastewater: Biochemical Oxygen Demand (BOD)

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Find pH and turbidity of water
CO2	Explain the water quality parameters
CO3	Estimate the BOD and COD of water sample
CO4	Inspect the chemical characteristics of Water and Wastewater
CO5	Test for Sodium in water samples using Flame photometer
CO6	Demonstrate water sample for its bacteriological analysis

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	3	3	3	3	-	3	3	1	2	-	-	1	3	2	1	2
CO2	3	2	3	3	-	3	3	1	2	-	-	1	3	2	1	2
CO3	3	2	3	3	-	3	3	1	2	-	-	1	3	2	1	2
CO4	3	3	3	3	-	3	3	1	2	-	-	1	3	2	1	2

CO5	3	3	3	3	-	3	3	1	2	-	-	1	3	2	1	2
CO6	3	3	3	3	-	3	3	1	2	-	-	1	3	2	1	2

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

191CE58	SOIL MECHANICS LABORATORY				L-T-P	C
					0-0-4	2
Programme:	**B.E. Civil Engineering**	**Sem:**	**V**	**Category:**	**PCC**	
Prerequisites:	191CE43					
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 – Sieveanalysis
2. Grain size distribution – Hydrometeranalysis
3. Determination of Specific gravity of soilgrains
4. Relative density ofsands
5. Atterberg limitstest
6. Determination of moisture - Density relationship using standard Proctortest.
7. Permeability determination (constant head and falling headmethods)
8. Determination of shear strengthparameters.
9. Direct shear test on cohesion less soil
10. Unconfined compression test on cohesivesoil
11. Tri-axial compression test (demonstrationonly)
12. One dimensional consolidation test (Demonstrationonly)
13. Field density test (Core cutter and sand replacementmethods)
14. Standard Penetration Test.

Total Periods 45

References:

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", New Age 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)			
	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	3	2	-	2	3	2	-	2	3	2	1	2
CO2	3	3	2	3	3	2	-	2	3	2	-	2	3	2	1	2
CO3	3	3	2	3	3	2	-	2	3	2	-	2	3	2	1	2
CO4	3	3	2	3	3	2	-	2	3	2	-	2	3	2	1	2
CO5	3	3	2	3	3	2	-	2	3	2	-	2	3	2	1	2
CO6	3	3	2	3	3	2	-	2	3	2	-	2	3	2	1	2

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

191HS57	Business English				L-T-P	C
					0-0-2	-
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**	**HSMC**	
Prerequisites:	191HS41					
Aim:	To Improve learner's Communication Skills in English					

UNIT I

Elements of effective presentation – Structure of presentation – Presentation tools – Voice Modulation – Audience analysis – Body language – Video samples

UNIT II

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity – Stress Management & Poise – Video Samples

UNIT III

Covering letter – strategies to write, resume and it's various kinds

Course Outcomes:

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

CO1	Train the students in Language Skills, Soft Skills, Inter Personal Skills, Decision Making and Business Communication
CO2	Competent in Presentation skill
CO3	Imbibe the knowledge of effective classroom speaking and presentation
CO4	Provide opportunities to learners to practice their communicative skills to become proficient users of English
CO5	Write job applications
CO6	Acquire knowledge about the various principles of communication

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	PS O1	PS O2	PS O3	PS O4
CO1	-	2	2	-	-	-	-	-	3	3	3	3	-	-	-	3
CO2	-	-	-	-	-	-	-	-		3	-	2	-	-	-	2
CO3	-	-	-	-	2	-	-	-	2	3	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	2	-	-	1	-
CO5	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-	-
CO6	-	2	-	-	2	-	-	3	3	2	-	2	-	-	2	2

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

191CE61	STRUCTURAL ANALYSIS - II			L-T-P	C
				2-1-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**VI**	**Category:**	**PCC**
Prerequisites:	191CE52				
Aim:	To gain knowledge about analytical skills for finding the forces and moments in the structure.				

INFLUENCE LINE	**6+3**
Influence line - influence lines for bending moment and shear force, Muller-Breslau's principle,determinate and indeterminate beams - Maxwell's reciprocal theorem.	
ANALYSIS OF ARCHES	**6+3**
Two hinged and three hinged parabolic arches- circular arches, cables - tension forces in towers - influence line for horizontal thrust and bending moment.	
FLEXIBILITY MATRIX METHOD	**6+3**
Concept of flexibility matrix - analysis of continuous beams - plane frames and pin jointed plane trusses.	
STIFFNESS MATRIX METHOD	**6+3**
Stiffness matrix for beam element - analysis of continuous beams - plane frames & pin jointed plane Trusses	
PLASTIC ANALYSIS	**6+3**
Plastic moment of resistance - shape factor, collapse load - analysis of continuous beams and portals – limiting conditions for applications	
Total Periods	**45**

Text books:

1. V.N.Vazirani & M.M.Ratwani (2000), Analysis of Structures, Khanna Publishers, New Delhi

References:

1. R.L.Jindal (1996), Indeterminate Structures, Tata McGraw Hill PublishingHouse.
2. Negi.L.S(2002),Theory&ProblemsinStructuralAnalysis,TataMcGrawHillPublishingHouse.
3. G.S.Pandit & Gupta S.P (1998), Structural Analysis (A matrix approach), Tata Mc-GrawHill Publishing Ltd.

Course Outcomes:

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

CO1	Illustrate the concepts of ILD and moving loads on determinate structures
CO2	Analyze three hinged arches of parabolic profiles
CO3	Analyze three hinged arches of circular profiles
CO4	Make use of Matrix Flexibility method to analyze the indeterminate pin jointed plane frames, continuous beams and rigid frames
CO5	Make use of Matrix Stiffness method to analyze the indeterminate pin jointed plane frames, continuous beams and rigid frames
CO6	Inspect indeterminate beams and frames for its plastic moment capacity.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	2	2	2	-	-	-	2	-	-	1	3	-	-	1
CO2	3	3	3	2	2	-	-	-	1	-	-	1	2	-	-	1
CO3	3	3	3	2	2	-	-	-	1	-	-	1	3	-	-	1
CO4	3	3	3	2	2	-	-	-	1	-	-	1	3	-	-	1
CO5	3	3	3	2	2	-	-	-	1	-	-	1	3	-	-	1
CO6	3	3	3	2	2	-	-	-	1	-	-	1	3	-	-	1

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

191CE62	DESIGN OF STEEL STRUCTURES				L-T-P	C
					2-1-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**VI**	**Category:**		**PCC**
Prerequisites:	Nil					
Aim:	To make the students familiar with the design of steel members					

STRUCTURAL STEEL CONNECTIONS	**6+3**
Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts	
TENSION MEMBERS	**6+3**
Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag	
COMPRESSION MEMBERS	**6+3**
Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base	
BEAMS	**6+3**
Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns	
ROOF TRUSSES AND INDUSTRIAL STRUCTURES	**6+3**
Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing – Design of steel chimney.	
Total Periods	45

Text books:

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.

References:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of SteelPublications,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 InternationalPublishing 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 IndianStandards, New Delhi, 2007.

Course Outcomes:

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

CO1	Design common bolted and welded connections for steel structures
CO2	Outline the design concepts of axially loaded columns and column base connections.
CO3	Design tension members and understand the effect of shear lag.
CO4	Design various industrial steel structures
CO5	Design Roof trusses and purlins
CO6	Design self-supporting steel chimney

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	2	2	2	-	-	-	-	-	-	1	3	-	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	1	2	-	2	1
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	-	2	1
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	-	2	1
CO5	3	3	3	2	2	-	-	-	-	-	-	1	3	-	2	1
CO6	3	3	3	2	2	-	-	-	-	-	-	1	3	-	2	1

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

191CE63	CONCRETE TECHNOLOGY				L-T-P	C
					3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**VI**	**Category:**		**PCC**
Prerequisites:	191CE44					
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 – RCPT	
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 - Bioandbacterialconcrete-Smartconcrete-Extremeweatherconcreting-Vacuumdewateringconcreting- Underwater concreting - Guniting and shotcreting .	
Total Periods	45

Text books:

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.

References:

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	Examine the concrete materials as per IS code.
CO2	Explain the different types and necessity of admixtures.
CO3	Design concrete mix as per ACI, British and IS methods.
CO4	Demonstrate the destructive tests of hardened concrete.
CO5	Demonstrate the non-destructive tests of hardened concrete.
CO6	Design special concretes and explain their specific applications.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	2	-	3	2	-	-	-	-	-	-	3	3	-	2	1
CO2	2	-	2	3	2	1	-	-	-	-	-	3	3	-	2	1
CO3	2	-	3	2	1	-	-	-	-	-	-	3	1	-	2	2
CO4	2	2	3	2	1	-	-	-	-	-	-	3	-	-	2	2
CO5	2	2	3	2	1	-	-	-	-	-	-	3	-	-	2	2
CO6	2	2	3	-	2	-	-	-	-	-	-	3	-	-	2	1

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

191CE64	DESIGN OF REINFORCED CONCRETE STRUCTURES AND DETAILING			L-T-P	C
				3-0-2	4
Programme:	**B.E. Civil Engineering**	**Sem:**	**VI**	**Category:**	**PCC**
Prerequisites:	191CE56				
Aim:	To make the students familiar with the design of RC structures and detailing.				

YIELD LINE THEORY	**9+3**
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.	
BUILDING FRAME	**9+3**
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	**9+3**
Design of Flat slabs using IS code – Direct design method – Detailing – Design of Reinforced concrete walls using IS code.	
RETAINING WALLS	**9+3**
Design of cantilever and counterfort retaining walls for level surface filled with / without uniform surcharge – Stability requirements – Description of inclined backfill.	
WATER TANKS	**9+3**
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

LIST OF EXPERIMENTS

1. Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcementdetails
2. Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcementdetails
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 includingconnections.
5. Design and detailing of T-BeamSlab
6. Design and detailing of Column andFooting.

Text books:

1. Purushothamaraj.P., "Design of RC & Brick Masonry Structures", Lakshmi PublicationsChennai,2012.
2. Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, Delhi,2006.

References:

1. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH PublishingCompany
2. Ram Chandra.N. andVirendraGehlot, "Limit State Design", Standard BookHouse.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 ofpractice

Course Outcomes:

At end of this course, the students will be able to	
CO1	Design RC slabs using yield line theory
CO2	Design building frame using portal frame and cantilever methods
CO3	Design flat slab and concrete walls using IS codes
CO4	Design cantilever and counterfort retaining wall
CO5	Classify water tank based on shapes, levels and functions
CO6	Design underground and overhead water tank as per IS code

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	3	1	3	1	1	-	-	1	-	2	-	1	3	2	2	1
CO2	1	2	1	1	-	-	1	1	1	2	1	1	3	1	2	1
CO3	2	1	-	2	-	-	-	1	-	1	-	1	2	3	-	-
CO4	2	1	-	2	-	-	-	1	-	1	-	1	2	3	-	-
CO5	1	2	1	-	2	-	-	-	-	-	-	1	-	3	-	3
CO6	2	3	2	-	2	-	-	2	-	2	1	2	1	2	2	1

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

191CE67	CONCRETE LABORATORY				L-T-P	C
					0-0-2	1
Programme:	**B.E. Civil Engineering**	**Sem:**	**VI**	**Category:**	**PCC**	
Prerequisites:	191CE44					
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 and ACI methods
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

Total Periods **30**

References:

1. M.L.Gambhir, Neha Jamwal, "Building and Construction Materials – Testing and Quality Control(Lab Manual)",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 (Laboratory Manual)", NemChand & Bros, Roorkee (U.P), Revised Edition,2009.

Course Outcomes:

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

CO1	Examine the quality of concrete materials as per relevant IS codes
CO2	Design the concrete mix by ACI and IS code methods
CO3	Determine the properties of concrete
CO4	Summarize special concretes and its specific applications
CO5	Inspect concrete samples for its quality control
CO6	Determine the Mechanical Properties of hardened concrete

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	2	2	2	2	3	2	-	2	3	3	1	2
CO2	3	3	3	3	2	2	2	2	3	2	-	2	3	3	1	2
CO3	3	3	3	3	2	2	2	2	3	2	-	2	3	3	1	2
CO4	3	3	3	3	2	2	2	2	3	2	-	2	3	3	1	2
CO5	3	3	3	3	2	2	2	2	3	2	-	2	3	3	1	2
CO6	3	3	3	3	2	2	2	2	3	2	-	2	3	3	1	2

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

191CE68	Mini Project				L-T-P	C
					0-0-2	1
Programme:	**B.E. Civil Engineering**	**Sem:**	**VI**	**Category:**	**PROJ-CE**	
Prerequisites:	Nil					
Aim:	To make the students to improve learn practically as they realize the value of practical training.					

OBJECTIVES

The students may be asked to work in groups with not more than two students in each group. Basic study through review of literature on the topic selected shall be completed. The scope of the project, necessary data, sources of such data etc. shall be identified. The group of students has to prepare a brief report on the work done during the semester and is to be submitted. The report should at least include Introduction, Aim and objective of the project, scope of the project, methodology, and review of literature and reference list. The group shall prepare and present a seminar based on this work.

EVALUATION PROCEDURE

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.

Total Periods	30

Course Outcomes:

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

CO1	Apply the knowledge of core subjects in civil engineering projects.
CO2	Define the ethical and professional responsibilities as a Civil Engineer.
CO3	Infer the need for a continuous learning to be part with the constantly emerging field of civil engineering.
CO4	Formulate problems by collecting data, analyzing and designing a feasible and effective solution to the problem under all realistic constraints.
CO5	Explain the professional concepts while working as a team
CO6	Measure the ability to do project as an individual as well as a team.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	3	3	3	3	3	3	-	2	3	2	3	3
CO2	2	3	3	2	3	3	3	3	3	3	-	3	3	2	3	3
CO3	2	3	3	2	3	3	3	3	3	3	-	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	-	2	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	1	2	3	2	2	3

CO6	3	3	3	3	3	3	3	3	3	3	-	2	3	2	2	3

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

191HS67	**Career English**				**L-T-P**	**C**
					0-0-2	**-**
Programme:	**B.E. Civil Engineering**	**Sem:**	**III**	**Category:**		**MC**
Prerequisites:	191HS51					
Aim:	To practice English for Enhancing Employability skills					

UNIT I

Verbal analogy, verbal reasoning, error spotting, sentence completion

UNIT II

Why is GD part of selection process? – Structure of GD – Moderator – Strategies in GD – Team work – Body Language – Mock GD – Video samples

UNIT III

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)
3. Group Discussion: Students participate in group discussions. (6)
4. Interview Skills: Students participate in Mock Interviews (8)

Course Outcomes:

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

CO1	Enlarge the student's aptitude and reasoning skills
CO2	Deal with the barriers that affect communication in a professional set up.
CO3	Understand various stages of communication and the role of audience and purpose.
CO4	Practice English for Enhancing Employability skills
CO5	Develop students job prospects through oral communication
CO6	Enhance the performance of learners at placement interviews and group discussions and other recruitment procedures

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	2	-	-	-	-	-	-	-	3	3	3	2	-	-	-	2
CO2	-	-	-	-	-	2	-	-	3	3	3	2	-	-	1	-
CO3	-	-	-	-	-	-	-	-	2	3	2	2	-	-	-	1
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	-	1	-	-	-
CO6	-	-	-	-	-	-	-	-	3	3	--	-	1	-	1	2

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

191CE71	CONSTRUCTION MANAGEMENT			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**VII**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To impart the students as a decision maker in the construction industry.				

INTRODUCTION	**9**
Construction Management - Importance – Scope of construction Management – Principles – Management Functions – Construction stages - Constructor Sequence- Types of firms – Government – Private – Public sector – Owner-Builder Operation - Planning for materials – Machines – Organization of Project Participants Traditional Designer- Turnkey Operation -Leadership and Motivation for the Project Team	
PLANNING AND SCHEDULING	**9**
Construction Planning: Need – Collection of field data – Scheduling- Defining Activities- WBS creation, Project planning: Precedence Relation -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 – Approval and sanction of estimates – Budget -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 books:

1. Sengupta (2002), Construction Management, Tata McGraw-Hill.
2. Construction Management and accounts (2002) by J.L. Sharma, Satya Publications

References:

1. Subramaniam (2001), Construction Management, Anuradha Agencies.
2. Joseph.L (2000), Essential of Management, Prentice Hall of India.
3. Mote Paul and Gupta (2001), Management Economics, Tata McGraw-Hill.
4. Manie (2005), Essentials of Management, Prentice Hall of India.

Course Outcomes:

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

CO1	Explain the fundamental techniques in construction management.
CO2	Outline the system of scheduling by using software.
CO3	Build the system of labour management and safety measures.
CO4	Explain the engineering economics system and network analysis.
CO5	Classify the basic value of project management.
CO6	Appraise the system of payments, accounts and accounting management.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	1	2	3	3	2	2	3	2	2	1	2	-	-	2
CO2	1	-	2	1	3	-	1	1	1	2	1	1	2	-	3	2
CO3	-	-	3	3	1	-	1	3	1	2	1	1	2	-	2	-
CO4	1	-	1	1	-	2	-	1	-	-	-	1	3	-	2	2
CO5	1	-	2	3	2	-	-	2	3	-	3	1	2	-	-	3
CO6	2	2	2	-	1	1	-	-	2	-	2	1	2	2	1	3

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

191CE72	ENGINEERING ECONOMICS, ESTIMATION AND COSTING			L-T-P	C
				3-0-0	3
Programme:	**B.E. Civil Engineering**	**Sem:**	**VII**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To know about the basics of economics and cost analysis related to engineering and estimate any building through the quantity surveying and valuation.				

BASIC PRINCIPLES AND METHODOLOGY OF ECONOMICS	9
Demand/Supply – elasticity – Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes, Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve	
INDIAN ECONOMY	9
Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.	
ANALYSIS OF RATES AND TENDERS	9
Rate analysis & preparation of bills – Data analysis of rates for various items of works – abstract estimates for Building projects, contracts-types of contracts - tender preparation documents.	
QUANTITY ESTIMATION FOR BUILDING	9
Estimation of building – Procedure of estimating, Types of estimates, detailed estimate of buildings including sanitary & electrical fittings.	
VALUATION	9
Valuation- rent fixation, tenders, - contracts –accounting procedure, measurement book, stores, cost & quality control – PWD & CPWD practice – Software Applications for Estimation of Buildings.	
Total Periods	45

Text books:

1. B.N.Datta (1998), Estimating and costing, Charator Publishing House

References:

1. Vazirani (1997), Estimating and costing, Khanna Publishers
2. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
3. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw-Hill
4. Misra, S.K. and Puri (2009), Indian Economy, Himalaya.

Course Outcomes:

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

CO1	Spell different concepts of economics and financial system
CO2	Explain the methodology of economics and their function
CO3	Interpret the basic concepts of Indian economic issues
CO4	Analyze the item rates and preparation of building estimation
CO5	Estimate the quantity of buildings
CO6	Explain the concepts of quality control and utilizing estimation software

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	PS O1	PS O2	PS O3	PS O4
CO1	1	2	-	-	3	2	-	-	-	3	2	1	1	-	3	-
CO2	1	2	-	-	3	2	-	-	-	3	2	1	1	-	3	-
CO3	-	3	2	-	2	3	3	-	-	-	-	1	1	-	-	3
CO4	1	1	2	-	3	1	1	3	3	-	-	1	1	-	2	2
CO5	1	1	2	-	3	1	1	3	3	-	-	1	1	-	2	2
CO6	1	2	1	2	3	-	-	-	2	-	-	1	1	-	3	1

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

191CE73	INSTRUMENTATION FOR CIVIL ENGINEERING			L-T-P	C
				3-0-2	4
Programme:	**B.E. Civil Engineering**	**Sem:**	**VII**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To impart the students as a decision maker in the construction industry.				

STRAIN GAUGES	
Mechanical strain gauge – optical strain gauge – electrical resistance strain gauge - description and operation – inductance and capacitance strain gauges-strain rosettes – measurement of static and dynamic strain – effect of transverse strains –use of strain recorders and load cells –calibration of testing machines.	9+ 3
THEORY OF PHOTO ELASTICITY	
Theory of Photo Elasticity- Basic concepts ,stress optic law-Isoclinics and Iso chromatics and Materials fringe value- Crack propagation study using fringes- Components of photo elastic bench- Dark field and white field arrangements of photo elastic bench- Stress Freezing Technique-Hologram Technique.	9+ 3
NDT METHODS	
Load testing towers - brittle coating method - Moire fringe method- Ultra sonic pulse velocity technique - Rebound hammer method - X-ray method - Gamma ray method - corrosion measurements - linear polarization resistance - rapid chloride ion penetration test-open circuit potential measurements – Electrical impedance spectroscopy.	9+ 3
MODEL ANALYSIS	
structural similitude – use of models – structural and dimensional analysis – Buckingham pi theorem–MullerBreslau'sprinciplefordirectandindirectanalysis–useofBegg'sdeformeter– moment indicators – design of models for direct and indirect analysis.	9+ 3
INSTRUMENTATION	
LVDT(linear variable differential transducer) –transducers for velocity and acceleration measurement-vibrationmeter–seismographs–vibrationanalyser–displayandrecordingsignals– cathode ray oscillograph – XY plotter - chart plotter – digital acquisition systems.	9+ 3
Total Periods	60

Lab Experiment

1. Rebound Hammer Test
2. Ultrasonic Pulse Velocity Test
3. Determination of Impact resistance of Concrete
4. To study on Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
5. To measure the stress & strain using strain gauges mounted on steel beam.

Text books:

1. Dally . J.W and Riley.W.F, "Experimental stress analysis", McGraw Hill BookCompany,N.Y.1991
2. Ganesan.T.P, "Model analysis Of Structures", University press, India,2000.
3. Ravisankar.k. and Chellappan.A., "Advanced course on Non-Destructive Testing and Evaluation of Concrete Structures", SERC, Chennai,2007.

References:

1. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New delhi,2006.
2. Sirohi.R.S., Radhakrishna.H.C, "Mechanical Measurements", New Age International (P)Ltd.1997.

Course Outcomes:

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

CO1	Illustrate the working principles and uses of different types of strain Gauges

CO2	Show thebehavior of photo elastic techniques applied to the Structures
CO3	Demonstrate different NDT methods.
CO4	Examine the structure by non – destructive testing methods and model analysis.
CO5	Apply the principle of model analysis to the prototype.
CO6	Explain the working of Begg'sdeformeter.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	1	3	-	-	-	-	1	-	-	-	-	1	1	-	-	1
CO2	2	2	-	-	-	-	2	-	-	-	1	2	2	-	1	-
CO3	2	3	-	-	3	-	-	1	-	-	-	1	-	2	-	-
CO4	2	2	-	-	-	-	-	-	-	1	-	1	3	-	-	2
CO5	2	-	-	-	-	-	3	-	2	-	-	-	-	1	-	-
CO6	1	1	-	-	1	-	2	-	-	-	2	-	1	-	2	1

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

191CE77	COMPUTER AIDED DESIGN AND ANALYSIS			L-T-P	C
				0-0-4	2
Programme:	**B.E. Civil Engineering**	**Sem:**	**VII**	**Category:**	**PCC**
Prerequisites:	Nil				
Aim:	To familiarize and give hands-on training to students in the following areas of civil engineering application software				

SYLLABUS

Design of deep beams, Corbels, Ribbed slabs, Flat slabs, Yield line theory, Design of multi storey buildings. Design of Gantry girders, Design of Industrial structures, Beam Column connections, Analysis and design of light gauge structures, Tall structures, shear wall ductility detailing.

Total hours 60

References:

1. Purushothamaraj.P., "Design of RC & Brick Masonry Structures", Lakshmi PublicationsChennai,2012.
2. Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, Delhi,2006.
3. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company
4. Ram Chandra.N. andVirendraGehlot, "Limit State Design", Standard BookHouse.2004.
5. Varghese, P.C., "Limit State Design of Reinforced Concrete Structures", Prentice Hall of India PvtLtd New Delhi,2007.
6. 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	Analyze and design deep beams, corbels and ribbed slab.
CO2	Design and detail the flat slabs
CO3	Analyze and design the light gauge structures
CO4	Analyze and design gantry girder.
CO5	Designbeam-column connections.
CO6	Analyze and design Tall Structures.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	2	-	-	2	-	1	3	-	-	1	2	3	-	2
CO2	3	2	2	-	-	2	-	1	3	-	-	1	2	3	-	2
CO3	3	2	2	-	-	2	-	1	3	-	-	1	2	3	-	2
CO4	1	1	1	-	3	1	-	-	-	-	3	1	1	-	3	-
CO5	1	-	2	-	3	-	3	-	1	-	2	2	1	-	-	-
CO6	1	1	1	3	2	1	-	-	1	-	-	1	1	3	-	1

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

191CE79	PROJECT-I				L-T-P	C
					0-0-4	2
Programme:	**B.E. Civil Engineering**	**Sem:**	**VII**	**Category:**	**PROJ**	
Prerequisites:	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.

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 theInstitution)
2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the samemark
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)

Total Periods	**60**

Course Outcomes:

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

CO1	Apply the knowledge of core subjects in civil engineering projects.
CO2	Compare the ethical and professional responsibilities as a Civil Engineer.
CO3	Understand the need for a continuous learning to be part with the constantly emerging field of civil engineering.
CO4	Extend the knowledge in collecting data, analyzing and designing a feasible and effective solution to the problem under all realistic constraints.
CO5	Apply the professional concepts while working as a team in finding a solution to real life Civil engineering problem.
CO6	Prove to work in a project as an individual as well as a team.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	3	3	3	3	3	3	-	2	3	2	3	3
CO2	2	3	3	2	3	3	3	3	3	3	-	3	3	2	3	3
CO3	2	3	3	2	3	3	3	3	3	3	-	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	-	2	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	1	2	3	2	2	3
CO6	3	3	3	3	3	3	3	3	3	3	-	2	3	2	2	3

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

191CE89	PROJECT II				L-T-P	C
					0-0-12	6
Programme:	**B.E. Civil Engineering**	**Sem:**	**VIII**	**Category:**	**PROJ-CE**	
Prerequisites:	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 provide opportunity to utilize the creative ability and inference capability.

EVALUATION PROCEDURE

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.

Total Periods	180

Course Outcomes:

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

CO1	Apply the knowledge of core subjects in civil engineering projects.
CO2	Compare the ethical and professional responsibilities as a Civil Engineer.
CO3	Understand the need for a continuous learning to be part with the continuously emerging field of engineering.
CO4	Extend the knowledge in collecting data, analyzing and designing a feasible and effective solution to the problem under all realistic constraints.
CO5	Apply the professional concepts while working as a team in finding a solution to real life Civil engineering problem.
CO6	Prove to work in a project as an individual as well as a team.

Mapping with Programme Outcomes:

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	3	3	3	3	3	3	-	2	3	2	3	3
CO2	2	3	3	2	3	3	3	3	3	3	-	3	3	2	3	3
CO3	2	3	3	2	3	3	3	3	3	3	-	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	-	2	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	1	2	3	2	2	3
CO6	3	3	3	3	3	3	3	3	3	3	-	2	3	2	2	3

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

191CEEA	BASICS OF DYNAMICS AND ASEISMIC DESIGN	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	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 – Epicenter – Hypocenter – 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 – Bauschinger Effects – Evaluationof 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 books:

1. Anil K Chopra “Dynamics of Structures: Theory and Applications to Earthquake Engineering” (Prentice-Hall International Series I Civil Engineering and Engineering Mechanics), 4th edition2011.
2. Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of IndiaPvt. Ltd. 2007.

References:

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	Classify static and dynamic problems
CO2	Determine Natural frequencies, Mode shapes for Two and multi degree of freedom system
CO3	Describe the causes of earthquake and tectonic plate theory.
CO4	Examine the response of structures to earthquake
CO5	Analyze the effect of earthquake on different type of structures.
CO6	Design the structures as per IS codes by making use of base isolation techniques

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	PS O1	PS O2	PS O3	PS O4
CO1	3	1	3	1	1	-	-	1	-	2	-	1	3	2	2	1
CO2	-	2	1	1	-	-	1	1	1	2	1	1	3	1	2	1
CO3	2	1	-	2	-	-	-	1	-	1		1	2	3	-	-
CO4	1	2	1	--	2	-	-	-	-	-	-	1	-	3	2	3
CO5	1	2	1	1	-	-	-	-	-	-	-	2	3	-	2	-
CO6	2	3	2	-	2	-	-	2	-	2	1	2	1	2	2	1

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

191CEEB	CONCEPT OF FINITE ELEMENT METHODS	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	Nil		
Aim:	To develop an advanced understanding of the behavior, analysis and design of bridge Structures.		

FUNDAMENTAL CONCEPTS	**9**
Concept of an element - various element shapes - one, two and three dimensional elements - finite element procedure - stresses and equilibrium - boundary conditions - strain displacement relations - stress strain relations - Potential energy and equilibrium – Weighted residual and weak formulations – Variational approach – Rayleigh Ritz method.	
DIRECT STIFFNESS METHOD	**9**
Steps in direct method of FEA – element stiffness matrix – global stiffness matrix – boundary conditions – simple problems on beams and trusses.	
ELEMENT SHAPES, NODAL UNKNOWNS AND COORDINATE	**9**
Discretization - basic element shapes - element properties – node numbering procedure – convergence requirements – generalized co-ordinates – natural co-ordinates – shape functions for linear & quadratic models – stiffness matrix – nodal load vector – static condensation – simple problems.	
TWO DIMENSIONAL PROBLEMS	**9**
Introduction – finite element modelling – constant strain triangle – isoparametric representation – potential energy approach - element stiffness – force terms – stress calculations – introduction to beam element.	
ISOPARAMETRIC ELEMENTS AND NUMERICAL INTEGRATION	**9**
Introduction – higher order elements and its applications - concept of sub, iso and super parametric elements – shape functions - Gaussian quadrature – examples in one and two dimensional elements	
Total Periods	**45**

Text books:

1. Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall,India,2003.
2. Krishnamoorthy C. S. ,"Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 1994.

References:

1. Rajasekaran, S., "Finite Element Methods in Engineering Design", Wheeler,1993.
2. Reddy J.N., “An Introduction to Finite Element Method”, McGraw-Hill, Intl. StudentEdition,1985.
3. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4thEdition, McGraw-Hill, Book Co.,1987
4. Rao S.S, “The Finite Element Method in Engineering”, PergamanPress,2003.
5. David V. Hutton, "Fundamentals of Finite Element Analysis", Tata McGrawHill,2004

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

CO1	Explain the basic concepts of finite element method
CO2	Formulate the Element Stiffness matrix for beams and trusses.
CO3	Developdiscretization process and shape functions.
CO4	Simplify the finite element analysis using 2-D triangular and rectangular problems.
CO5	Solve the stress calculations using potential energy approach.
CO6	Develop the shape function of iso and super parametric elements.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	2	1	-	2	-	-	-	-	-	-	1	-	3	-	3
CO2	2	2	1	1	-	-	2	1	-	-	-	1	2	1	-	1
CO3	1	3	1	2	-	-	-	-	-	-	-	2	2	1	-	1
CO4	2	2	1	1	-	-	-	-	-	-	-	-	3	1	2	-
CO5	1	2	1	2	-	-	-	-	-	-	-	2	2	1	-	1
CO6	2	3	1	1	-	-	-	-	-	-	-	1	2	2	2	-

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

191CEEC	ENVIRONMENTAL GEOTECHNOLOGY	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	Nil		
Aim:	To make the students to assess the investigation on geotechnical problems.		

INTRODUCTION	**9**
Introduction, Development of Environmental Geo technology, Aims, Environmental Cycle and their interaction with geo technology, Natural environment, cycles of nature, environmental geotechnical problems.	
SUB SURFACE CONTAMINATION	**9**
Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil water system, Site Investigation for detection of sub surface contamination	
FOOTING INTERACTION	**9**
Load environment factor design criteria, soil structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under water foundation problems.	
WASTE REMOVAL PROCESS	**9**
Ash Pond and Mine Tailing Impoundments, Geotechnical reuse of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action	
LANDFILLS	**9**
Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and http://mowr.gov.in/synthetic clay liners, Bearing capacity of foundation on sanitary landfills.	
Total Periods	**45**

Text books:

1. Hsai-Yang Fang, Ronald C. Chaney, "Introduction to Environmental Geotechnology", CRC Press.
2. Sharma, H. D. and Sangeeta, P.L., "Waste containment systems, Waste stabilization and landfills: Design and evaluation", Wiley Publications,1994.

References:

1. Koerner, R. M. "Designing with geosynthetics", Xlibris Publishers.
2. Robert W.Sarsby, "EnvironmentalGeotechniques, ICE Publishing.
3. Shahrukh Rouhanvy, "Geo statics for Environmental & geotechnical application", ASTM International

Course Outcomes:

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

CO1	Outline natural environment to solve environment related problems
CO2	Determine the amount of contamination in the soil by new methods
CO3	Identify the relation of soil structure Interaction
CO4	Determine the lateral pressure and underwater problems
CO5	Invent the new method of treatment of hazardous waste
CO6	Explain the concepts of landfills and to design the liners

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	2	3	1	3	2	1	2	1	-	-	-	1	2	-	-	2
CO2	3	2	1	2	2	1	2	1	-	-	-	1	3	-	-	3
CO3	1	2	2	1	2	1	2	1	-	-	-	1	2	-	-	2
CO4	2	1	3	1	1	2	1	1	-	-	-	1	2	-	-	3
CO5	1	2	3	1	2	1	1	1	-	-	-	1	1	-	-	2
CO6	1	2	3	1	2	1	1	1	-	-	-	1	1	-	-	2

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

191CEED	ENVIRONMENTAL POLLUTION AND CONTROL	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	Nil		
Aim:	To provide knowledge about the pollution control, legislation and how to attain a healthy environment.		

WATER POLLUTION & CONTROL	**9**
Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.	
AIR POLLUTION AND CONTROL	**9**
Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation.	
NOISE POLLUTION AND CONTROL	**9**
Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.	
SOLID WASTE MANAGEMENT	**9**
Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.	
MARINE POLLUTION	**9**
Marine Pollution: A definition- Main types of marine pollution in coastal waters- Human Effects on the Marine Environment- Characteristics of Pollution- Biodegradable vs. Inert Toxic Substances- Using Organisms to Monitor Pollution	
Total Periods	45

Text books:

1. H.S.,Rowe, Donald and GeorgeTcnobanoglous(2001), "EnvironmentalEngineering",Mc-GrawHill company, NewDelhi.
2. Rao C.S. (1996), "Environmental Pollution Control Engineering", Wiley Eastern Ltd.,NewDelhi.

References:

Course Outcomes:

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

CO1	Explain the atmospheric process and pollutant transport mechanism
CO2	Analyze the techniques to determine the fate of air pollutant with respect to time and space
CO3	Assess air pollution by suitable air pollution control measures
CO4	Spell the importance of Environmental Risk Assessment.
CO5	Choose feasible remediation measures for the contaminated sites
CO6	Explain environmental and ecological concerns associated with marine pollution.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	-	1	-	3	1	2	-	3	-	3	1	-	2	3	1
CO2	3	-	2	3	-	2	-	3	1	2	-		-	1	-	2
CO3	2	-	-	-	1	-	2	-	3	-	2	3	1	2	1	-
CO4	-	2	1	3	-	2	-	1	-	-	-	2	-	-	3	1
CO5	1	-	-	2	-	-	1	-	1	3	3	-	-	3	-	-
CO6	2	-	3	-	2	-	2	-	3	-	2	1	3	-	2	1

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

191CEEE	FAST TRACK CONSTRUCTION TECHNIQUES	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	Nil		
Aim:	To make the students to aware of advanced project management and digitization in construction		

ADVANCED PROJECT MANAGEMENT	9
Scheduling – Reduction in schedule - Resource management – Resource levelling techniques – Earned value management – integrated project planning and monitoring – Execution strategies (Traditional, phased, concurrent and fast track)- Procurement management –Fast tracking Vs Project crashing- Implications of Fast tracking	
TEMPORARY STRUCTURES FOR CONSTRUCTION	**9**
Formwork design – process automation –Selection of materials – Selection of systems	
CONSTRUCTION METHODS AND EQUIPMENT	**9**
Choice of technology – Selection of construction methods – Linear construction –prefabrication and pre-caging – precast construction – Modular construction	
CONTRACT MANAGEMENT	**9**
Types of contracts –Contractual provisions - Delay management –Risk management – Risk identification – Risk assessment –Risk Mitigation-Risk cost estimation	
DIGITALIZATION CONSTRUCTION	**9**
Resource tracking –Barcode –RFID; 3D printing –BIM (Building Information Modelling) –Robotics – Drones – Lidar.	
Total Periods	**45**

Text books:

1.Construction Project management—Planning, Scheduling and controlling—K. K. Chitkara—Eight reprint 2004, Tata McGraw Hill Publishing Company Limited.

References:

1.Scheduling Construction Projects—Principles and practices—Sandra Weber—Indian edition published in 2012—Pearson Publication.

Course Outcomes:

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

CO1	Develop resource allocation concept and improve the fast track technique
CO2	Model the fast-track formwork system
CO3	Adapt modernized equipment for speed up the project
CO4	Analyze the managerial risks in construction management
CO5	Explain the advanced level tracking and monitoring system in construction.
CO6	Apply BIM and its advantage in construction sector.

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	PS O1	PS O2	PS O3	PS O4
CO1	3	2	-	-	2	-	2	-	-	2	-	-	3	2	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	3	3	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	3	3	-	-
CO4	3	3	2	3	2	-	-	-	-	-	-	-	3	2	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-	-
CO6	2	3	2	3	3	-	-	-	-	-	-	-	3	2	-	-

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

191CEEF	GROUND IMPROVEMENT TECHNIQUES	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PE
Prerequisites:	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 - Vacuum 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 – Vibrofloatation - Sand pile compaction - Preloading with sand drains and fabric drains – Stonecolumns – 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 - Stabilization of expansive soils.	
Total Periods	45

Text books:

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.

References:

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 Indraratnaand 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	Explain the concept of suitable foundation for suitable soil
CO2	Identify proper drainage and dewatering facility for embankment
CO3	Discover proper treatment process for different soil
CO4	Decide proper reinforcement to the soil
CO5	Apply the process of drainage and separation of road works
CO6	Inspect proper grout material for soil stabilization of expansive soils

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	PS O1	PS O2	PS O3	PS O4
CO1	1	1	1	1	2	3	2	-	-	-	-	1	2	2	-	2
CO2	1	1	1	1	2	2	2	-	-	-	-	1	1	1	-	2
CO3	1	1	1	1	2	2	2	-	-	-	-	1	2	2	-	2
CO4	2	1	2	1	2	1	2	-	-	-	-	1	1	1	-	2
CO5	2	1	1	2	1	1	1	-	-	-	-	1	1	2	-	2
CO6	2	2	1	1	1	1	1	-	-	-	-	1	1	1	-	2

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

191CEEG	HYDRAULIC STRUCTURES	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	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**
Classificationofcanals–Alignmentofcanals–Regimetheories–CanalHeadworks–Canalregulators– 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.	
Total Periods	**45**

Text books:

1. Punmia, B.C., Pande. B.B Lal., "Irrigation and Water Power Engineering", Lakshmi Publications, New Delhi, 2001.

References:

1. Garg S.K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi,2001.
2. Sahasrabudhe 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	Explain the design of canal and its maintenance
CO2	Tell the types of canal, distributors, canal headworks, cross-drainage and canal regulator works
CO3	Classify canals and Headworks
CO4	Apply canal, dam and distributaries in civil engineering structures
CO5	Formulate mix proportioning techniques for field applications
CO6	Analyze characteristics and design of a concrete mix for field applications

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	PS O1	PS O2	PS O3	PS O4
CO1	3	-	-	1	-	-	-	-	-	1	-	2	2	3	1	1
CO2	3	3	2	2	1	-	-	-	-	1	-	2	1	2	-	2
CO3	3	-	-	-	-	-	-	-	-	1	-	2	2	-	2	1
CO4	3	3	2	2	1	-	-	-	-	1	-	2	1	-	2	-
CO5	3	1	2	1	-	-	-	-	-	1	-	2	2	3	-	1
CO6	3	1	-	1	-	-	-	-	-	1	-	2	2	3	1	1

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

191CEEH	HYDROLOGY	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	Nil		
Aim:	To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.		

INTRODUCTION AND HYDRO METEOROLOGY	**9**
Definition – Development of hydrology – hydrologic design – Hydrologic failures – Importance in Engineering – Hydrological budget. Weather and hydrology – General circulation Temperature humidity – Wind – Diurnal and monsonic wind systems.	
PRECIPITATION AND RUNOFF	**9**
Formation of precipitation – forms of precipitation – types of precipitation – Rainfall measurement – gauges – recorders – processing precipitation data – check for consistency – supply of missing data – Aerial mean mass curve technique – Intensity duration frequency curves.	
ABSTRACTION, INFILTRATION AND EVAPORATION	**9**
Process of evaporation, transpiration – Infiltration factors affecting evaporation – Measurement of evaporation and infiltration indices – Horton's equation.	
HYDROGRAPH	**9**
Runoff-Factorsaffectingrunoff–measurement–streamgauging–stagedischargerelationship–Hydrograph components – Hydrograph separation – Unit hydrograph – Derivation of unit Hydrograph – S. Hydrograph – Synthetic hydrograph – Instantaneous Unit Hydrograph(IUH)	
FLOOD ANALYSIS	**9**
Empirical methods – statistical methods – flood routing – routing through reservoir routing – through channels – flood forecasting, water shed management.	
Total Periods	**45**

Text books:

1. Chow, V.T. Applied Hydrology, McGraw Hill Company

References:

1. R.K. Linely, et al (1997), Hydrology for Engineers, McGraw Hill PublishingCompany.
2. Varshney R.S. (1995),EngineeringHydrology.
3. Subramanya (1998), Engineering Hydrology, Tata McGraw Hill Co., GrawHillCo.
4. Das (2005), Hydrology & Soil Conservation Engineering, Prentice-HallofIndia.
5. Mutraja, K.N. (1992), Applied Hydrology, Tata McGraw HillPublishingCompany.

Course Outcomes:

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

CO1	Explain the basic concepts of hydrology and integrate the physical hydrological processes.
CO2	Explain the various process, measurement and estimation of hydrological components, evaporation, infiltration, stream flow etc.
CO3	Develop runoff and hydrograph estimation and apply into engineering practices.
CO4	Apply various statistical methods for hydrological analysis.
CO5	Solve the flood route and channel route problems
CO6	Construct the unit hydrograph for surface runoff

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	PS O1	PS O2	PS O3	PS O4
CO1	3	1	-	2	-	2	3	-	-	1	-	2	2	1	3	1
CO2	3	-	-	1	1	3	3	-	-	1	-	2	1	2	-	1
CO3	3	2	3	-	1	3	3	-	-	1	-	2	1	3	2	1
CO4	3	2	3	1	1	3	3	-	-	1	-	2	1	-	2	2
CO5	3	2	1	3	1	3	3	-	-	1	-	2	2	3	-	1
CO6	3	2	1	1	1	2	2	-	-	1	-	2	1	1	2	1

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

191CEEI	INDUSTRIAL STRUCTURES	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	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.	
Total Periods	**45**

Text books:

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.

References:

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	Summarize the concept of Industrial structures
CO2	Explain the design and constructional aspects ofIndustrialstructures.
CO3	Infer the planning and functional requirements of Industrial structures
CO4	Design Industrial roofs, Crane girders, Mill buildings, Bunkers and Silos
CO5	Design Corbels, Brackets and Nibs.
CO6	Analyze and design structural elements used in pre-cast construction including fabrication, erection and installation.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	3	-	1	1	2	-	-	-	-	2	3	-	-	2
CO2	2	1	2	-	-	1	2	-	-	-	-	2	3	-	1	2
CO3	2	2	1	-	-	1	1	-	-	-	-	1	2	-	1	2
CO4	3	3	2	2	1	1	1	-	-	-	-	2	3	1	-	1
CO5	3	3	2	2	1	1	1	-	-	-	-	2	3	1	-	1
CO6	3	3	2	2	1	1	1	-	-	-	-	2	3	1	-	1

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

191CEEJ	INDUSTRIAL WASTE TREATMENT AND DISPOSAL	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	Nil		
Aim:	To provide the student to familiar with various industrial waste, treatment and disposal methods		

INDUSTRIAL POLLUTION	**9**
Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Hazardous Wastes – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes – Pollution Control Boards.	
WASTE MANAGEMENT APPROACH	**9**
Waste management approach – Waste Audit – Volume and strength reduction – material and process modifications – Recycle, reuse and byproduct recovery – Applications.	
LIQUID WASTE TREATMENT TECHNIQUES	**9**
Equalization – Neutralization – removal of suspended and dissolved organic solids - Chemical oxidation – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management.	
INDUSTRIAL SOLID WASTE TREATMENT	**9**
Physico-chemical treatment – solidification – incineration – Secured landfills – Legal Provisions.	
CASE STUDIES OF INDUSTRIAL POLLUTION CONTROL	**9**
Sources & their Characteristics, waste treatment flow sheets for selected industries such as textiles, tanneries, dairy, sugar, paper, distilleries, steel plants, refineries, fertilizer, thermal power plants.	
Total Periods	45

Text books:

1. N.Rao & A.K.Dutta (1995), Wastewater Treatment, Oxford IBHPublication.
2. Nelson, L. Nemerow (2000), Liquid Waste of Industry, Theories, Practices and Treatment, Addison-Wesley Publishing Company, London.

References:

1. T.T. Shen, 1999, Industrial Pollution Prevention, Springerpublications.
2. R.L. Stephenson & J.B.Blackburn Jr. (1998), Industrial Wastewater Systems Handbook, Lewis Publishers, NewYork.

Course Outcomes:

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

CO1	Label the wastewater generated from a specific industry and interpret the possible impacts on the environment.
CO2	Identify the means and methods to reduce the quantity of generation of wastewater from industrial premises by performing source reduction techniques and waste audit.
CO3	Design appropriate treatment systems for the wastewater generated from the industries
CO4	Assess the possible recycling and reuse opportunities for the generated wastewater and residuals by employing suitable treatment units.
CO5	Tell the feasibility and benefits of individual, common and joint treatment of industrial wastewater
CO6	Make use of the provision for legal control of industrial pollution by legislations

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	1	-	2	3	-	1	3	-	2	3	1	-	2	3	1
CO2	1	2	2	-	-	2	3	-	1	-	1	-	-	3	-	3
CO3	1	-	2	-	3	-	1	-	2	3	-	-	2	-	3	1
CO4	-	2	-	2	-	1	-	2	-	-	-	2	-	3	1	3
CO5	3	1	-	3	1	-	2	-	3	1	-	-	2	-	-	1
CO6	1	-	2	-	2	-	3	1	3	2	-	1	3	1	-	3

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

191CEEK	PRESTRESSED CONCRETE STRUCTURES	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	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	99
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 unpropped constructions – Design of shear connectors – Shrinkage stresses.	
Total Periods	45

Text books:

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.

References:

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.

Course Outcomes:

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

CO1	Explain the terminology related to pre-stressing.
CO2	Analyze 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	Design a prestress concrete pipes and tanks.
CO5	Design the composite prestressed concrete beams.
CO6	Determine the stress and estimate the deflection for propped and unpropped constructions.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	-	2	1	-	-	-	-	-	-	2	3	-	-	1
CO2	3	3	2	2	1	1	1	-	-	-	-	2	3	1	-	1
CO3	3	3	2	-	-	1	1	-	-	-	-	2	2	1	-	1
CO4	3	3	2	-	-	1	1	-	-	-	-	1	2	1	-	2
CO5	3	3	2	-	-	1	1	-	-	-	-	2	2	1	-	2
CO6	3	2	1	-	-	-	1	-	-	-	-	1	2	-	1	1

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

191CEEL	RAILWAY, AIRPORT AND HARBOUR ENGINEERING	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	Nil		
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, wind rose 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**
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.	
Total Periods	**45**

Text books:

1. Rangwala S.C, Rangwala P.S, "Railway Engineering", Charotar Publishing House Pvt. Limited,2008.
2. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering" , Dhanpat Rai and Sons, Delhi,2006.

References:

1. Khanna S K, Arora M G and Jain S "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2005.
2. 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	Interpret Zonal of railways and different production units
CO2	Develop skills required for Track alignment in railway Surveys.
CO3	Demonstrate the requirements and classification of stations and yards
CO4	Plan and design the runways by using wind rose diagram
CO5	Understand the Airport marking and Lightings
CO6	Develop the skills required for planning, site selection and layout of harbours

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	PS O1	PS O2	PS O3	PS O4
CO1	1	2	-	-	1	-	1	-	-	-	-	1	-	-	2	1
CO2	1	2	2	-	1	-	1	-	-	-	-	1	-	-	2	1
CO3	1	2	2	-	1	-	1	-	-	-	-	1	-	-	2	1
CO4	1	2	2	-	1	-	1	-	-	-	-	1	1	-	2	1
CO5	1	2	2	-	1	-	1	-	-	-	-	1	1	-	2	1
CO6	1	2	-	-	1	-	1	-	-	-	-	1	-	-	2	1

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

191CEEM	REMOTE SENSING AND GIS	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	Nil		
Aim:	To introduce the students to the basic concepts and principles of various Components of remote sensing.		

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-datacompression.Applications-Transport, Waterresources,LandinformationsystemandDisaster management.	
Total Periods	**45**

Text books:

1. Atkinson and Nicholas Tate**, "**Advances in Remote Sensing and GIS Analysis" Wiley India Pvt Ltd, (2012).

References:

1. Anil K. Jamwal**, "**Remote Sensing and GIS" JnanadaPrakashan ,2008.
2. Thomas.M.Lillesand 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	Explain the knowledge of remote sensing and earth material
CO2	Apply the knowledge of modern tools to access space details
CO3	Evaluate the interpretation of data and digital image processing
CO4	Execute the process of preparation of maps by GIS
CO5	Analyze the data with measurement scale and validation of data
CO6	Formulate the methods of data base management system in GIS

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	PS O1	PS O2	PS O3	PS O4
CO1	1	1	1	2	2	2	2	-	-	-	-	1	1	2	-	1
CO2	1	1	2	2	2	1	1	-	-	-	-	1	2	2	-	1
CO3	2	1	2	1	2	1	2	-	-	-	-	1	2	2	-	1
CO4	1	2	1	2	1	2	1	-	-	-	-	1	2	1	-	1
CO5	1	2	2	2	2	1	1	-	-	-	-	1	2	2	-	1
CO6	2	1	2	1	2	1	2	-	-	-	-	1	2	2	-	1

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

191CEEN	REPAIR AND REHABILITATION OF STRUCTURES	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	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 books:

1. Dr.B.Vidivelli, "Rehabilitation of Concrete Structures", Standard Publishers Distributors, 2007.

References:

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	Explain the causes of deterioration of concrete and steel structures.
CO2	Evaluate the failures and to identify preventive measures in construction techniques.
CO3	Examine the different methods of repairing concrete and steel structures.
CO4	Demonstrate the different methods of strengthening existing structures.
CO5	Apply the different non-destructive tests for assessment of deterioration of structures.
CO6	Decide repair method of structures in marine exposure

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	PS O1	PS O2	PS O3	PS O4
CO1	1	3	2	2	2	-	-	-	-	-	-	1	3	1	-	2
CO2	1	3	2	2	3	-	-	-	-	-	-	1	3	1	-	2
CO3	2	3	2	3	2	-	-	-	-	-	-	2	3	1	2	1
CO4	2	3	2	3	3	-	-	-	-	-	-	2	3	2	2	1
CO5	1	3	2	3	3	-	-	-	-	-	-	2	3	1	2	1
CO6	1	3	-	-	-	-	-	-	-	-	-	2	2	1	3	1

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

191CEEO	SMART MATERIALS AND STRUCTURES	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	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 – Magneto 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 books:

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton.London-2006.

References:

1. Srinath L. S. – Experimental Stress Analysis – Tata McGraw-Hill,2005.
2. Srinivasan A.V and Michael McFarland D, “Smart Structures-Analysis and Design, Cambridge University Press,2001.
3. Mel.M.Schwartz, Encyclopedia of Smart Materials, John Wiley and Sons Inc.,2002.

Course Outcomes:

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

CO1	Explain instrumented structures, their functions and response.
CO2	Identify strain measuring techniques using electrical strain gauges.
CO3	Construct Chemical and Bio-Chemical sensing in structural Assessment.
CO4	Compare Piezoelectric and Electrostrictive Material.
CO5	Construct Signal Processing and Control for Smart Structures.
CO6	Make use of the sensors in smart materials for safety and quality in core.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	2	-	3	2	-	-	-	-	-	-	1	-	-	1	1
CO2	2	3	-	2	3	-	-	-	-	-	-	2	-	2	-	-
CO3	2	2	-	-	3	-	-	-	-	-	-	1	2	2	2	2
CO4	2	3	-	3	2	-	-	-	-	-	-	2	1	2	1	1
CO5	2	2	-	3	2	-	-	-	-	-	-	1	1	1	1	2
CO6	3	2	-	3	3	-	-	-	-	-	-		3	3	2	1

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

191CEEP	SOLID AND HAZARDOUS WASTE MANAGEMENT	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**PEC**
Prerequisites:	Nil		
Aim:	To provide principles of solid waste management and legislation.		

FUNDAMENTALS OF WASTE MANAGEMENT	**9**
Types and sources of solid waste, non-hazardous and hazardous waste-Present scenario and need for solid and hazard waste management- Legislations on management and handling of solid waste sand hazardous waste - Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management.	
MUNICIPAL SOLID WASTE	**9**
Waste generation rates and variation in MSW- waste sampling and characterization physical, chemical and biological properties of solid wastes- Source reduction of wastes- Recycling and Reuse-Handling storage and collection of MSW-Analysis of collection system-Optimization of collection routes-Need for transfer and transport – transfer station.	
PROCESSING TECHNOLOGIES	**9**
Waste processing – purposes of processing-Material separation and processing technologies-Biological conversion technologies-Chemical conversion technologies and-Thermal conversion technologies-Energy recovery from conversion products-Co- processing of solid waste.	
NON-HAZARDOUS & HAZARDOUS WASTES INDUSTRIAL SOLID WASTES	**9**
Recycling and reuse of solid wastes-Handling and disposal methodologies of high volume non-hazardous solid wastes. Identification, classification of Hazardous waste-Source and characterization of hazardous waste – TCLP tests-Storage, labeling and handling of hazardous wastes-Hazardous waste manifests and transport-Waste minimization options-Hazardous waste technological options-Physical treatment methods and chemical treatment methods-Biological treatment methods.	
DISPOSAL OF MUNICIPAL SOLID WASTE & HAZARDOUS WASTE	**9**
Disposal in landfills –Types-Site selection criteria's-Design and operation of landfill-Leachate and landfill gas management-Land fill closure and environmental monitoring-Land fill remediation. Hazardous waste landfills-Site selection Criteria-Design and Operation of Hazardous waste landfills-Remediation of H.W disposal sites.	
Total Periods	**45**

Text books:

1. George Tchobanoglous et.al, "Integrated Solid Waste Management", McGraw-HillPublishers,1993.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, "Waste Management",Springer,1994.

References:

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, NewDelhi,2000
2. R.E.Landreth and P.A.Rebers, "Municipal Solid Wastes – problems and Solutions", LewisPublishers,1997.
3. Bhide A.D. and Sundaresan, B.B., "Solid Waste Management in Developing Countries",INSDOC,1993

Course Outcomes:

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

CO1	Explain the functional elements of municipal solid waste management system
CO2	Identify the concept of waste characterization and collection system
CO3	Evaluate the various processing technologies for MSW
CO4	Choose the treatment, storage, and disposal options for hazardous waste
CO5	Identify variousdisposal methods of Hazardous waste

CO6	Decide feasible remediation measures for the contaminated sites

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	-	3	2	-	3	1	1	2	-	3	2	-	3	1
CO2	2	3	-	1	-	3	2	1	1	-	-	2	3	1	-	3
CO3	1	-	2	-	3	-	2	2	-	3	2	1	-	2	-	3
CO4	3	2	1	2	-	3	2	1	-	2	-	2	1	-	2	2
CO5	1	-	3	2	-	-	1	2	-	-	-	2	-	3	1	2
CO6	2	-	1		-	2	2	2	2	-	-	3	2	-	2	1

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

191CEEQ	TRAFFIC ENGINEERING AND MANAGEMENT	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	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, - Channelized 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, One way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes, Introduction to Intelligent Transportation System (ITS).	
Total Periods	**45**

Text books:

1. Subhash Saxena, "A Course in Traffic Engineering and Design", DhanpatRai& Sons, 2010.

References:

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	Develop the skills required for Characteristics of Vehicles Road Users and Skid Resistance
CO2	Understand the Accident Studies and Safety Level of Services
CO3	Demonstrate the traffic control aids and street furniture
CO4	Plan and design elements of intersection and rotary
CO5	Develop skills required for Transportation System Management (TSM)
CO6	Apply the concepts of Intelligent Transportation System (ITS) in Traffic Engineering

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	PS O1	PS O2	PS O3	PS O4
CO1	1	1	-	-	1	2	2	-	-	-	-	1	-	2	-	1
CO2	1	1	-	-	1	3	2	-	-	-	-	1	-	2	-	2
CO3	1	1	1	-	1	2	2	-	-	-	-	1	-	2	-	1
CO4	1	2	1	-	1	2	2	-	-	-	-	1	-	2	-	1
CO5	1	1	1	-	1	2	2	-	-	-	-	1	-	2	-	1
CO6	1	1	-	-	1	2	2	-	-	-		1	-	2	-	1

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

191CEER	TRANSPORT PLANNING AND MANAGEMENT	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	Nil		
Aim:	To provide knowledge on concepts of distribution and transport planning and Zoning.		

TRANSPORT PLANNING PROCESS	**9**
Scope – interdependence of land use and traffic – systems approach to transport planning – survey of existing conditions and forecasting future conditions. Transport survey – definition of study area – zoning survey – types and methods – inventory on transport facilities – inventory of land use and economic activities.	
TRIP GENERATION	**9**
Factors governing trip generation and attraction rates – multiple linear regression analysis – category analysis – critical appraisal of techniques.	
DISTRIBUTION METHODS	**9**
Uniform factor method, average factor methods – gravity model and its calibration – opportunity model.	
TRIP ASSIGNMENT AND MODAL SPLIT	**9**
Traffic assignment – general principles – assignment techniques – all nothing assignment – multiple root assignment – capacity – restraint assignment – diversion curves Modal split – advantages and limitations.	
EVALUATION TECHNIQUES	**9**
Economic evaluation techniques – performance evaluation – rating and ranking methods – case studies in evaluation – rating and ranking methods – case studies in evaluation of transport projects – land use transport models – transport planning for medium and small sized towns.	
Total Periods	**45**

Text books:

1. L.R. Kadiyali (2001), Traffic Engineering and Transport planning, Khanna Publishers, New Delhi

References:

1. Paul.H.Wright (1995), Transportation Engineering – Planning & Design, John Wiley &Sons, New York.
2. John W Dickey (1995), Metropolitan Transportation Planning, Tata McGraw-Hill publishing company Ltd, New Delhi.

Course Outcomes:

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

CO1	Explain the inventory of land use and economic activities
CO2	Apply the multiple linear regression in Transport Planning Process
CO3	Make use of Uniform factor method and average factor methods
CO4	Assess the trip and modal split
CO5	Identify the factors of economic evaluation techniques
CO6	Develop skills required for transport planning for medium and small sized towns.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	-	1	1	-	1	1	-	-	-	-	1	-	3	2	-
CO2	2	-	1	1	1	1	2	-	-	-	-	1	-	3	2	-
CO3	1	-	1	1	1	1	2	-	-	-	-	1	1	3	2	-
CO4	1	-	1	1	1	1	1	-	-	-	-	1	1	3	2	-
CO5	1	-	1	1	1	1	2	-	-	-	-	1	1	3	2	-
CO6	1	2	1	1	-	1	2	-	-	-	-	1	-	3	2	-

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

191CEES	WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	PEC
Prerequisites:	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 books:

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.

References:

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 ResourcesSystemsPlanningandManagement:AnIntroductiontoMethods,ModelsandApplications" (Paris : UNESCO, 2005)

Course Outcomes:

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

CO1	Explain the general principles of systems analysis and apply to problems in Water Resources Engineering
CO2	Make use of various methods of water resources economics to various problems in Water Resources Engineering
CO3	Interpret surface and sub-surface water quality management
CO4	Infer legal aspects of water and environment systems
CO5	Assess water demands from towns, agriculture and industry including their quantification
CO6	Develop and apply numerical model for various application along with better understanding aquifer characteristics

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	PS O1	PS O2	PS O3	PS O4
CO1	2	1	-	-	1	-	-	-	-	-	2	2	3	1	1	2
CO2	2	3	2	2	1	-	-	-	-	-	-	-	1	2	-	1
CO3	2	1	-	-	-	2	-	-	-	-	1	2	2	-	1	1
CO4	2	3	2	2	1	-	-	-	-	-	-	-	1	-	2	1
CO5	2	1	2	1	-	1	-	-	-	-	2	1	2	3	-	1
CO6	2	2	1	2	3	1	-	-	-	-	-	2		2	1	2

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

191OE7A	AIR AND NOISE POLLUTION CONTROL	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	OEC
Prerequisites:	Nil		
Aim:	Promote societies in harmony with nature, while adapting to climate change		

SOURCES AND EFFECTS OF AIR POLLUTION	9
Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.	
TRANSPORT OF AIR POLLUTION	**9**
Elements of atmosphere and dispersion of pollutants – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutions – Gaussian dispersion models – Applications.	
CONTROL OF AIR POLLUTION	**9**
Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment, gaseous pollutant control by adsorption & absorption, condensation, combustion – Pollution control for specific major industries.	
AIR QUALITY MANAGEMENT	**9**
Airqualitystandards–Airqualitymonitoring–Airpollutioncontrolefforts–Zoning–Townplanning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment –Methods.	
NOISE POLLUTION & CONTROL	**9**
Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution - fundamentals of sound generation - propagation, sound measurement - sound level meters – types, components, Noise prevention & control measures, environmental and industrial noise -noise control legislation.	
Total Periods	**45**

Text books:

1. Noel De Nevers (2000), Air Pollution Control Engineering, 2nd Edition, McGraw HillInternationalEdition.
2. Singal, S.P. (2000), Noise Pollution and Control, First Edition, Narosa Publishing House,New Delhi.

References:

1. RaoC.S., (2006) Environmental Pollution Control Engineering,2nd edition,NewAgeInternational,Delhi.
2. W.L.Heumann (1997), Industrial Air Pollution Control Systems, McGraw Hill,New York.
3. Rao M.N., & Rao H V N. (1996), Air Pollution Control, Tata-McGraw Hill,NewDelhi.

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	Apply principles and design of control measures.
CO4	Identify the gaseous pollutant control by adsorption, absorption, condensation and combustion.
CO5	Define the environmental impact assessment and air quality.
CO6	Describe the sources and control method of noise pollution.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	1	3	2	2	2	3	-	-	-	-	1	1	-	-	3
CO2	1	1	3	2	2	3	3	-	-	-	-	1	1	-	2	3
CO3	1	2	2	2	2	2	2	-	-	-	-	1	1	-	-	3
CO4	2	2	2	2	3	1	3	-	-	-	-	1	1	1	-	2
CO5	1	-	-	2	-	2	2	-	1	-	-	-	2	-	1	3
CO6	1	1	-	-	3	3	2	-	1	-	-	-	1	-	-	3

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

191OE7B	ENERGY SCIENCE AND ENGINEERING	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**OEC**
Prerequisites:	Nil		
Aim:	To provide introduction to energy systems and renewable energy resources, alternative energy sources and their technology applications		

INTRODUCTION TO ENERGY SCIENCE	**9**
Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment.	
ENERGY SOURCES	**9**
Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)	
ENERGY & ENVIRONMENT: ENERGY EFFICIENCY AND CONSERVATION:	**9**
Introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.	
CIVIL ENGINEERING PROJECTS CONNECTED WITH THE ENERGY SOURCES:	**9**
Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems.	
ENGINEERING FOR ENERGY CONSERVATION:	**9**
Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); *LEED ratings;* Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption.	
Total Periods	45

Text books:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press

References:

1. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living,Gaiam
2. Richard Loulou, Jean-Philippe,Georges Zaccour, (2005), Energy and Environment, Springer Science
3. Ristinen,RobertA.Kraushaar,JackJ.AKraushaar,JackP.Ristinen,Robert A.(2006)Energyandthe Environment, 2nd Edition, JohnWiley
4. UNDP (2000), Energy and the Challenge of Sustainability, World Energyassessment
5. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley PublishingCompany.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Explain the concept of Energy science
CO2	Spell the basics of energy system and resources
CO3	Demonstrate the solar energy perspectives and design aspects.
CO4	Influence the importance of energy efficiency and conservation.
CO5	Tell the concepts of civil engineering projects connected with the energy sources
CO6	Explain various energy conservation techniques

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	1	2	1	-	-	-	2	-	-	-	-	2	2	-	1	1
CO2	2	2	1	1	-	-	1	-	-	-	-	2	2	-	1	1
CO3	1	1	2	2	-	-	3	-	-	-	-	2	3	-	-	1
CO4	2	1	1	1	1	-		-	-	-	-	1	2	-	-	1
CO5	1	2	1	-	-	-	2	-	-	-	-	2	2	-	1	1
CO6	2	2	1	1	-	-	1	-	-	-	-	2	2	-	1	1

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

191OE7C	ENVIRONMENT AND ECOLOGY	L-T-P	C
		3-0-0	3

Programme:	B.E. Civil Engineering	Category:	OEC
Prerequisites:	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 books:

1. Pandey SN & Misra SP, “Environment and Ecology”, Ane Books Pvt. Ltd, New Delhi,2011.
2. SharmaP.D., “Ecology and Environment”, Rastogi Publication,2007.

References:

1. Shukla, S.K. and Srivastava, P.R., “Concepts in Environmental Impact Analysis”, Commonwealth Publishers, New Delhi,1992.
2. Canter, R.L., “Environmental Impact Assessment”, McGraw-Hill Inc., New Delhi,1997.
3. S. S. Dara, “A Textbook of Environmental Chemistry & Pollution Control”, S. Chand andCo.
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	Distinguish the various ecosystem and effects of human activities on environment.
CO2	Classify the types of natural resources and the sources of energy produced.
CO3	Explain the environment issue based on environmental pollution.
CO4	Explain Climate Change and Global warming effects
CO5	Apply the Environment Quality Standards according to pollution types.
CO6	Formulate the Environment Impact Assessment for infrastructure projects.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	1	2	2	-	-	3	-	-	-	-	2	3	-	-	1
CO2	2	1	1	1	1	-	-	-	-	-	-	1	2	-	-	1
CO3	1	2	1	-	-	-	2	-	-	-	-	2	2	-	1	1
CO4	2	2	3	1	-	-	1	-	-	-	-	2	2	-	1	1
CO5	3	2	2	1	-	1	1	-	-	-	-	1	1	-	1	3
CO6	3	2	1	-	-	-	1	-	-	-	-	1	1	-	-	1

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

161OE7D	FUNDAMENTALS OF FIRE SAFETY	L-T-P	C
		3-0-0	3
Programme:	**B.E. Civil Engineering**	**Category:**	**OEC**
Prerequisites:	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- smoldering 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 firefighting 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.	
Total Periods	**45**

Text books:

1. Dasa K**, "** Principles of Fire Safety Engineering: Understanding Fire and Fire Protection", Prentice Hall India Learning Private Limited(2014).
2. Gupta, R.S., "Handbook of Fire Technology" Orient Longman, Bombay,2010.

References:

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 Publishers Delhi (2012).
3. Lees F.P., "Fire Prevention and firefighting", Loss prevention Association, India.
4. Purandare D.D., Abhay D. Purandare, "Handbook on Industrial Fire Safety", 1st Edition, P & A Publications.
5. B. M., "Fire Protection and Prevention: The Essential Handbook" UBS Publishers (19 June2013).

Course Outcomes:

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

CO1	Explain the basic concepts of fire and explosion science
CO2	Outline the different causes and effects of fire and explosion
CO3	Examine the Risk analysis and assessment fire
CO4	Explain the operation of various types of firefighting equipment
CO5	Demonstrate the prevention of explosion
CO6	Explain the various fire prevention techniques to be followed in a building

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	PS O1	PS O2	PS O3	PS O4
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	3	1	-	2	3	-	-	2	-	-	3	-	2	2
CO5	1	2	-	3	-	2	2	-	-	2	-	-	3	2	-	1
CO6	1	2	1	-	-	-	2	--	-	-	-	2	2	-	1	1

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

191BAE1	ENGINEERING ECONOMICS & ACCOUNTING			L-T-P	C
				3-0-0	3
Programme:	**B.E. / B.Tech**	**Sem:**	-	**Category:**	**OEC**
Prerequisites:	Nil				
Aim:	To enable the students and provide an analytical idea about economics and accounting practices				

INTRODUCTION TO ECONOMICS&DEMAND	9
Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis. Demand - Types of demand - Determinants of demand - Demand function - Demand elasticity - Demand forecasting.	
SUPPLY, PORDUCTION AND COST CONCEPTS	9
Supply - Determinants of supply - Supply function - Supply elasticity. **Production function** - Introduction - Production Process & Function - One Variable and Two Variable Inputs - Isoquants - Returns to scale. **Cost Concepts** - Cost function – Types of Cost - Determinants of cost - Short run and Long run cost curves - Cost Output Decision - Estimation of Cost.	
PRICING AND CAPITAL BUDGETING	9
Pricing - Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice. **Capital Budgeting** - Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.	
FINANCIAL ACCOUNTING	9
Financial Accounting - Trail Balance, Balance sheet and related concepts: Trading Account, Profit & Loss Statement and related concepts - Analysis & Interpretation of financial statements - Financial Ratio Analysis.	
COST ACCOUNTING	9
Cost Accounting - Types of costing - traditional costing approach - activity based costing - full cost pricing - marginal cost pricing - going rate pricing - bid pricing - feasibility reports - technical, economic and financial feasibility.	
Total Periods	45

Text books:

1. McGuigan, Moyer and Harris, "Managerial Economics; Applications, Strategy and Tactics", Cengage Learning, 13th Edition,2013.
2. Prasanna Chandra. "Fundamentals of Financial Management", Tata McGraw Hill Publishing Ltd., 8th Edition,2011.

References:

1. Paresh Shah, "Basic Financial Accounting for Management", Oxford University Press, New Delhi,2007.
2. Sasmitha Mishra, "Engineering Economics and costing", PHI Learning, 2nd Edition,2010.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Explain the economic theories, cost concepts and major economic problems
CO2	Tell the concepts of Demand, Supply and its types.
CO3	Make use of the concept of theory of production
CO4	Determine the recent pricing methods in market and prepare internal rate of return, payback period, net present value for project selection
CO5	Interpret the accounting systems and analyze financial statements using ratio analysis.
CO6	Construct an analytical idea about financial feasibility.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	1	1	-	1	-	3	-	-	-	-	3	-	3	-	2	2
CO2	1	2	-	1	-	1	-	-	-	-	3	2	2	-	2	3
CO3	2	2	-	2	-	1	-	-	-	-	3	-	2	-	2	1
CO4	1	2	-	1	-	1	-	-	-	-	3	-	2	-	2	1
CO5	1	2	-	1	-	1	-	-	-	-	3	-	2	2	3	1
CO6	1	2	-	1	-	1	-	-	-	-	3	1	1	-	1	1

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

191BAE2	ENTREPRENEURSHIP			L-T-P	C
				3-0-0	3
Programme:	**B.E. / B.Tech**	**Sem:**	-	**Category:**	**OEC**
Prerequisites:	Nil				
Aim:	To develop and strengthen entrepreneurial quality and motivation in students and impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.				

ENTREPRENEURSHIP	9
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager.	
MOTIVATION	9
Attributes and Characteristics of a successful Entrepreneur, Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.-women Entrepreneurs.	
BUSINESS PLAN PREPARATION	9
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	
FINANCING AND ACCOUNTING	9
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	
SUPPORT TO ENTREPRENEURS	9
Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	
Total Periods	45

Text books:

1. Hisrich, "Entrepreneurship", Tata McGraw Hill, 9th Edition, New Delhi,2014
2. S. S. Khanka, "Entrepreneurial Development", S.Chand and Co. Ltd., New Delhi, (Revised Edition) 2013.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Extend the knowledge about the ideologies of entrepreneur.
CO2	Demonstrate a solid fundamental knowledge of entrepreneur and their successful characteristics within the broad field of entrepreneurism.
CO3	Assess and to prepare the feasible business plan and project reports for initiating businesses.
CO4	Identify the ways to get financing for starting up the business and taxation issues.
CO5	Discover the ways of sickness in business and its turnout initiatives by the Government policies.
CO6	Develop and strengthen entrepreneurial quality and motivation in students and impart basic entrepreneurial skills

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	PS O1	PS O2	PS O3	PS O4
CO1	2	-	-	-	-	3	-	-	3	-	3	3	1	-	-	2
CO2	2	-	-	-	-	3	-	-	2	-	2	2	1	-	2	2
CO3	2	3	3	3	-	1	-	-	1	-	1	-	1	-	3	2
CO4	-	-	-	-	-	1	-	1	2	-	1	1	1	-	-	2
CO5	-	-	-	-	-	1	-	-	1	-	2	-	1	-	-	2
CO6	1	-	-	-	-	1	-	-	3	1	2	1	1	-	2	2

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

191BAE3	ESSENTIALS OF MANAGEMENT			L-T-P	C
				3-0-0	3
Programme:	**B.E. / B.Tech**	**Sem:**	-	**Category:**	**OEC**
Prerequisites:	Nil				
Aim:	To study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.				

INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS	9
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company- public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.	
PLANNING	9
Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.	
ORGANISING	9
Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.	
DIRECTING	9
Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.	
CONTROLLING	9
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.	
Total Periods	45

Text books:

1. Harold Koontz, Heinz Weihrich and Mark V Cannice, "Management - A global & Entrepreneurial Perspective", Tata McGraw Hill, 12th Edition,2014.
2. James A.F. Stoner, R. Edward Freeman, Daniel R. Gilbert Jr., "Management", Prentice-Hall of India, 6th Edition,2012.

References:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert 'Management', Pearson Education, 6th Edition,2004.
2. Robert Kreitner, Mamata Mohapatra, "Management", Biztantra,2008.
3. Stephen A. Robbins, David A. Decenzo, Mary Coulter, "Fundamentals of Management", Pearson Education, 7th Edition,2011.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Demonstrate knowledge of managerial functions, types of organizations, managers, and managerial roles and skills
CO2	Discuss and apply the planning, organizing and control processes.
CO3	Analyze organizational structure, and organizational control and culture.
CO4	Adapt motivation and leadership qualities and effective communicate through both oral and written presentations.
CO5	Take part in research and analyze information by using both human and technological resources.
CO6	Organize the control management system and process.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	2	-	-	-	-	-	-	-	3	-	3	1	1	3	3	1
CO2	1	-	-	-	-	-	-	-	3	-	3	2	1	-	1	1
CO3	1	-	-	-	-	2	-	2	-	-	1	2	1	-	1	1
CO4	1	-	-	-	-	-	-	-	1	3	-	2	1	-	1	1
CO5	1	3	-	3	3	-	-	-	-	-	2	2	1	2	2	1
CO6	1	-	-	-	1	-	-	-	-	-	3	1	1	-	2	2

-

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

191BAE4	INTELLECTUAL PROPERTY RIGHTS			L-T-P	C
				3-0-0	3
Programme:	**B.E. / B.Tech**	**Sem:**	-	**Category:**	**OEC**
Prerequisites:	Nil				
Aim:	To provide an idea about IPR, registration and its enforcement				

INTRODUCTION	9
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.	
REGISTRATION OF IPRs	9
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.	
AGREEMENTS AND LEGISLATIONS	9
International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.	
DIGITAL PRODUCTS AND LAW	9
Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.	
ENFORCEMENT OF IPRs	9
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.	
Total Periods	45

Text books:

1. S.V. Satarkar, 'Intellectual Property Rights and Copy Rights', ESS Publications, New Delhi,2002.
2. Vinod V. Sople, 'Managing Intellectual Property', PHI Learning Pvt. Ltd, 4th Edition,2014.

References:

1. Deborah E. Bouchoux, 'Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets', Cengage Learning, Third Edition,2012.
2. Prabuddha Ganguli, 'Intellectual Property Rights: Unleashing the Knowledge Economy', McGraw Hill Education, 2011.
3. Derek Bosworth and Elizabeth Webster, 'The Management of Intellectual Property', Edward Elgar Publishing Ltd.,2013.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	List Intellectual property rights in professional society.
CO2	Model the process that shapes the registration of various categories of Intellectual Property Rights.
CO3	Relate familiarity with agreements, and legislations of act relating to IPR.
CO4	Identify digital products and respective legislations.
CO5	Utilize the ability of individuals to recognize and enforcing the legislations.

CO6	Infer an idea about IPR, registration and its enforcement.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	-	-	-	-	3	-	3	-	-	3	2	-	-	2	3
CO2	-	-	-	-	1	2	-	-	-	-	2		-	-	1	2
CO3	-	-	-	-	-	2	-	2	-	-	-	2	-	-	1	1
CO4	1	-	-	-	2	2	-	-	-	1	-	-	-	-	1	2
CO5	-	-	-	-	-	-	-	-	-	-	3	-	-	1	1	-
CO6	-	-	-	-	-	2	-	1	2	-	2	-	-	-	1	2

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

191BAE5	PROFESSIONAL ETHICS IN ENGINEERING			L-T-P	C
				3-0-0	3
Programme:	**B.E. / B.Tech**	**Sem:**	-	**Category:**	**OEC**
Prerequisites:	Nil				
Aim:	To enable the students to create an awareness on Engineering Ethics and Human Values				

HUMAN VALUES	9
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.	
ENGINEERING ETHICS	9
Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories	
ENGINEERING AS SOCIAL EXPERIMENTATION	9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.	
SAFETY, RESPONSIBILITIES AND RIGHTS	9
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) –Discrimination.	
GLOBAL ISSUES	9
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.	
Total Periods	45

Text books:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2012.
2. CharlesEHarrisJr,MichaelS.Pritchard,RayWJames,ElianEEnglehardt,MichaelJ Rabins, "Engineering Ethics – Concepts and Cases", 6th Edition, Wadsworth Publishing, 2019.

References:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico,2012.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education,2013.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press,2013.
4. DavidErman&MicheleShauf,"Computers,EthicsandSociety",OxfordUniversityPress, 2012.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Outline human values in professional society.

CO2	Identify the core values that shape the ethical behavior of an engineer.
CO3	Enhance familiarity with codes of conduct, and responsibilities of engineers in professional society to ensure balanced outlook
CO4	Identify ethical concerns and conflicts.
CO5	Extend the ability to recognize and resolve ethicaldilemmas.
CO6	Plan moral and social ethics and loyalty and to appreciate the rights of others.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	-	-	-	-	3	-	3	3	-	3	3	1	-	-	1
CO2	2	-	-	-	-	3	-	3	2	-	2	2	-	-	2	1
CO3	2	3	3	3	-	2	-	2	-	-	1	-	-	-	3	1
CO4	1	-	-	-	-	2	-	1	-	-	-	1	-	-	-	1
CO5	1	-	-	-	-	2	-	2	-	-	2	-	-	-	-	1
CO6	1	-	-	-	-	2	-	3	3	1	2	1	-	-	2	1

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

191BAE6	WOMEN STUDIES AND WOMEN EMPOWERMENT			L-T-P	C
				3-0-0	3
Programme:	**B.E. / B.Tech**	**Sem:**	-	**Category:**	**OEC**
Prerequisites:	Nil				
Aim:	To study the legal provisions for women and women's access to justice and familiarize the students with the notion of gender and its operation in society.				

WOMEN'S STUDIES: AN INTRODUCTION	9
Women's Studies -Definition, Scope and Controversies. Basic concepts of Women's Studies- Women's Studies perspectives- Gender: Perspectives-Gender sensitive approach- Gender and sex- Biological determinism- stereotyping- Socialization- Patriarchy- Devaluation- Marginalization- Silencing- Male Gaze- Power politics- Gynocriticism- Gender mainstreaming- Gender and work-Invisibility-Glass ceiling. Women's Studies in India.	
LEGISLATION AND GENDER JUSTICE	9
Women's rights as human rights, UN Conventions, Convention on the Elimination of all forms of Discrimination against Women (CEDAW), Millennium Development Goals (MDGs) - Women's Rights in the Indian Constitution, Fundamental Rights, Directive Principles- Protective legislation for women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act- Women's Rights to property,Uniform Civil Code, Property rights according to religions background Muslim, Christian.	
FEMINIST THEORIES	9
Early feminist thinkers- J.S Mill, Mary Wollstonecraft - Women's Movements before and during the world war.- Recent trends in feminist thinking- Masculinities, Eco-feminism, queer theory, transgender politics, Cyber feminism, Post-colonial - Different Schools of feminist through intheIndian context- National and regional feminist thoughts.	
GENDER AND MASS MEDIA	9
Definition of gender, difference between sex and gender- Feminist terminology, stereotyping, patriarchy, silencing, marginalization - Male Gaze, Feminist film criticism, thematic and semiotic analysis- Various forms of mass media. Print media, radio, visual, new media- internet, feminism and cyber space, texting, SMS and cell phone usage - Influence of media in society, patriarchy – inoperation, use of feminist methods for - critiquing media representation, practice sessions.	
WOMEN AND SOCIETY IN INDIA	9
Women's position from Vedic times to the present, women participation in India's independence movement - Social construction of gender and gender roles – Socialization - Women in family- Women in family- feminization of poverty, violence against women, empowerment measures - Women and environment- eco-feminist movements, women and globalization- women'slabour,discriminatory wages, changing working conditions and workplace related issues.	
Total Periods	45
Text books:	

1. Roberta Rosenberg, "Women's Studies: An Interdisciplinary Anthology", Peter Lang,2001.
2. Jean Fox O'Barr, "Feminism in Action: Building Institutions and Community through Women's Studies", University of North Carolina Press,1994.

References:

1. Jill Duerr Berrick, "Faces of Poverty: Portraits of Women and Children on Welfare", Oxford University Press,1997.

Course Outcomes:	
At end of this course, the students will be able to	
CO1	Explain the laws related to women's, rights protection.
CO2	Show stereotypical representation of women in the media and equip them to critique them.
CO3	Identify specific cultural contexts of women in India.
CO4	Infer the legal provisions for women and women's access to justice.
CO5	Identify the notion of gender and its operation in society.
CO6	Identifyworkplace related issues and discriminatory wages.

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	PS O1	PS O2	PS O3	PS O4
CO1	1	-	-	-	-	3	-	3	-	-	-	2	1	-	-	1
CO2	1	1	-	-	-	3	-	2	-	3	-	2	-	-	-	1
CO3	1	-	-	-	-	3	-	2	-	-	-	2	-	-	-	1
CO4	1	-	-	-	-	3	-	2	-	-	-	2	-	-	-	1
CO5	1	-	-	-	-	3	-	2	2	-	-	2	-	-	2	1
CO6	1	-	-	-	-	3	-	2	2	-	-	2	-	-	2	2

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

191MC01	DESIGN THINKING	L-T-P	C
		2-0-0	0
Programme:	**B.E. / B.Tech**	**Category:**	**MC**
Aim:	To impart knowledge on design thinking process for understanding complex designs and to provide design skills to analyze design thinking issues and apply the tools and techniques of design.		

OVERVIEW OF DESIGN THINKING PROCESS	6
Introduction to design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools. Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test and Iterate or Empathize, Analyze, Solve and Test.	
EMPATHIZE	6
Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, creation of user personas, customer journey mapping, How might we questions.	
SOLVE / IDEATE	6
Silent brainstorming, metaphors for ideation, CREATE and What-If tool for ideation, introduction to TRIZ, Inventive principles and their applications	
ANALYZE / DEFINE	6
Root cause analysis, conflict of interest, perspective analysis, big picture thinking through system operator, big picture thinking through function modeling.	
TEST (PROTOTYPING AND VALIDATION)	6
Prototyping, Assumptions during the design thinking process, Validation in the market, best practices of presentation.	
Total Periods	30

References:

1. Dr. Bala Ramadurai, "Karmic Design Thinking", First Edition TRIZ Innovation India, 2020.
2. Karl T. Ulrich, “Design Creation of Artifacts in Society”, Trustees of the University of Pennsylvania Publisher, USA, 2011
3. Alma R. Hoffmann, “Sketching as Design Thinking”, Taylor & Francis, UK, 2019
4. Michael Lewrick, Patrick Link and Larry Leifer, “The Design Thinking Playbook”, Wiley, USA, 2018.

Course Outcomes:

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

CO1.	Demonstrate knowledge of design thinking process
CO2.	Recall design thinking techniques to design relevant products/services
CO3.	Apply human cantered design (HCD) methodology for product or service design.
CO4.	Develop techniques for innovative products or services
CO5.	Analyse the causes for the problems in the design of products or services
CO6.	Organize the steps to gain practical knowledge of prototyping, testing and validation.

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	PS O1	PS O2	PS O3	PS O4
CO1	2	3	1	-	1	2	-	2	-	1	1	2	3	2	2	2
CO2	1	2	2	-	2	2	-	1	-	2	1	2	2	2	2	2
CO3	1	1	3	-	2	2	-	2	2	3	1	2	3	2	2	2
CO4	1	1	3	-	2	2	-	2	2	3	1	2	3	2	2	2
CO5	1	2	2	-	2	2	-	1	-	2	1	2	2	2	2	2
CO6	1	2	1	1	2	2	-	1	-	1	1	1	3	2	2	1

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

191MC02	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L-T-P	C
		2-0-0	0
Programme:	**B.E. / B.Tech**	**Category:**	**MC**
Aim:	To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.		

INTRODUCTION TO TRADITIONAL KNOWLEDGE	6
Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge	
PROTECTION OF TRADITIONAL KNOWLEDGE	6
The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	
LEGAL FRAME WORK AND TRADITIONAL KNOWLEDGE	6
The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.	
TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY	6
Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.	
TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS	6
Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.	
Total Periods	30

References:

1. Amit Jha, “Traditional Knowledge System in India”, 2009.
2. Basanta Kumar Mohanta, Vipin Kumar Singh, “Traditional Knowledge System and Technology in India”, Pratibha Prakashan 2012.
3. Amit Jha, “Traditional Knowledge System in India”, Atlantic publishers, 2002
4. Kapil Kapoor, Michel Danino, "Knowledge Traditions and Practices of India"

E-Resources:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

Course Outcomes:	
At end of this course, the students will be able to	
CO2.	Identify the concept of Traditional knowledge and its importance
CO3.	Explain the need and importance of protecting traditional knowledge.
CO4.	Illustrate the various enactments related to the protection of traditional knowledge.
CO5.	Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO6.	Identify the importance of conservation and sustainable development of environment

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	1	1	-	-	-	3	2	-	1	-	-	2	1	-	-	3
CO2	1	1	-	-	-	2	2	-	1	-	-	2	1	-	-	2
CO3	1	1	-	-	-	3	2	-	-	-	-	2	1	-	-	3
CO4	1	1	-	-	-	2	2	-	-	-	-	2	1	-	-	2
CO5	2	1	-	-	-	2	2	-	-	-	-	2	1	-	-	1
CO6	3	1	-	-	-	3	2	-	-	-	-	1	1	-	-	3

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

191MC03	INDIAN CONSTITUTION	L-T-P	C
		2-0-0	0

Programme:	B.E. / B.Tech	Category:	MC
Aim:	To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, election commission.		

INTRODUCTION TO INDIAN CONSTITUTION	6
Constitution - meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.	
UNION GOVERNMENT AND STATE GOVERNMENT	6
Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions **State Government and its Administration** Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions	
LOCAL ADMINISTRATION AND PACHAYAT RAJ	6
Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, **Panchayat raj:** Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.	
CONCEPT AND DEVELOPMENT OF HUMAN RIGHTS	6
Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act, 1993 - (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.	
ELECTION COMMISSION	6
Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women	
Total Periods	30

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust

3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4E, 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution
9. Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
10. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes:	
At end of this course, the students will be able to	
CO1.	Label the sources, features and principles of Indian Constitution.
CO2.	Outline about Union Government and its administration.
CO3.	Outline about State government and its administration.
CO4.	Compare Local administration and Panchayat Raj
CO5.	Identify the basic concepts and developments of Human Rights.
CO6.	Dissectthe roles and functioning of Election Commission.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	-	-	3	-	-	3	2	3	1	2	-	3	-	-	-	3
CO2	-	-	3	-	-	2	2	3	2	2	-	2	-	-	-	3
CO3	-	-	3	-	-	2	1	2	1	2	-	2	-	-	-	2
CO4	-	-	2	-	-	3	2	2	2	1	-	3	-	-	-	3
CO5	-	-	3	-	-	2	1	2	2	2	-	2	-	-	-	3
CO6	-	-	2	-	-	2	3	3	1	2	-	2	-	-	-	3

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

191MC04	UNIVERSAL HUMAN VALUES	L-T-P	C
		2-0-0	0
Programme:	**B.E. / B.Tech**	**Category:**	**MC**
Aim:	To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.		

INTRODUCTION	6
The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.	
UNDERSTANDING HUMAN BEING AND ITS EXPANSION	6
The domain of right understanding starts from understanding the human being (the knower, the experience and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).	
ACTIVITIES OF THE SELF	6
Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.	
UNDERSTANDING CO-EXISTENCE WITH OTHER ORDERS	6
The need and the process of inner evolution (through self-exploration, self-awareness and self-evaluation)-particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence	
EXPANSION OF HARMONY FROM SELF TO ENTIRE EXISTENCE	6
Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence.	
Total Periods	30
References:	

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Sangal, G. P. Bagaria (2010), Excel Books, New Delhi [ISBN 978-8- 174-46781-2]
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varanasi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA
5. Ishandi Nau Upnishad, Shankaracharya, Geeta press, Gorakhpur,
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India

Course Outcomes:	
At end of this course, the students will be able to	
CO1.	Tell human aspirations, goal, activities and purpose of life.
CO2.	Developthe understanding of human tradition and its various components.
CO3.	Compare the preconditioning and present beliefs.
CO4.	Interpret the inner and self- evolution.
CO5.	Examine the truth or reality in their own rights
CO6.	Organize do's and don'ts related to values.

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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO1	-	-	1	-	-	1	-	1	-	-	-	2	-	-	-	3
CO2	-	-	1	-	-	1	-	-	-	-	-	2	-	-	-	3
CO3	-	-	2	-	-	2	-	1	-	-	-	2	-	-	-	3
CO4	-	-	2	-	-	2	-	-	-	-	-	2	-	-	-	3
CO5	-	-	2	-	-	2	-	1	-	-	-	3	-	-	-	3
CO6	-	-	1	-	-	2	-	-	-	-	-	3	-	-	-	3

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

191MC05	YOGA	L-T-P	C
		2-0-0	0

Programme:	B.E. / B.Tech	Category:	MC
Aim:	To promote positive health, prevention of stress related health problems and rehabilitation through Yoga.		

FOUNDATIONS OF YOGA	5
Origin of Yoga, History and Development of Yoga; Etymology and Definitions, Misconceptions, Aim and Objectives of Yoga, True Nature and Principles of Yoga.	
YOUTH AND YOGA	5
Youth and yoga- yoga as a tool for healthy lifestyle, Yoga as a preventive, promotive and curative method. Pranayama and Different Yoga traditions and their impacts.	
ROLE OF YOGA IN PREVENTIVE HEALTH CARE	5
Role of Yoga in preventive health care – Yoga as a way of life, Heyam dukham anagatam; Potential causes of Ill-health: Tapatrayas and Kleshas, Physical and Physiological manifestation of Disease: Vyadhi, Alasya, Angamejayatva and Ssvasa-prashvasa.	
METHODS OF TEACHING YOGA	5
Teaching and Learning: Concepts and Relationship between the two; Principles of Teaching: Levels and Phases of Teaching, Quality of perfect Yoga Guru; Yogic levels of learning, Vidyarthi, Shishya, Mumukshu; Meaning and scope of Teaching methods, and factors influencing them; Sources of Teaching methods	
ASAN AND PRANAYAM	10

• Various yoga poses and their benefits for mind & body
• Regularization of breathing techniques and its effects
• Different Phases in Pranayama Practice:
  • Puraka (Inhalation), Kumbhaka (Retension) and Recaka (Exhalation)
  • Breathing Ratio in Pranayama Practice
  • Application of Bandhas in Pranayama	

Total Periods	30

References:

1. Yogic Asanas for Group Training-Part-I", Janardan Swami Yogabhyasi Mandal, Nagpur.
2. Swami Vivekananda, "Raja yoga or conquering the Internal Nature" Advaita Ashrama Publication, Kolkata.
3. Silva Mehta, Mira Mehta and Shyam Mehta, "Yoga: The Iyengar Way", Knopp publication, 1990.
4. Vishnu-Devananda, "The Complete Illustrated Book of Yoga", 1995.
5. Timothy McCall, "Yoga as Medicine: The Yogic Prescription for Health and Healing", Harmony, 2007.
6. Hathayoga Pradipika of Swatmarama - Kaivalyadhama, Lonavala
7. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras

Course Outcomes:	
At end of this course, the students will be able to	
CO1:	Tell the history and evolution of Yoga**.**
CO2:	Develop skills in Yoga for health.
CO3:	Experiment with habits to ensure mental and emotional balance.
CO4:	Demonstrate basic skills associated with yogaactivities including strength and flexibility, balanceand coordination.
CO5:	Demonstrate the ability to perform yogamovements in various combination and forms.
CO6:	Demonstrate the ability to create and present various yoga sequences.

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	PS O1	PS O2	PS O3	PS O4
CO1	-	-	3	-	-	3	-	-	3	-	-	3	-	-	-	3
CO2	-	-	3	-	-	2	-	-	3	-	-	3	-	-	-	3
CO3	-	-	2	-	-	2	-	-	3	-	-	3	-	-	-	3
CO4	-	-	2	-	-	1	-	-	2	-	-	3	-	-	-	3
CO5	-	-	2	-	-	1	-	-	2	-	-	3	-	-	-	3
CO6	-	-	3	-	-	3	-	-	2	-	-	3	-	-	-	3

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