# REGULATIONS, COURSE STRUCTURE AND SYLLABUS

**(Aligned with AICTE Model Curriculum 2018-2019)**

## SITE 2018(M) REGULATION

**For**

**B.Tech.**

# Civil Engineering

**With effective from the Academic Year**

# 2020-2021

sasi INSTITUTE OF TECHNOLOGY & ENGINEERING
autonomous
Values We Live...
Accredited by NAAC with "A" Grade
Recognised by UGC under section 2(f) &12(B)
Approved by AICTE - New Delhi
Permanently Affiliated to JNTUK, SBTET
Ranked as "A" Grade by Govt. of A.P.

# REGULATIONS, COURSE STRUCTURE

# AND

# SYLLABUS

(Aligned with AICTE Model Curriculum 2018-19)

# Chapter-I

# UG
# Regulations

## Chapter – I

## B.Tech. Regulations

### 1.1 Short title and Commencement

The regulations listed under this head are common for all degree level under graduate programs (B.Tech.) offered by the college with effect from the academic year 2020-21 and they are called as "SITE18M" regulations.

The regulations here under are subject to amendments as may be made by the Academic Council of the college from time to time, keeping the recommendations of the Board of Studies in view. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the program, as may be decided by the Academic Council.

### 1.2. Definitions

a. "Commission" means University Grants Commission (UGC)
b. "Council" means All India Council for Technical Education (AICTE)
c. "University" Means Jawaharlal Nehru Technological University Kakinada (JNTUK)
d. "College" means Sasi Institute of Technology & Engineering, Tadepalligudem.
e. "Program" Means any combination of courses and /or requirements leading to award of a degree
f. "Course" Means a subject either theory or practical identified by its course title and code number and which is normally studied in a semester.
g. For example, (Data Structures) is a course offered at third semester of B.Tech (CST) and its code is (18MCSCST3020)
h. "Degree" means an academic degree conferred by the university upon those who complete the undergraduate curriculum
i. "Regular Student" means student enrolled into the four year program in the first year
j. "Lateral entry Students" Means student enrolled into the four year program in the second year

### 1.3. Academic Programs

#### 1.3.1. Nomenclature of Programs

The nomenclature and its abbreviation given below shall continue to be used for the degree programs under the University, as required by the Council and Commission. The name of specialization shall be indicated in brackets after the abbreviation. For e.g. UG engineering degree

in Mechanical Engineering program is abbreviated as B.Tech. (ME). Bachelor of Technology (B.Tech.) degree program offered in:

1. Civil Engineering(CE)
2. Computer Science and Engineering(CSE)
3. Computer Science and Technology(CST)
4. Electronics and Communication Engineering(ECE)
5. Electronics and Communication Technology(ECT)
6. Electrical and Electronics Engineering(EEE)
7. Information Technology(IT)
8. Mechanical Engineering(ME)

- Curriculum framework is important in setting the right direction for a Degree program as it takes into account the type and quantum of knowledge necessary to be acquired by a student to qualify for a award in his/her chosen branch or specialization.
- Besides, this also helps in assigning the credits for each course, sequencing the courses semester-wise and finally arriving at the total number of courses to be studied and the total number of credits to be earned by a student to fulfill the requirements for conferment of degree.
- Each theory course shall consist of five units.

**1.3.2. Curriculum Structure**

The curriculum structure is designed in such a way that it facilitates the courses required to attain the expected knowledge, skills and attitude by the time of their graduation as per the needs of the stakeholders. The curriculum structure consists of various course categories (as described in 1.6.3 to 1.6.9) to cover the depth and breadth required for the program and for the attainment of program outcomes of the corresponding program. Each Program of study will be designed to have 40-45 theory courses and 16-18 laboratory courses. The distribution and types of courses offered from the above is indicated in the following table 3.

**1.3.3. Induction Program**

The Induction Program for two weeks is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students and building of character. Induction program covers:

- Physical activity
- Creative arts

- Universal human values
- Literary and Proficiency modules
- Lectures by Eminent peoples

**1.4.Admission Criteria**

The eligibility criteria for admission into UG engineering programs are as per the norms approved by government of Andhra Pradesh from time to time. The sanctioned seats in each program in the college are classified into CATEGORY-A and CATEGORY-B at first year level and Lateral Entry at second year level.

- **CATEGORY – A Seats:** These seats will be filled as per the norms approved by the Government of Andhra Pradesh.
- **CATEGORY – B Seats:** These seats will be filled by the College as per the norms approved by the Government of Andhra Pradesh.
- **CATEGORY – Lateral Entry Seats:** Lateral entry candidates shall be admitted into the Third semester directly as per the norms approved by government of Andhra Pradesh. The percentages of Category-A, Category-B and Lateral Entry Seats are decided time to time by the Government of Andhra Pradesh.

**2. Award of B. Tech. Degree**

a) A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:
   i. A student shall be declared eligible for the award of B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years. After eight academic years from the year of their admission, he/she shall forfeit their seat in B.Tech course and their admission stands cancelled.
   ii. The candidate shall register for 160 credits and secure all the 160 credits.

b) The medium of instruction for the entire under graduate program in Engineering &Technology will be in **English** only.

**3. Program Pattern:**

a) Total duration of the of B. Tech (Regular) Program is four academic years

b) Each Academic year of study is divided into Two Semesters.

c) Minimum number of instruction days in each semester is 90.

d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

e) The total credits for the Program is 160.

f) Three week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

g) Student is introduced to "Choice Based Credit System (CBCS)".

h) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)

i) A student has to register for all courses in a semester.

j) All the registered credits will be considered for the calculation of final CGPA.

k) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

l) A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and make engineering graduates to connect with the needs of the industry and society at large.

m) All the students shall be mandatorily registered for NCC, NSS activities and Community Service Project as per the Government and University norms.

n) Each college shall assign a faculty advisor/mentor after admission to each student or group of students from same department to provide guidance in courses registration/career growth/placements/ opportunities for higher studies/GATE/other competitive exams etc.

**4. Registration for Courses:**

a) In each semester a student shall mandatorily register courses which he/she wishes to pursue within a week from the starting of the class work with the advice of Head of the Department and mentor of the student of the concerned department of the college.

b) If any student wishes to withdraw the registration of the course, he/she shall submit a letter to the Principal of the college through the Head of the Department and mentor within fifteen days.

c) The concerned college shall thoroughly verify and upload the data/courses registered by each student in the university examination center within 20 days. The Principal of the concerned college shall ensure that there no wrong registration courses by the student. The university registration portal will be closed after 20 days.

5. **(a) Award of B. Tech. Degree:** A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:
   i. A student shall be declared eligible for award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years. After eight academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.
   ii. The student shall register for 160 credits and must secure all the 160 credits.
   iii. All students shall mandatorily register for the courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure at least 40% of the marks allotted in the internal evaluation for passing the course and shall maintain 75% of attendance in the subject.
   iv. All students shall mandatorily register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
   v. Credits are defined as per AICTE norms.

**(b) Award of B. Tech. (Honor)/B. Tech. (Minor):** B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. The regulations/guidelines are separately provided. Registering for an Honors/Minor is optional.

6. **Attendance Requirements**

   a) A student is eligible to write the University examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.
   b) Condonation of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) may be granted by the College Academic Committee. However, this Condonation concession is applicable only to any two semesters during the entire program.
   c) Shortage of Attendance below 65% in aggregate shall not be condoned.
   d) A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.

e) Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

f) A stipulated fee of Rs. 1000/- in the concerned semester shall be payable towards Condonation of shortage of attendance. Students availing Condonation on medical ground shall produce a medical certificate issued by the competitive authority.

g) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.

h) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

i) For induction program attendance shall be maintained as per AICTE norms.

j) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses

**7. Evaluation-Distribution and Weightage of marks**

i. Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the University Examination section from time to time.

ii. To maintain the quality, external examiners and question paper setters shall be selected from reputed institutes like IISc, IITs, IIITs, IISERs, NITs and Universities.

iii. For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

iv. A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

v. **Distribution and Weightage of marks:**

The assessment of the student's performance in each course will be as per the details given:

| S.No. | Components | Internal | External | Total |
|---|---|---|---|---|
| 1 | Theory | 30 | 70 | 100 |
| 2 | Engineering | 30 | 70 | 100 |
| 3 | Practical | 15 | 35 | 50 |
| 4 | Mini Project/Internship/Industrial Training/ Skill Development programs/Research Project | - | 50 | 50 |
| 5 | Project Work | 60 | 140 | 200 |

vi. **Continuous Internal Theory Evaluation:**

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (20 multiple choice questions) for 10 marks for duration of 20 minutes (ii) one descriptive examination (3 full questions for 5 marks each) for 15 marks for duration of 90 minutes and (iii) one assignment for marks. All the internal exams shall be conducted as per university norms from first 50% of the syllabi.

b) In the similar lines, the second online, descriptive examinations assignment shall be conducted on the rest of the 50% syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of online objective examination, descriptive examination and assignment shall be submitted to the University examination section within one week after completion of first mid examination.

d) The mid marks submitted to the University examination section shall be displayed in the concerned college notice boards for the benefit of the students.

e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of university examination section within one week from the submission.

f) Second mid marks (Mid-2) consisting of marks of online objective examination, descriptive examination and assignment shall also be submitted to University examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of university examination section within one week from the submission.

g) Internal marks can be calculated with 80% Weightage for better of the two mids and 20% Weightage for other mid exam.

   Example:

   **Mid-1 marks** = Marks secured in

   (Online examination-1 + descriptive examination-1 +one assignment-1)

   **Mid-2 marks** = Marks secured in

   (Online examination-2+descriptive examination-2+one assignment-2)

   **Final internal Marks** = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

h) With the above criteria, university examination section will send mid marks of all subjects in consolidated form to all the concerned colleges and same shall be displayed in the

concerned college notice boards. If any discrepancy found, it shall be brought to the notice of university examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

**vii. Semester End Theory Examinations Evaluation:**

a) The semester end examinations will be conducted university examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b) For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day to day work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed.

c) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% Weightage for better of the two tests and 20% Weightage for other test and these are to be added to the marks obtained in day to day work.

d) Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG program. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the University. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the

departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% Weightage respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

e) The job oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the job oriented skill courses.

f) Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

g) **Procedure for Conduct and Evaluation of MOOC:** There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM /NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam.

The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be pass.

**h) Major Project *(*Project - Project work, seminar and internship in industry):**

In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

**Evaluation**: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

**8 Results Declaration:**

i. Before results declaration, an academic council meeting shall be conducted and results shall be placed before the academic council for approval.

ii. With the approval of academic council, the results shall be submitted to the University to get the Approval from Honorable Vice-Chancellor.

iii. The University may normalize the result, if required, before declaration of the result (Guidelines for normalization will be provided separately)

iv. A copy of approved results in a CD shall be submitted to the University Examination Center.

**9. Academic Audit:** Academic audit in each semester will be conducted as per norms.

**10. Recounting or Re-evaluation of Marks in the End Semester Examination:** A student can request for recounting of revaluation of his/her answer book on payment of a prescribed fee as per norms.

**11. Supplementary Examinations:** A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the University.

12. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the University.
13. **Promotion Rules:** The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5 for promotion to higher classes
    a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per University norm.
    b) A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
    c) A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.
14. **Course Pattern**
    a) The entire course of study is for four academic years; all years are on semester pattern.
    b) A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.
    c) When a student is detained for lack of credits / shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.
15. **Earning of Credit**:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below. Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned. For project same % percentages will be followed for grading.

| Marks Range Max:100 | Marks range Max:50 | Level | Letter Grade | Grade point |
|---|---|---|---|---|
| ≥ 90 | ≥ 45 | Outstanding | A+ | 10 |
| ≥80 to <89 | ≥40 to <44 | Excellent | A | 9 |
| ≥70 to <79 | ≥35 to <39 | Very Good | B | 8 |
| ≥60 to <69 | ≥30 to <34 | Good | C | 7 |
| ≥50 to <59 | ≥25 to <29 | Fair | D | 6 |
| ≥40 to <49 | ≥20 to <24 | Satisfactory | E | 5 |
| <40 | <20 | Fail | F | 0 |
| - | | Absent | AB | 0 |

**16. Award of Class:**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

| Class Awarded | CGPA to be secured | Remarks |
|---|---|---|
| First Class with Distinction | ≥7.75 (Without any supplementary appearance) | From the CGPA secured from 160 Credits |
| First Class | ≥ 6.75 | |
| Second Class | ≥ 5.75 to < 6.75 | |
| Pass Class | ≥ 5.00 to < 5.75 | |

**17. Minimum Instruction Days:**

The minimum instruction days for each semester shall be 90 working days. There shall be no branch transfers after the completion of the admission process. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

**18. Withholding of Results:**

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

**19. Transitory Regulations**

a) Discontinued or detained candidates are eligible for re-admission as and when next offered.

b) The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted.

c) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.

d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. In addition, the transferred candidates have to pass the failed subjects at the earlier Institute with already obtained internal/sessional marks to be conducted by JNTUK.

**20. Gap – Year:**

Gap Year concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I/II/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at university level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

**21. General:**

a) Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

b) The academic regulation should be read as a whole for the purpose of any interpretation.

c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

d) The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

## ACADEMIC REGULATIONS (SITE18M) FOR B. Tech

## (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2021-22 onwards

**1. Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

a) A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years. After six academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

b) The candidate shall register for 122 credits and secure all the 122 credits.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B. Tech (lateral entry)

3. **Promotion Rules:** A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4. **Award of Class**

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

| Class Awarded | CGPA to be secured | Remarks |
|---|---|---|
| First Class with Distinction | $\geq 7.75$ (Without any supplementary appearance) | From the CGPA secured from 121 Credits from II Year to IV Year |
| First Class | $\geq 6.75$ | |
| Second Class | $\geq 5.75$ to $< 6.75$ | |
| Pass Class | $\geq 5.00$ to $< 5.75$ | |

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

5. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**

## COMMUNITY SERVICE PROJECT

### *Introduction*

1. Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
2. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
3. Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

### *Objective*

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

1. To sensitize the students to the living conditions of the people who are around them,
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.
7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

### *Implementation of Community Service Project*

1. Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation
2. Each class/section should be assigned with a mentor.

3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
4. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded. The log book has to be countersigned by the concerned mentor/faculty in charge.
5. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
6. The final evaluation to be reflected in the grade memo of the student.
7. The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
8. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
9. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

***Procedure***

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
2. The Community Service Project is a twofold one –
   a) First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
   b) Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
      - Agriculture
      - Health
      - Marketing and Cooperation
      - Animal Husbandry
      - Horticulture
      - Fisheries
      - Sericulture

- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

***EXPECTED OUTCOMES*** **BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS**

***Learning Outcomes***

1. Positive impact on students' academic learning.
2. Improves students' ability to apply what they have learned in "the real world".
3. Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
4. Improved ability to understand complexity and ambiguity.

***Personal Outcomes***

1. Greater sense of personal efficacy, personal identity, spiritual growth, and moral development.
2. Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

***Social Outcomes***

1. Reduced stereotypes and greater inter-cultural understanding
2. Improved social responsibility and citizenship skills
3. Greater involvement in community service after graduation

***Career Development***

1. Connections with professionals and community members for learning and career opportunities
2. Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

***Relationship with the Institution***

1. Stronger relationships with faculty
2. Greater satisfaction with college
3. Improved graduation rates

**BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS**

1. Satisfaction with the quality of student learning
2. New avenues for research and publication via new relationships between faculty and community
3. Providing networking opportunities with engaged faculty in other disciplines or institutions
4. A stronger commitment to one's research

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES**

1. Improved institutional commitment
2. Improved student retention
3. Enhanced community relations

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY**

1. Satisfaction with student participation
2. Valuable human resources needed to achieve community goals
3. New energy, enthusiasm and perspectives applied to community work
4. Enhanced community-university relations.

**SUGGESTIVE LIST OF PROGRAMS UNDER COMMUNITY SERVICE PROJECT**

The following the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

***For Engineering Students***

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programs

5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programs and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people

39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

***Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested lists of programs are;***

**Programs for School Children:**

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

***Programs for Women Empowerment***

1. Government Guidelines and Policy Guidelines
2. Women's' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

***General Camps***

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharat
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programs
12. Commemoration and Celebration of important days

***Programs for Youth Empowerment***

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

***Common Programs***

1. Awareness on RTI
2. Health intervention programs
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

***Role of Students:***

1. Students may not have the expertise to conduct all the programs on their own. The students then can play a facilitator role.
2. For conducting special camps like Health related, they will be coordinating with the Government agencies.
3. As and when required the College faculty themselves act as Resource Persons.
4. Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.

5. And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
6. An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

***Timeline for the Community Service Project Activity***

**Duration: 8 weeks**

***1. Preliminary Survey (One Week)***

a) A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
b) A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
c) The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

***2. Community Awareness Campaigns (Two Weeks)***

Based on the survey and the specific requirements of the habitation, different awareness campaigns and programs to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

***3. Community Immersion Program (Four Weeks)***

Along with the Community Awareness Programs, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement program will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

***4. Community Exit Report (One Week)***

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

**Course Numbering Scheme**

The Course number code consists of 11 alphabets. A typical course number code is illustrated in the following Figure-1.

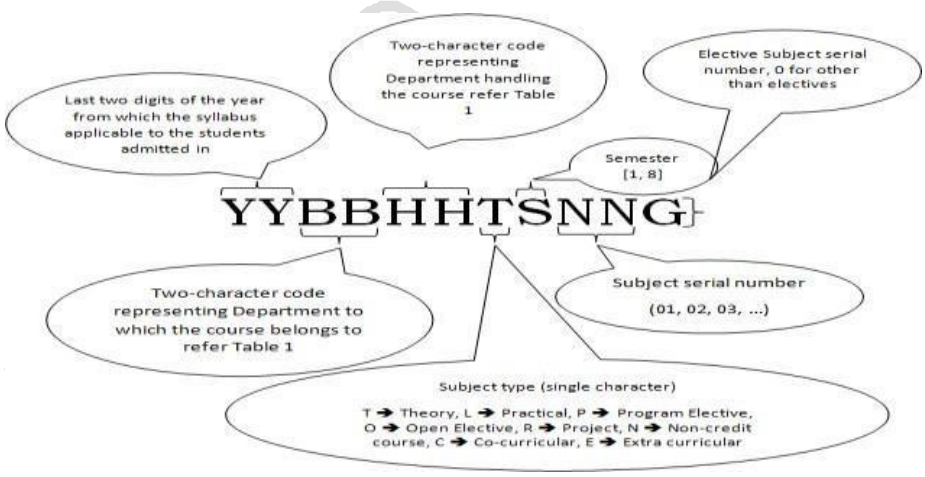



**Figure 1:** Course Numbering Scheme

The department codes are in given in following table 1.

**Table 1: Department Codes**

| Department | Two-character code |
|---|---|
| Civil Engineering | CE |
| Electrical & Electronics Engineering | EE |
| Mechanical Engineering | ME |
| Electronics & Communication Engineering | EC |
| Electronics & Communication Technology | ET |
| Computer Science and Engineering | CS |
| Computer Science and Technology | CT |
| Information Technology | IT |
| Management Science | MS |
| Mathematics | MA |
| Physics | PH |
| Chemistry | CH |
| English | EG |
| Biology | BI |
| Common to All Branches | CM |

**Example:** STLD in 3rd semester for ECE with S. No 2

**Course Code:** 18ECECT3020

**Table 2: Comparison of Number of credits given by AICTE and Approved credits**

| S. No. | Category | No. of Credits | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ECE/ ECT | | EEE | | CSE/IT/CST | | ME | | CE | |
| | | AICTE | Approved | AICTE | Approved | AICTE | Approved | AICTE | Approved | AICTE | Approved |
| 1 | Humanities and Social Sciences | 12 | 11 | 12 | 11 | 12 | 11 | 12 | 11 | 12 | 08 |
| 2 | Basic Science courses | 25 | 23 | 26 | 25 | 24 | 26 | 25 | 26 | 26 | 26 |
| 3 | Engineering Science courses | 24 | 23 | 20 | 20 | 29 | 29.5 | 24 | 23 | 29 | 24.5 |
| 4 | Professional Core courses | 48 | 56 | 53 | 62 | 49 | 48.5 | 48 | 55 | 47 | 56.5 |
| 5 | Professional Elective Courses | 18 | 20 | 18 | 15 | 18 | 18 | 18 | 18 | 23 | 21 |
| 6 | Open elective courses | 18 | 12 | 18 | 12 | 12 | 12 | 18 | 12 | 11 | 9 |
| 7 | Project work , Seminar and Internship | 15 | 15 | 11 | 15 | 15 | 15 | 15 | 15 | 12 | 15 |
| 8 | Mandatory Courses | - | - | - | - | - | - | - | - | - | - |
| Total Credits | | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |

**DISCIPLINARY ACTION FOR MALPRACTICES /IMPROPER CONDUCT IN EXAMS**

| S. No. | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| | If the candidate: | |
| 1. (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which | Expulsion from the examination hall and cancellation of the performance in that subject only. |

| | | |
|---|---|---|
| | can be used as an aid in the subject of the examination) | |
| 1. (b) | Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University. |
| 3. | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against |

| | | |
|---|---|---|
| | | him. |
| 4. | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |

| | | |
|---|---|---|
| | to disrupt the orderly conduct of the examination. | |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 8. | Possess any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. |
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.<br>Person(s) who do not belong to the College will be handed over to police and, a police case will be |

| | | |
|---|---|---|
| | | registered against them. |
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations. |
| 12. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment. | |

**MALPRACTICES**

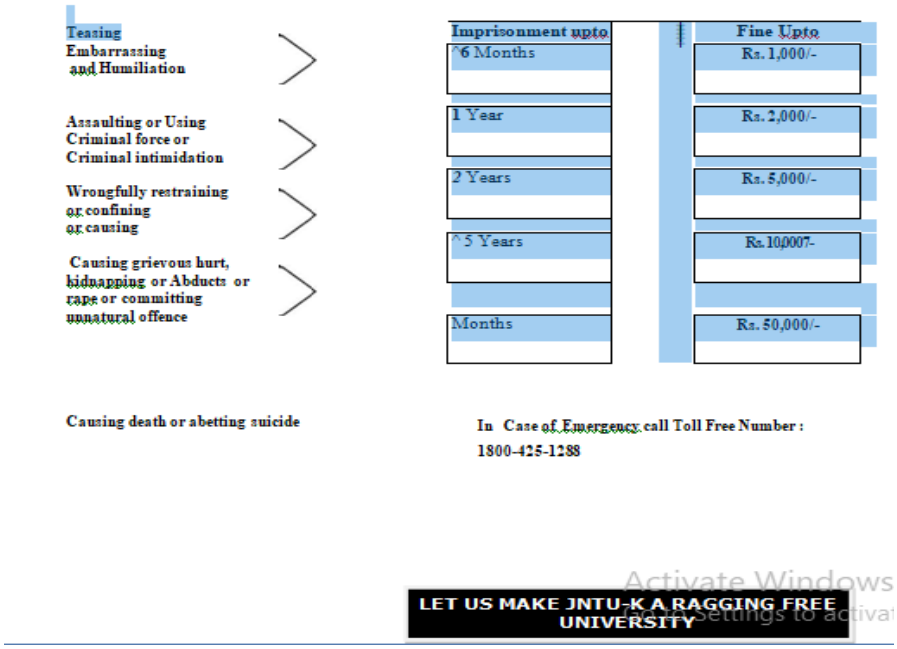
- The Principal shall refer the cases of malpractices in Continuous Evaluation and Semester-End Examinations, to Malpractice Enquiry Committee, constituted by him/her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students based on the recommendations of the committee.
- Any action on the part of student at an examination trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing/keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

**Ragging**

**Prohibition of ragging in educational institutions Act 26 of 1997 Salient Features**

- Ragging within or outside any educational institution is prohibited.

- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.



# COURSE STRUCTURE AND DETAILED SYLLABUS

## For Civil Engineering

## B.Tech.-SITE18M Regulations

## With Effective from the Academic Year

## 2020-2021

**Program Outcomes for an Engineering Graduates:**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**B. Tech. (Civil Engineering)**
**Semester I (First Year)**

| S. No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| **1** | **HSMC** | 18CMEGT1010 | Technical English | 3 | 0 | 0 | 3 |
| **2** | **BSC** | 18CMMAT1020 | Engineering Mathematics-I | 3 | 1 | 0 | 4 |
| **3** | **BSC** | 18CMCHT1030 | Engineering Chemistry | 3 | 1 | 0 | 4 |
| **4** | **ESC** | 18CMEET1040 | Basic Electrical Engineering | 3 | 1 | 0 | 4 |
| **5** | **HSMC** | 18CMEGL1050 | English Communication skills lab | 0 | 0 | 2 | 1 |
| **6** | **BSC** | 18CMCHL1060 | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 |
| **7** | **ESC** | 18CMEEL1070 | Basic Electrical Engineering Lab | 0 | 0 | 3 | 1.5 |
| **8** | **MC** | 18CMMSN1080 | Constitution of India, Professional Ethics & Human Rights | 3 | 0 | 0 | 0 |
| | | | | | | **Total Credits** | **19** |

**B.Tech. (Civil Engineering)**
**Semester II (First Year)**

| Sl. No. | Course Category | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|---|
| 1. | **BSC** | 18CMMAT2010 | Engineering Mathematics-II | 3 | 1 | 0 | 4 |
| 2. | **BSC** | 18MEPHT2020 | Engineering Physics | 3 | 1 | 0 | 4 |
| 3. | **ESC** | 18CMCST2030 | Programming for Problem Solving | 3 | 0 | 0 | 3 |
| 4. | **ESC** | 18CMMEL2040 | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5. | **BSC** | 18MEPHL2050 | Engineering Physics Lab | 0 | 0 | 3 | 1.5 |
| 6. | **ESC** | 18CMCSL2060 | Programming for Problem Solving lab | 0 | 0 | 4 | 2 |
| 7. | **ESC** | 18CMMEL2070 | Work Shop/Manufacturing Practice | 0 | 0 | 3 | 1.5 |
| 8. | **MC** | 18CMCHN2080 | Environmental Science | 3 | 0 | 0 | 0 |
| | | | | | | **Total Credits** | **19** |

**B.Tech. (Civil Engineering)**
**Semester III (Second Year)**

| Sl. No. | Course Category | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|---|
| 1. | **BSC** | 18CEMAT3010 | Engineering Mathematics - III | 3 | 1 | 0 | 4 |
| 2. | **ESC** | 18CMCET3020 | Engineering Mechanics | 3 | 1 | 0 | 4 |
| 3. | **PCC** | 18CECET3030 | Engineering Geology | 2 | 0 | 0 | 2 |
| 4. | **PCC** | 18CECET3040 | Surveying & Geomatics | 3 | 0 | 0 | 3 |
| 5. | **PCC** | 18CECET3050 | Building materials & Concrete Technology | 3 | 0 | 0 | 3 |
| 6. | **PCC** | 18CECEL3060 | Engineering Geology Lab | 0 | 0 | 3 | 1.5 |
| 7. | **PCC** | 18CECEL3070 | Surveying field work Lab | 0 | 0 | 3 | 1.5 |
| 8. | **PCC** | 18CECEL3080 | Computer- aided civil Engineering Drawing Lab | 0 | 0 | 3 | 1.5 |
| 9. | **MC** | 18CEECN3090 | Basic Electronics | 3 | - | - | - |
| | | | | | | **Total Credits** | **20.5** |

**B.Tech. (Civil Engineering)**
**Semester IV (Second Year)**

| Sl. No. | Course Category | Course Category | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|---|
| 1. | **PCC** | 18CECET4010 | Fluid Mechanics | 3 | 0 | 0 | 3 |
| 2. | **PCC** | 18CECET4020 | Strength of Materials | 3 | 0 | 0 | 3 |
| 3. | **PCC** | 18CECET4030 | Environmental Engineering | 3 | 0 | 0 | 3 |
| 4. | **PCC** | 18CECET4040 | Transportation Engineering | 3 | 0 | 0 | 3 |
| 5. | **HSMC** | 18CMMST4050 | Engineering Economics and Financial Management | 3 | 0 | 0 | 3 |
| 6. | **PCC** | 18CECEL4060 | Strength of Materials Lab | 0 | 0 | 3 | 1.5 |
| 7. | **PCC** | 18CECEL4070 | Environmental Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8. | **PCC** | 18CECEL4080 | Material Testing Lab | 0 | 0 | 3 | 1.5 |
| | | | | | | **Total Credits** | **19.5** |

**B.Tech. (Civil Engineering)**
**Semester V (Third Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | PCC | 18CECET5010 | Geo Technical Engineering | 3 | 0 | 0 | 3 |
| 2. | PCC | 18CECET5020 | Theory of Structures -I | 3 | 0 | 0 | 3 |
| 3. | PCC | 18CECET5030 | Hydraulic & Hydraulics Machinery | 3 | 0 | 0 | 3 |
| 4. | PCC | 18CECET5040 | Reinforced Concrete Structures | 3 | 0 | 0 | 3 |
| 5. | OE | 18CExxO505x | Open Elective- I | 3 | 0 | 0 | 3 |
| 6. | PE | 18CECEP506x | Professional Elective -I | 3 | 0 | 0 | 3 |
| 7. | PCC | 18CECEL5070 | Geo Technical Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8. | PCC | 18CECEL5080 | Fluid mechanics & Hydraulics Machinery Lab | | | | 1.5 |
| 9. | SOC | 18CEAHS5090 | Soft Skills & Aptitude Builder - 1 | 2 | 0 | 0 | 2 |
| 10 | MC | 18CMBIT4100 | Biology for Engineers | 2 | 0 | 0 | 0 |
| | | | | | | Total Credits | 23 |

**B.Tech. (Civil Engineering)**
**Semester VI (Third Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | PCC | 18CECET6010 | Theory of Structures -II | 3 | 0 | 0 | 3 |
| 2 | PCC | 18CECET6020 | Design of Steel Structures | 3 | 0 | 0 | 3 |
| 3 | OE | 18CExxO603x | Open Elective- II | 3 | 0 | 0 | 3 |
| 4 | PE | 18CECEP604x | Professional Elective -II | 3 | 0 | 0 | 3 |
| 5 | PE | 18CECEP605x | Professional Elective- III | 3 | 0 | 0 | 3 |
| 6 | PCC | 18CECEL6060 | Structural Design and Drawing Lab | 0 | 0 | 3 | 1.5 |
| 7 | PCC | 18CECEL6070 | Software Applications in civil Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8 | PCC | 18CECEL6080 | Surveying Field Camp | 1 | 0 | 2 | 2 |
| 9 | SOC | 18CEAHS6090 | Soft Skills & Aptitude Builder - 2 | 2 | 0 | 0 | 2 |
| | | | | | | Total Credits | 22 |

**B.Tech. (Civil Engineering)**
**Semester VII (Fourth Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | PCC | 18CECET7010 | Contracts, Specifications & Project Management | 3 | 0 | 0 | 3 |
| 2 | PCC | 18CECET7020 | Hydrology and Water Resource Engineering | 3 | 0 | 0 | 3 |
| 3 | OE | 18CExxO703x | Open Elective III | 3 | 0 | 0 | 3 |
| 4 | OE | 18CExxO704x | Open Elective IV | 3 | 0 | 0 | 3 |
| 5 | PE | 18CECEP705x | Professional Elective IV | 3 | 0 | 0 | 3 |
| 6 | PE | 18CECEP706x | Professional Elective V | 3 | 0 | 0 | 3 |
| 7 | PCC | 18CECEL7070 | Irrigation Engineering & Drawing Lab | 0 | 0 | 4 | 2 |
| 8 | | 18CECEL7080 | Internship with Seminar | 0 | 0 | 3 | 3 |
| 9 | SOC | 18CECES7090 | STAAD.Pro | 1 | 0 | 2 | 2 |
| | | | | | | **Total Credits** | 25 |

**Semester VIII (Fourth Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | | | Project | 0 | 0 | 0 | 12 |

**Professional Elective Courses:**

| | | |
|---|---|---|
| Elective -I | 18CECEP506a | Solid and Hazardous Waste management |
| | 18CECEP506b | Architecture & Town Planning |
| | 18CECEP506c | Advanced Transportation Engineering |
| | 18CECEP506d | Sustainable construction methods for buildings |
| Elective -II | 18CECEP605a | Transportation Economics |
| | 18CECEP605b | Advanced Concrete Technology |
| | 18CECEP605c | Remote Sensing & GIS Applications |
| | 18CECEP605d | Foundation Engineering |
| Elective -III | 18CECEP606a | Ground Improvement Techniques |
| | 18CECEP606b | Surface water Hydrology |
| | 18CECEP606c | Offshore Engineering |
| | 18CECEP606d | Rural Water Supply and Onsite Sanitation Systems |
| Elective -IV | 18CECEP705a | Advanced Structural Analysis |
| | 18CECEP705b | Environmental Impact Assessment and Environment Management Planning |
| | 18CECEP705c | Engineering with Geo-synthetics |
| | 18CECEP705d | Urban Hydrology |
| Elective -V | 18CECEP706a | Pre-Stressed Concrete |
| | 18CECEP706b | Repairs and Rehabilitation of Structures |
| | 18CECEP706c | Ground Water development & Management |
| | 18CECEP706d | Air and Noise Pollution and Control |

**Open Elective Courses offered by Dept. of CE to Other Depts.**

| | | |
|---|---|---|
| 1 | 18xxCEOxxxx | Civil Engineering Societal & Global Impact |
| 2 | 18xxCEOxxxx | Introduction to Civil Engineering |
| 3 | 18xxCEOxxxx | Disaster Management |
| 4 | 18xxCEOxxxx | Environmental Pollution and control |
| 5 | 18xxCEOxxxx | Building Materials |
| 6 | 18xxCEOxxxx | Green Buildings and sustainability |

**I B. Tech I Semester Course structure for the Academic Year 2020-2021**
**Common for ME/CE/EEE/ECT/CST**

| S.N | Subject Code | Subject title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | **18CMEGT1010** | Technical English | 3 | 0 | 0 | 3 |
| 2 | **18CMMAT1020** | Engineering Mathematics-I | 3 | 1 | 0 | 4 |
| 3 | **18CMCHT1030** | Engineering Chemistry | 3 | 1 | 0 | 4 |
| 4 | **18CMEET1040** | Basic Electrical Engineering | 3 | 1 | 0 | 4 |
| 5 | **18CMEGL1050** | English Communication skills lab | 0 | 0 | 2 | 1 |
| 6 | **18CMCHL1060** | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 |
| 7 | **18CMEEL1070** | Basic Electrical Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8 | **18CMMSM1080** | Constitution of India, professional ethics & human rights. | 3 | 0 | 0 | 0 |
| | | | | | **Total Credits** | **19** |

**I B. Tech II Semester Course structure for the Academic Year 2020-2021**
**Common for /CE/CST/EEE/ECT/ME**

| S.N | Subject Code | Subject title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | **18CMMAT2010** | Engineering Mathematics II | 3 | 1 | 0 | 4 |
| 2 | **18CEPHT2020** | Engineering Physics | 3 | 1 | 0 | 4 |
| 3 | **18CMCST2030** | Programming for problem solving | 3 | 0 | 0 | 3 |
| 4 | **18CMMEL2040** | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5 | **18CEPHL2050** | Engineering Physics Lab | 0 | 0 | 3 | 1.5 |
| 6 | **18CMCSL2060** | Programming for problem solving lab | 0 | 0 | 4 | 2 |
| 7 | **18CMMEL2070** | Work Shop/ Manufacturing practice | 0 | 0 | 3 | 1.5 |
| 8 | **18CMESN2080** | Environmental Science | 3 | 9 | 0 | 0 |
| | | | | | **Total Credits** | **19** |

| TECHNICAL ENGLISH | | | |
|---|---|---|---|
| Subject Code | 18CMEGT1010/18CMEGT2010 | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exams Hours | 03 |

**Credits -02**

**Course Objectives:**

To enable the students to learn and apply fundamental principles in Technical English & Communication by focusing on:

- Technical English Vocabulary
- Writing Skills
- Common Errors in Writing
- Nature and Style of Sensible Technical Writing
- Writing Technical Reports and Letters
- Providing an inspiring reading experience from the biography of a renowned technocrat.

| **Unit -1** | |
|---|---|
| **Principles of Scientific Vocabulary**<br>• **Principles of Scientific vocabulary**: short and simple words-compact substitutes for wordy phrases- redundant words and expressions-Avoid hackneyed and stilted phrases, verbosity and incorrect use of words<br>• The role of roots in word building prefixes and suffixes, confusing words and expressions.<br>• Non-detailed text-Karma yogi: 1-4 chapters, Page No 1-53 | 10 hours |
| **Unit -2** | |
| **Writing Skills**<br>• Distinguishing between academic and personal styles of writing<br>• Use of clauses in technical phrases and sentences<br>• Techniques of Sentence and paragraph writing<br>• Measuring the clarity of a text through Fog Index or Clarity Index<br>Non-detailed text- Karma yogi: 5-8 chapters, Page No 54-100 | 10 hours |
| **Unit -3** | |
| **Common Errors in Writing**<br>• Subject-verb agreement and concord of nouns, pronouns and possessive adjectives<br>• Common errors in the use of articles, prepositions, adjectives and adverbs<br>• Punctuation<br>• Technical Guidelines for Communication<br>• Avoiding the pitfalls<br>Non-detailed text-Karma yogi: 9-12 chapters, Page No101- 151 | 10 hours |
| **Unit -4** | |
| **Nature and Style of Sensible Technical Writing**<br>• Academic Writing Process<br>• Describing, processes and products<br>• Defining, Classifying<br>• Effective use of charts, graphs, and tables<br>Non-detailed text- Karma yogi: 13-16 chapters, Page No 152-203 | 10 hours |

| **Unit -5** | |
|---|---|
| **Report writing and Letter writing**<br>• Writing Technical Reports<br>• Précis writing<br>• Letter Writing<br>• Essay writing<br>• Non-detailed text- Karma yogi: 13-16 chapters, Page No 204-250 | 10 hours |

**COURSE OUTCOMES**

On Completion of the course student will acquire

1. Ability to understand Scientific vocabulary and use them confidently
2. Familiarity with the basic principles of writing clear sentences and paragraphs
3. Ability to write error free simple technical passages
4. Knowledge of writing different writing styles
5. Confidence to write letters and technical reports clearly and coherently

Get inspired by achievements and values upheld by a renowned technocrat

**Text Books**

1. Effective Technical Communication by Barun K Mitra, Oxford University Publication

**Non-detailed Text**

1. Karma yogi: A Biography of E Sreedharan by M SAshokan

**Reference Books**

1. Communication Skills by Sanjay Kumar &PushpaLatha, OUP
2. Study Writing by LizHamp-Lyonsand Ben Heasly, Cambridge University Press.
3. Remedial English Grammar by F T Wood, Macmillian2007
4. Practical English Usage by Michael Swan Oxford University Press
5. English Collocations in Use by Michael McCarthy &Felicity O'Dell
6. Effective Technical Communication by Arsah f Rizvi,
7. Essential English Grammar by Raymond Murphy, CUP, 2017

**ENGINEERING MATHEMATICS-I**

Common to all the branches

SEMESTER - I

| | | | |
|---|---|---|---|
| Subject Code | 18CMMAT1010/18CMMAT1020 | IA Marks | 30 |
| Number of Lecture Hours/Week | 3+ 1(T) | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 04**

**Course Objectives:**

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

- To solve first order differential equations.
- To solve linear differential equations with constant coefficients.
- To find the extreme of a function.
- To solve partial differential equations
- To evaluate multiple integrals
- To verify vector integral theorems

| | |
|---|---|
| **Unit -1** | |
| **First order and first degree Ordinary Differential Equations**<br>Exact, reducible to exact, linear and Bernoulli's differential equations. Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling. Law of natural growth and decay. | **Hours – 10** |
| **Unit -2** | |
| **Linear differential equations with constant coefficients:** Solutions of second and higher order differential equations - inverse differential operator methods, Method of variation of parameters. Application: LCR Circuits | **Hours – 8** |
| **Unit – 3** | |
| **Partial derivatives –**Definition and Euler's theorem (without proof), total derivatives, partial differentiation of composite functions. Jacobian - Functional dependence. | **Hours – 10** |
| Taylor's and Maclaurin's theorems for function of two variables (statement only). Maxima and minima- Lag ranges method of undetermined multipliers | |
| **Unit – 4** | |
| **First order Partial differential equations:**<br>Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear ( Lagrange) equation and non linear (standard type) equations<br>**Higher order Partial differential equations:**<br>Solutions of Homogeneous and Non Homogeneous partial differential equations with constant coefficients – Classification of partial differential equations. | **Hours – 10** |
| **Unit – 5** | |
| **Double and triple integrals:** Evaluation of double and triple integrals. Evaluation of double integrals by changing the order of integration and by changing into polar co-ordinates. Beta and gamma functions and their properties<br>**Vector Calculus** – Gradient – Divergence - Curl - Line integrals-definition and | **Hours – 12** |

| | |
|---|---|
| problems, surface and volume integrals definition, Green's theorem in a plane, Stokes and Gauss-divergence theorems (without proof) and problems. | |

**Course outcomes:**

On completion of this course, students are able to

1. Solve first order differential equations.
2. Solve linear differential equations with constant coefficients.
3. Find the extreme of a function.
4. Solve partial differential equations
5. Evaluate multiple integrals
6. Verify vector integral theorems

**Text Books:**

1. B.S. Grewal, **"Higher Engineering Mathematics"**, Khanna publishers, 44$^{th}$edition, 2016.
2. Erwin Kreyszig, **"Advanced Engineering Mathematics**, Wiley, 9$^{th}$edition, 2013.

**Reference Books**:

1. B.V. Ramana, **"Higher Engineering Mathematics"**, TataMc Graw-Hill,2006
2. N.P. Baliand Manish Goyal, **"A textbook of Engineering mathematics"**, Laxmi publications, latest edition.
3. H.K. Dass and Er. RajnishVerma, **"Higher Engineering Mathematics"**, S. Chand publishing, 1$^{st}$edition, 2011.

| ENGINEERING CHEMISTRY | | | |
|---|---|---|---|
| Subject Code | 18CMCHT1030/18CMCHT2030 | IA Marks | 30 |
| Number of Lecture Hours/Week | 3(L) + 1(T) | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 04** | | | |

**COURSE OBJECTIVES:**

The objectives of this course, help the students to

- Rationalize periodic properties like ionization potential, electro negativity and oxidation states.
- Apply the concepts of electro chemistry.
- Analyze bulk properties and processes using thermodynamic considerations.
- List major chemical reactions that are used in the synthesis of molecules.
- Understand the concepts of atomic and molecular orbital

| **Unit -1** | |
|---|---|
| **PERIODIC PROPERTIES**<br>Effective nuclear charge of fluorine and magnesium, penetration of orbital's, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro negativity, oxidation states, coordination numbers 2 & 3and geometries, hard soft acids and bases. | **Hours – 10** |
| **Unit -2** | |
| **USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA**<br>**Thermo dynamic functions:** State and Path functions, First and second laws of thermodynamics, Gibbs Helmholtz Equation, concept of entropy and enthalpy.<br>**Electro chemistry:** Introduction, electrode potential, standard electrodes – Hydrogen and Calomel electrodes, Nernst equation and applications.<br>**Water chemistry:** Surface and subsurface water quality parameters – turbidity, pH, total dissolved salts, chloride content, and break point chlorination.<br>**Corrosion:** Wet chemical theory, control methods – Proper designing, cathodic protection- Sacrificial anodic and impressed current cathodic protection. | **Hours – 10** |
| **Unit -3** | |
| **STEREO CHEMISTRY**<br>Principles of stereochemistry, representations of 3 dimensional structures of organic compounds, geometrical and stereoisomer's, configuration and symmetry, enantiomers.<br>**ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE**<br>Introduction to reactions involving Substitution – $SN^1$ & $SN^2$ with mechanism, Addition – Free radical, Elimination – E1 & E2 with examples (mechanism is not involved), Synthesis of aspirin drug molecule. | **Hours – 10** |
| **Unit -4** | |
| **ATOMIC, MOLECULAR STRUCTURE AND ADVANCED MATERIALS**<br>Schrodinger equation. Particle in a box solution and their applications for conjugated molecules.<br>**Nano particles**: Introduction, preparation methods – Sol-gel method, Chemical | **Hours** |

| | |
|---|---|
| reduction method – properties and applications.<br>**Surface properties:** Determination of surface tension and viscosity of liquids.<br>**Ceramics:** Classification, examples and applications.<br>Crystal field theory and the energy level diagrams fortransition metal ions. | **– 10** |
| **Unit -5** | |
| **SPECTROSCOPIC TECHNIQUES**<br>Regions of electromagnetic spectrum - Principles of vibration and rotational spectroscopy. Vibration and rotational spectroscopy of diatomic molecules: Rigid diatomic molecules - selection rule - simple Harmonic Oscillator - diatomic vibrating rotator. Nuclear magnetic resonance – Principle and Instrumentation. Principles of chromatography – TLC & Paper. | **Hours – 10** |

**COURSE OUTCOMES:**

On completion of the course student will be

1. Able to rationalize periodic properties like ionization potential, electro negativity and oxidation states.
2. Able to know the nature and working of various electrodes.
3. Able to analyze bulk properties and processes using thermodynamic considerations.
4. Able to synthesize organic molecules using different types of chemical reactions.
5. Able to understand the concepts of atomic and molecular orbital's.
6. Able to gain knowledge on spectroscopic techniques and the ranges of the electromagnetic spectrum used for exciting different molecular energy levels.

**TEXT BOOKS:**


1. Stereo chemistry of Carbon Compounds by Ernest Eliel; McGraw Hill Education.
2. Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
3. Concise In organic Chemistry, J.D. Lee, 5$^{th}$Edition; Wiley India.
4. Engineering Chemistry – Fundamentals and applications by Shikha Agarwal; Cambridge University Press
5. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5$^{th}$Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp
6. Engineering Chemistry by Jain & Jain; Dhanpat Rai Publishing Company


**REFERENCE BOOKS**:


1. Engineering Chemistry (NPTELWeb-book), by B.L. Tembe, Kamaluddin and M.S.Krishnan.
2. Physical Chemistry, by P. W. Atkins.
3. Physical Chemistry, by Glasstone, S
4. Advanced in organic chemistry by Wilkinson G and Cotton FA

| BASIC ELECTRICAL ENGINEERING | | | |
|---|---|---|---|
| Subject Code | 18CMEET1040/18CMEET2040 | IA Marks | 30 |
| Number of Lecture Hours/week | 3(L)+1(T) | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 04** | | | |

**Course Objectives:**

This course will enable student to :

- Describe the basics electrical circuit concepts and how to apply the various theorems for given electrical network
- Describe the representation of sinusoidal wave form and also analysis of single phase ac circuit with various elements
- Describe the principle and operation of ac and dc electrical machines
- Describe the basic operation of different converters circuits
- Describe the necessity of the batteries and importance of the basic switch gear unit

| | |
|---|---|
| **Unit -1** | |
| **DC Circuits:**<br>Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition,Thevenins and Norton Theorems (Simple Numerical problems).Time-domain analysis of first-order RL and RC circuits. | **Hours- 10** |
| **Unit – 2** | |
| **AC Circuits:**<br>Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single- phase ac circuits consisting of R, L, C, RL, RC,RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections. | **Hours- 10** |
| **Unit – 3** | |
| **Transformers**<br>Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, OC and SC tests, regulation and efficiency.<br>Auto transformer and three-phase transformer connections. | **Hours- 10** |
| **Unit – 4** | |
| **Electrical Machines: Ac machines-** Generation of rotating magnetic fields, construction details and working of three phase induction motor, significance of torque – slip characteristics. Loss components and efficiency, starting and speed control of induction motor. Single phase induction motor. Construction and working of synchronous generators.<br>**DC machines-**<br>Construction, working, torque-speed characteristics and speed control of dc shunt motor. | **Hours- 10** |
| **Unit – 5** | |
| **Power Converters and Electrical Installations**<br>DC – DC Buck and boost converters, duty ratio control, PWM techniques, single phase voltage source inverters. Classification of batteries and Low Voltage switch gear. | **Hours- 10** |
| **Course outcomes:** | |

On completion of the course student will be

1. Able to analyze DC circuits by using KCL, KVL and Network theorems
2. Able to analyze AC circuits
3. Able to explain the operation and compute performance of transformer
4. Able to explain the construction and working of rotating electrical machines
5. Able to describe DC-DC and DC-AC converters
6. Able to explain about types of LV switch gear and types of batteries

**Test books**.


1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. D.P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
4. J.P. Tewari, "Basic Electrical Engineering", New Age International Publishers, 2003


**References**


1. M.D. Singh, "Power Electronics", 2nd edition.
2. "Battery Energy Storage for Smart Grid Applications", Eurobat 2013.
3. L.S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 1996.
4. V.D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
5. R.M. Dell, D.A.J. Rand, "Understanding Batteries", 2001.
6. BhaveshBhalja, R.P., Maheshwari, Nilesh G. Chothani,"Protection and Switchgear", Oxford University Press, 5th impression, 2014.

## English Language Communication Skills Lab

| | | | |
|---|---|---|---|
| Subject Code | 18CMEGL1050/18CMEG2050 | IA Marks | 15 |
| Number of Practical Hours/Week | 02 | Exam Marks | 35 |
| Total Number of Practical Hours | 32 | Exam Hours | 03 |

**Credits – 01**

**Objectives:** To enable the students to learn communication skills of Listening, Speaking, Reading and Writing by focusing on:

- Listening Comprehension
- Pronunciation
- Functional English in formal and Informal Situations
- Interpersonal Communication Skills
- Presentation Skills

**List of Experiments**

**UNIT I -** Listening Comprehension

**UNIT II -** Pronunciation , Stress, Intonation & Rhythm

**UNIT III -**Common Everyday Situations: Conversations & Dialogues, Communication at Workplace

**UNIT IV -** Interpersonal Communication Skills- Group discussions and debates

**UNIT V -** Formal Presentations

**Course Outcomes:**

By the end of the course the students will be able to acquire basic Proficiency in English by practicing the following:

- Listening Comprehension
- Pronunciation
- Dialogues
- Interpersonal Communication Skills
- Presentation Skills
- Discussions and Debates

**Learning Resources:**

- Interact–English Lab Manual for Undergraduate Students by Orient Black Swan
- Ted Talks, Interviews with Achievers and select movies
- Toastmaster's speeches and table topics
- Book Reviews and movie reviews
- Exercises in Spoken English Parts: I-III, CIEFL, Hyderabad.
- Oxford Guide to Effective Writing and Speaking by John Seely.
- https://www.ted.com/talk

| ENGINEERING CHEMISTRY LABORATORY | | | |
|---|---|---|---|
| Subject Code | 18CMCHL1060/ 18CMCHL2060 | IA Marks | 15 |
| Number of Practice Hours/Week | 03 | Exam Marks | 35 |
| Total Number of Practice Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**COURSE OBJECTIVES:**

The objectives of this course, help the students to

- Measure molecular properties like surface tension and viscosity
- Determine chloride content of water of given water sample.
- Familiarize the synthesis of a simple drug.
- Determine rate constant as a function of time.
- Determine the strength of acids using conductivity meter.
- Determine amount of Fe (II) using potentiometer.

**List of Experiments**

**(Any 10 experiments must be conducted)**

1. Determination of surface tension
2. Determination of viscosity of a liquid by Ostwald viscometer
3. Thin layer chromatography
4. Determination of chloride content of water
5. Determination hardness of water by EDTA.
6. Determination of the rate constant of first order reaction (Ester hydrolysis)
7. Determination of strength of strong acid using conductivity meter titration.
8. Determination of strength of weak acid using conductivity meter titration.
9. Determination of Ferrous iron using potentiometer.
10. Synthesis of a drug –Aspirin
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Determination of strength of acetic acid using charcoal adsorption.

**Demonstration Experiments:**

1. Preparation of lattice structure and determination of atomic packing factor.
2. Chemical oscillations- Iodine clock reaction
3. Synthesis of Phenol formal dehyderesin
4. Saponification of oil

**COURSE OUTCOMES:**

On completion of the course student will be

1. Able to measure molecular properties like surface tension and viscosity
2. Able to determine chloride content of given water sample.
3. Able to synthesize a drug.
4. Able to determine rate constant as a function of time.
5. Able to determine strength of acids using conductivity meter.
6. Able to determine amount of Fe (II) using potentiometer.

| BASIC ELECTRICAL ENGINEERING LAB | | | |
|---|---|---|---|
| Subject Code | 18CMEEL1070/ 18CMEEL2070 | IA Marks | 15 |
| Number of Practice Hours/Week | 2P | Exam Marks | 35 |
| Total Number of Practice Hours | 32 | Exam Hours | 03 |
| **Credits – 1.5** | | | |

**The objectives of this course, help the students to**

- Learn how to find the frequency response and resonance of RL& RC circuits
- Learn how to verify the given networks using theorems
- Learn how to measure the power and determination of efficiency of a single phase transformer and how to measure the power in three phase transformer
- Learn how to determine the Torque-slip characteristics of a dc shunt and induction motors.
- Learn how to find the regulation of an alternator
- Learn the operation of different converter circuits and know about the switch gear system

**List of Experiments (Any Ten experiments must be conducted)**

1. Study of R-L, R-C,R-L-C circuits.
2. Verification of superposition theorem.
3. Verification of Thevenin's and Norton's theorems.
4. Series and Parallel resonance of RL and RC circuits.
5. Open circuit & Short circuit tests on a single phase transformer.
6. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
7. Speed control of DC shunt motor.
8. Torque Speed Characteristic on single phase induction motor
9. Regulation of Alternator.
10. Demonstration of Buck and Book converter
11. Demonstration of Voltage Source Inverter
12. Demonstration of Low Voltage Switchgear

**COURSE OUTCOMES:**

On completion of this course, students are

1. Able to determine the time response and resonance of given RL, RC and RLC circuits
2. Able to determine the response using Superposition, Norton and Thevinins.
3. Able to determine the power, efficiency and regulation of ac machines

| CONSTITUTION OF INDIA, PROFESSIONAL ETHICS & HUMAN RIGHTS<br>Common to all | | | |
|---|---|---|---|
| Subject Code | 18CMMSN1080/<br>18CMMSN2080 | IA Marks | 30 |
| Number of Lecture Hours/Week | 3+1(T) | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 00** | | | |

**COURSE OBJECTIVES:**

The objectives of this course help the students to

- To provide basic information about Indian constitution.
- To identify individual role and ethical responsibility towards society.
- To understand human rights and its implications.

| | |
|---|---|
| **Unit -1** | |
| Lesson: Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution Fundamental Rights & its limitations. | **Hours– 10** |
| **Unit -2** | |
| Lesson: Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties.<br>Union Executives – President, Prime Minister Parliament Supreme Court of India. | **Hours– 10** |
| **Unit – 3** | |
| Lesson: State Executives – Governor, Chief Minister, State Legislature High Court of State.<br>Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th&91st Amendments. | **Hours– 10** |
| **Unit – 4** | |
| Lesson: Special Provision for SC & ST Special Provision for Women, Children & Backward Classes<br>Emergency Provisions.<br>Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India<br>Powers and functions of Municipalities, Panchayats and Co - Operative Societies. | **Hours–10** |
| **Unit – 5** | |
| Lesson: Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering. | **Hours– 10** |

**COURSE OUTCOMES:**

On completion of the course student will

1. Have general knowledge and legal literacy and thereby to take up competitive examinations.
2. Understand state and central policies, fundamental duties.
3. Understand Electoral Process, special provisions.
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies,
5. Understand Engineering ethics and responsibilities of Engineers
6. Understand Engineering Integrity &Reliability

**Text Books:**

1. Durga Das Basu: **"Introduction to the Constitution on India",** (Students Edn.) Prentice – Hall EEE, 19th / 20thEdn.,2001
2. Charles E. Haries, Michael S Pritchard and Michael J.Robins**"Engineering Ethics"** Thompson Asia, 2003-08-05.

**REFERENCE BOOKS**:

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing,2002.
2. M. Govindarajan, S. Natarajan, V.S.Senthilkumar, **"Engineering Ethics",** Prentice – Hall of India Pvt. Ltd. New Delhi,2004
3. Brij Kishore Sharma,**" Introduction to the Constitution of India"**, PHI Learning Pvt. Ltd., New Delhi,2011.
4. Latest Publications of Indian Institute of Human Rights, New Delhi

**Website Resources**

1. www.nptel.ac.in
2. www.hnlu.ac.in
3. www.nspe.org
4. www.preservearticles.com

| ENGINEERING MATHEMATICS-II<br>SEMESTER - II | | | |
|---|---|---|---|
| Subject Code | 18CMMAT2010 | IA Marks | 30 |
| Number of Lecture Hours/Week | 3(L)+ 1(T) | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 04** | | | |

**Course objectives:**

To enable students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following

1. To solve system of linear equations
2. To find eigen values and eigen vectors of a matrix
3. To solve initial value problems by using Laplace transforms
4. To find the solution of algebraic /transcendental equations and also interpolate the functions.
5. To evaluate numerical integration and to solve ordinary differential equations by using numerical methods.
6. To find Fourier series of a periodic function and to determine the Fourier transform of a function

| **Unit -1** | |
|---|---|
| **Linear Algebra:** Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method – Jacobi method and Gauss-Seidel method – Eigen values and Eigen vectors, Properties of Eigen values and Eigen vectors - Linear transformation, Diagonalization of a square matrix. Cayley-Hamilton theorem(without proof)- Reduction of Quadratic form to Canonical form. | **10 Hours** |
| **Unit -2** | |
| **Laplace Transforms:** Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function Inverse Laplace transforms– Convolution theorem(without proof).<br>Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms | **10 Hours** |
| **Unit – 3** | |
| **Numerical Methods**: Numerical solution of algebraic and transcendental equations by Regula- Falsi Method and Newton-Raphson method.<br>Finite differences: Error functions – Forward, backward and central differences, Newton's forward and backward interpolation formulae. Gauss`s forward and backward interpolation formulae - Lagrange's interpolation formula (all formulae without proof) | **10 Hours** |
| **Unit – 4** | |
| **Numerical integration**: Trapezoidal rule - Simpson's (1/3)rd and (3/8)th rules. Numerical solutions of ordinary differential equations-Taylors series method-Picard's method-Euler's method-Modified Euler's method-Runge-Kutta methods | **8 Hours** |
| **Unit – 5** | |

| | |
|---|---|
| **Fourier Series**: Periodic functions, Dirichlet's condition, Fourier Series of periodic functions with period $2\pi$ and with arbitrary period. Fourier series of even and odd functions, Half range Fourier Series.<br>**Fourier Transforms**: Infinite Fourier transforms, Fourier sine and cosine transforms Inverse Fourier transforms. | **12 Hours** |

**Course outcomes:**

On completion of this course, students are able to,

1. Solve system of linear equations
2. Find Eigen values and Eigen vectors of a matrix
3. Solve initial value problems by using Laplace transforms
4. Find the solution of algebraic/transcendental equations and also interpolate the functions.
5. Evaluate numerical integration and to solve ordinary differential equations by using numerical methods.
6. Find Fourier series of a periodic function and to determine the Fourier transform of a function

**Text Books:**


1. B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 44$^{th}$Edition, 2016.
2. Kreyszig, "Advanced Engineering Mathematics"-Wiley, 9$^{th}$Edition, 2013.


**Reference Books:**


1. B.V. Ramana "Higher Engineering Mathematics" TataMc Graw-Hill,2006
2. N P Baliand Manish Goyal," A text book of Engineering mathematics", Laxmi publications, 7$^{th}$edition.
3. H. K Dass and Er. RajnishVerma ,"Higher Engineering Mathematics", S. Chand publishing,1st edition,2011.
4. Dr.K.V. Nageswara Reddy and Dr.B. Rama BhupalReddy,"Engineering Mathematics, Volume II" Scitech Publications, 2017.

**ENGINEERING PHYSICS**
**(Mechanics) Common to CE and ME**
SEMESTER - II

| | | | |
|---|---|---|---|
| Subject Code | 18MEPHT2020, 18CEPHT2020 | Internal Marks | 30 |
| Number of Lecture Hours/Week | 3+1(T) | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 04**

COURSE OBJECTIVES:

The objectives of this course, help the students

- To impart the knowledge of Newton's law of motion in central force field
- To understand the Motion of rigid body systems in a Non inertial frames of reference
- To describe the Rigid body dynamics

| | |
|---|---|
| **Unit -1** | |
| **One Dimensional motion**<br>Newton's law, Equation of motion in one dimension, Invariance of Newton's equations-under shift of coordinate system rotation of coordinate system, time translation, Time reversal, Mirror reflection, Galileo transformation, Accelerating frames of reference. Simple harmonic motion-Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance. | **Hours – 10** |
| **Unit -2** | |
| **Two dimensional motion**<br>Two Dimensional motion in the Cartesian coordinate system and in the radial polar coordinate system, Kepler's law, Kepler's problem of planetary motion and its solutions , Classification of Kepler's orbits. | **Hours – 9** |
| **Unit -3** | |
| **Three dimensional motion**<br>Three dimensional motion in the Cartesian coordinate system –Example of Motion of charged particle, motion in non-referential plane- Accelerating reference plane along a straight plane, Reference frame rotating with a constant angular velocity, Earth as a reference frame- study of the effects of earth rotations-Apparent gravitational acceleration, Effect of Coriolis force on terrestrial experiments and freely falling body. | **Hours – 10** |
| **Unit – 4** | |
| **Conservative and non conservative force fields:** Conservative and non conservative force fields, Gradient of a potential field, Curl of a vector field, Newton equations for variable mass system (rocket), System of particles and centre of mass. | **Hours – 10** |
| **Unit -5** | |
| **Rigid body dynamics**<br>Angular momentum of a single particle and system of particle, Definition of a rigid body, Equation of motion of rigid body, Euler's equation describing rigid body motion, Angular velocity, Kinetic energy of rigid body and moment of inertia, Parallel axis theorem. | **Hours – 10** |

**COURSE OUTCOMES:**

On completion of the course student will able to

1. Understand the conditions for invariance and non invariance of Newton's second law.
2. Distinguish the various harmonic motions and resonance.
3. Apply Kepler's laws to understand the planetary motions.
4. Formulate Five-term acceleration formula with consideration of earth rotation effect.
5. Understanding the concept of conservative and non conservative force fields.
6. Describe the rigid body dynamics and moment of inertia.

**TEXT BOOKS:**

1. Introduction to Mechanics — MK Verma.
2. An Introduction to Mechanics — D Kleppner & R Kolenkow.

**REFERENCE BOOKS**:

1. Principles of Mechanics — JL Synge & BA Griffiths.

| PROGRAMMING FOR PROBLEM SOLVING<br>(Common for all branches) | | | |
|---|---|---|---|
| Subject Code: | 18CMCST1030/<br>18CMCST2030 | IA Marks | 30 |
| Number of Lecture Hours/Week | 3+1(T) | EA Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits - 03** | | | |

| **Unit-I: Introduction to computer systems and programming** | **Hours** |
|---|---|
| **History & Hardware:** Computer Hardware, components, Types of Software, Memory units.<br>**Introduction to Problem solving:** Algorithm, characteristics of Algorithms, Basic operations of algorithms, Pseudo code, Flowchart, Types of languages, Relation between Data, Information, Input and Output.<br>**Basics of C:** History and Features of C, Importance of C, Procedural Language, Compiler versus Interpreter, Structure of C Program, Program development steps, programming errors. | **08** |
| **Unit-II: C Expressions, evaluation and control statements** | |
| **Overview of C:** Character Set, C-Tokens, Data Types, Variables, Constants, Operators, Operator precedence and Associativity, converting mathematical expressions to C- expressions, evaluation of C-expressions, Input/output functions.<br>**Conditional Branching:** if statement, if...else statement, Nested if...else statement, if…else…if ladder, switch statement.<br>**Unconditional Branching:** goto.<br>**Control flow statements:** break, continue.<br>**Looping Constructs:** do-while statement, while statement, for statement. | **12** |
| **Unit-III: Arrays and Functions** | |
| **Arrays:** Introduction, 1-D Arrays, Character arrays and string representation, 2-D Arrays (Matrix), Multi- Dimensional Arrays.<br>**Functions**: Basics, necessity and advantages, Types of functions, Parameter passing mechanisms, Recursion, Storage Classes, Command Line Arguments, Conversion from Recursion to Iteration and vice-versa.<br>**Strings:** Working with strings, String Handling Functions(both library and user defined). | **10** |
| **Unit-IV: Derived and User Defined Data types** | |
| **Pointers:** Understanding Pointers, Pointer expressions, Pointer and Arrays, Pointers and Strings, Pointers to Functions.<br>**Dynamic Memory Allocation:** Introduction to Dynamic Memory Allocation malloc, calloc, realloc, free.<br>**Structures and Unions:** Defining a Structure, type def, Advantage of Structure, Nested structures, Arrays of Structures, Structures and Arrays, Structures and Functions, Structures and Pointers, Defining Unions, Union within union, Structure with in union, Union within structure, self-referential structures, bit fields, enumerations. | **12** |
| **Unit-V: Preprocessing and File Handling** | |

| | |
|---|---|
| **Preprocessing Directives**: Macro Substitution, File Inclusion, conditional compilation and other directives<br>**File Management in C:** Introduction to File Management, Modes and Operations on Files, Types of files, Error Handling During I/O Operations. | **8** |

**Text Books:**

1. Computer Programming ANSIC, E Balagurusamy, McGraw Hill Education(Private), Limited(TB1)
2. Programming in C, ReemaThareja, Second Edition, Oxford Higher Education (TB2)

**Reference Books:**

1. Computer Basics and C Programming, V Raja Raman, Second Edition, PHI(RB1)

**Course Outcomes: Student can able to**

1. Formulate algorithms, translate the min to programs and correct program errors.
2. Choose right control structures suitable for the problem to be solved.
3. Decompose reusable code in a program into functions.
4. Make use of arrays, pointers, structures and unions effectively.
5. Store and retrieve data from permanent storage.
6. learn file operations

| ENGINEERING GRAPHICS | | | |
|---|---|---|---|
| Subject Code | **18CMMEL1040/18CMMEL2040** | IA Marks | 30 |
| Number of Lecture Hours/Week | 1(L)+04(T) | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**COURSE OBJECTIVES:**

1. Students should be able to construct Polygons using general methods, inscribe and describe polygons on circles, draw curves (parabola, ellipse and hyperbola, cycloids, involutes by general methods
2. Students should be able to read, interpret and construct plain scales, diagonal scales and venier scales
3. Student should be able to draw orthographic projections of points, lines, Planes & Solids inclined to one reference plane. Students are should be able to apply various concepts to solve practical problems related to engineering.
4. Student should be able to draw sections and sectional views of Solids
5. Student should be able to draw isometric view of lines, plane figures and simple solids. Student should be able to convert given isometric views into orthographic views. Students should be able to apply various concepts to solve practical problems related to engineering
6. Student should be able to draw objects using draw and modify toolbars of Auto CAD

| **Unit -1** | |
|---|---|
| Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections – Ellipse, Parabola, Hyperbola (General method only); Cycloid, Epicycloids, Hypocycloid and Involutes; Scales – Plain, Diagonal and Venier Scales; | **Hours– 10** |
| **Unit -2** | |
| Projections of Points and lines inclined to both planes; Projections of planes inclined to one plane | **Hours– 08** |
| **Unit – 3** | |
| Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes | **Hours– 10** |
| **Unit – 4** | |
| Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone | **Hours– 10** |
| **Unit – 5** | |
| Isometric Projections covering, Principles of Isometric projection –Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions<br>**Introduction to AUTOCAD**-The Menu System, Toolbars(Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows | **Hours– 12** |

**COURSE OUTCOMES:**

1. Students will be able to construct Polygons using general methods, inscribe and describe polygons on circles, draw curves (parabola, ellipse and hyperbola, cycloids, involutes by general methods
2. Students will be able to read, interpret and construct plain scales, diagonal scales and vernier scales
3. Student will be able to draw orthographic projections of points, lines, Planes & Solids

inclined to one reference plane. Students will be able to apply various concepts to solve practical problems related to engineering.

4. Student will be able to draw sections and sectional views of Solids
5. Student will be able to draw isometric view of lines, plane figures and simple solids. Student will be able to convert given isometric views into orthographic views. Students will be able to apply various concepts to solve practical problems related to engineering
6. Student will be able to draw objects using draw and modify toolbars of AutoCAD

**Text/Reference Books:**


1. Engineering Drawing by N.D. Bhatt, Chariot Publications
2. Engineering Drawing by Agarwal&Agarwal, TataMcGraw Hill Publishers
3. Engineering Drawing by K.L.Narayana&P.Kannaiah,Scitech Publishers
4. Engineering Graphics for Degree by K.C. John, PHIPublishers

**ENGINEERING PHYSICS LABORATORY**
**Common to CE&ME**
SEMESTER - II

| | | | |
|---|---|---|---|
| Subject Code | 18CEPHL2050, 18MEPHL2050 | Internal Marks | 15 |
| Number of Practice Hours/Week | 03 | External Marks | 35 |
| Total Number of Practice Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**COURSE OBJECTIVES:**

The objectives of this course, help the students

- To apply the theoretical knowledge of Physics through hands on the experimental instruments
- To improve the experimental knowledge in the later studies
- To understand the basic need of experiments.
- To know how to measure the different physical quantities.

**List of Experiments**

1. To investigate the Motion of Coupled Oscillators
2. To determine the rigidity modulus of wire-Torsional pendulum.
3. To determine acceleration due to gravity *g* and radius of gyration *K* - Compound pendulum.
4. To determine the Frequency of an electrically maintained tuning fork by Melde's Experiment.
5. To determine the velocity of sound in air-Volume resonator.
6. To verify the transverse law of vibrations-Sonometer.
7. To determine the young's modulus and draw load depression graph in uniform bending.
8. To determine the Moment of Inertia of a Flywheel.
9. To verify the parallel axis and perpendicular axis theorems and determine the moment of inertia of a regular rectangular body -Bifilar pendulum.
10. To study of oscillations Spiral spring.

**COURSE OUTCOMES:**

On completion of the course student will able to

1. Study the mode of vibrations in Coupled Oscillators
2. Determine the g & values using the knowledge in simple harmonic motions.
3. Apply the phenomenon of resonance to verify the transverse laws of stretched string.
4. Determine the frequency of vibrating body, velocity of sound in air using resonance.
5. Determine the moment of inertia of a rigid body.
6. Verify the parallel axis and perpendicular theorems of moment of inertia

| PROGRAMMING FOR PROBLEM SOLVING LAB (Common for all branches) | | | |
|---|---|---|---|
| Subject Code | 18CMCSL1060/18CMCSL2060 | IA Marks | 15 |
| Number of Practice Hours/Week | 03 | Exam Marks | 35 |
| Total Number of Practice Hours | 36 | Exam Hours | 03 |
| **Credits – 2** | | | |

**COURSE OBJECTIVES:**

The objectives of this course, help the students

1. To apply programming for basic mathematical functions
2. To design and program mathematical concepts.
3. To create and use the functions and library functions
4. Able to apply the theoretical knowledge of formatting of documents
5. To create and apply user defined types to the real world problems.
6. To create files and shapes of the concepts.

**List of Experiments**

**Exercise 1 (Familiarization with programming environment)**

a) Familiarization of CODEBLOCKS C++ Editor to edit, compile, execute test and debugging C programs.

b) Familiarization of RAPTOR Tool to draw flow charts and understand flow of control.

c) Acquaintance with basic LINUX commands.

**Exercise 2 (Simple computational problems using arithmetic expressions)**

a) Write a C Program to display real number with 2 decimal places.

b) Write a C Program to convert Celsius to Fahrenheit and vice versa.

c) Write a C Program to calculate the area of triangle using the formula area = $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$

d) Write a C program to find the largest of three numbers using ternary operator.

e) Write a C Program to swap two numbers without using a temporary variable.

**Exercise 3 (Problems involving if-then-else structures)**

a) Write a C Program to check whether a given number is even or odd using bitwise operator, shift operator and arithmetic operator.

b) Write a C program to find the roots of a quadratic equation.

c) WriteaCProgramtodisplaygradebasedon6subjectmarks using if…else…if ladder.

d) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result using switch control statement. (Consider the operators +, -, *, /, %)

**Exercise 4 (Iterative problems)**

a) WriteaCProgramtocountnumberof0'sand1'sinabinary representation of a given number.

b) Write a C program to generate all the prime numbers between two numbers supplied by the user.

c) Write a C Program to print the multiplication table corresponding to number supplied as input.

**Exercise 5 (Iterative problems)**

a) Write a C Program to Find Whether the Given Number is

i) Armstrong Number

ii) Palindrome Number

b) Write a C Program to print sum of digits of a given number

**Exercise 6 (Series examples)**

a) Write a C Program to calculate sum of following series

i. 1+2+3+….n

ii. 1+1/2+1/3+……+1/n

iii. $1+x+x^2+x^3……+x^n$

**Exercise 7 (1D Array manipulation)**

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to search an element in an array (linear search).

c) Write a C Program to print the following pattern using a character array SSA SASSASI

**Exercise 8 (Matrix problems, String operations)**

a) Write a C program to add two matrices.

b) Write a C program to multiply two matrices if they are compatible or print an error message "incompatible matrix sizes" otherwise.

c) Write a C program to check given matrix is symmetric or not.

d) Implement the following string operations with and without library functions.

i) Copy ii) concatenate iii) length iv) compare

**Exercise 9 (Simple functions)**

a) Write a C Program demonstrating the following function types

i. With arguments and with return value.

ii. With arguments and without return value

iii. Without arguments and without return value.

iv. Without arguments and with return value.

b) Write a C Program illustrating call by reference

**Exercise 10 (Recursive functions)**

a) Write a C Program illustrating the following with Recursion without Recursion

i) Factorial ii) GCD iii) Power iv) Fibonacci

**Exercise 11(Pointers and structures)**

a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

*Note: Understand the difference between the above two programs.*

c) Write a C Program to read and print student details using structures.

**Exercise 12 (File operations)**

a) Write a C program to open a file and to print it contents on screen.

b) Write a C program to copy files

c) Write a C program merges two files onto a new file.

d) Write a C program to delete a file.

**COURSE OUTCOMES:**

1. Attain knowledge on using CODE BLOCKS and RAPTOR tools in solving problems.
2. Examine and analyze alternative solutions to a problem.
3. Design an algorithmic solution to a problem using problem decomposition and step-wise refinement.
4. Demonstrate conversion of iterative function store cursive and vice-versa.
5. Implement the concepts of arrays.
6. Implement the structures, Unions and files.

| WORKSHOP/MANUFACTURING PRACTICE | | | |
|---|---|---|---|
| Subject Code | 18CMMEL1070/18CMMEL 2070 | IA Marks | 15 |
| Number of Practice Hours/Week | 01(L)+4(P) | Exam Marks | 35 |
| Total Number of Practice Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**COURSE OBJECTIVES:**

1. Students should be able to learn the basic manufacturing processes, study the various tools and equipment used and gain hands-on experience in different trades.
2. Students should be able to learn the engineering and technology involved in carpentry, fitting, black smithy, foundry, welding, machining and plastic moulding.
3. Students should understand the workmanship required, working of machinery or equipment necessary.

**Lectures & videos: (10hours)**

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

Work shop Practice:

| S. No | Name of Shop floor | Exercises |
|---|---|---|
| 1 | Black smithy | 1. S-Hook |
| | | 2. Square Rod To Round Rod |
| 2 | Carpentry | 1. T-Lap Joint |
| | | 2. Cross Lap Joint |
| 3 | Foundry | 1. Mould for a Solid |
| | | 2. Mould for a Split Pattern. |
| 4 | Fitting | 1. Square Fitting |
| | | 2. V-Fitting |
| 5 | Welding | 1. Butt Joint |
| | | 2. Lap Joint |
| 6 | Machine Tools | 1. Turning |
| | | 2. Knurling |
| 7 | Plastic Moulding | 1. Key chain |

**COURSE OUTCOMES:**

1. Students will be able to make use of basic carpentry joints to make furniture.
2. Students will be able to fabricate mechanical engineering assemblies using fitting joints.
3. Students will be able to produce various machine components by using foundry, black smithy, machining and plastic moulding techniques.

| ENVIRONMENTAL SCIENCE | | | |
|---|---|---|---|
| Subject Code | 18CMCHN1080/18CMCHN2080 | IA Marks | 30 |
| Number of Lecture Hours/Week | 04 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 00**

**COURSE OBJECTIVES:**

The objectives of this course, help the students to

1. Know the importance of Environmental studies and the measures to be taken to overcome global environmental challenges.
2. Understand the concept of ecosystem and its diversity.
3. Gain knowledge on natural resources.
4. Understand the concept of biodiversity.
5. Gain knowledge on environmental pollution.
6. Gain knowledge on environmental legislation and global treaties.

| **Unit -1** | |
|---|---|
| **MULTIDISCIPLINARYNATUREOF ENVIRONMENTALSTUDIES**<br>**Environment**-Definition, Introduction - Scope and Importance - Global environmental challenges, global warming & climate change - Acid rains, ozone layer depletion - Carbon credits - Sustainability, Stockholm & Rio Summit - Population growth & explosion - Role of Information Technology in Environment and human health. **Ecosystem** - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. -Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the different ecosystems | **Hours– 10** |
| **Unit -2** | |
| **NATURAL RESOURCES**<br>Renewable and non-renewable resources – Natural resources and associated problems –Forest resources – Use and over – exploitation, deforestation - Timber extraction – Mining, dams and other effects on forest and tribal people<br>Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems<br>Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.<br>Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. | **Hours– 12** |
| **Unit -3** | |
| **BIODIVERSITY AND ITS CONSERVATION**<br>Introduction - Definition: genetic, species and ecosystem diversity. – | **Hours– 6** |

| | |
|---|---|
| Biogeographically classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels. India as a mega- diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. | |
| **Unit -4** | |
| **ENVIRONMENTAL POLLUTION**<br>Definition, Cause, effects and control measures of :<br>a. Air pollution<br>b. Water pollution<br>c. Soil pollution<br>d. Marine pollution<br>e. Noise pollution<br>f. Thermal pollution<br>g. Nuclear hazards<br>Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution. - Pollution case studies. | **Hours– 12** |
| **Unit -5** | |
| **SOCIAL ISSUES AND THE ENVIRONMENT**<br>Urban problems related to energy -Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people its problems and concerns. Environment Protection Act - Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.<br>**Field work:** Visit to a local area to document environmental assets River /forest grassland/hill/mountain<br>-Visit to a local polluted site Urban/Rural/industrial/<br>Agricultural Study of common plants, insects, birds. - Study of simple ecosystems - pond, river, hill slopes, etc. | **Hours– 10** |
| **COURSE OUTCOMES:**<br>On completion of the course student will be<br>1. Able to know the importance of Environmental studies and the measures to be taken to overcome global environmental challenges.<br>2. Able to understand the concept of eco system and its diversity.<br>3. Able to gain knowledge on natural resources.<br>4. Able to understand the concept of biodiversity.<br>5. Able to gain knowledge on environmental pollution.<br>6. Gain knowledge on environmental legislation and global treaties. | |
| **TEXT BOOKS:**<br>1. E. Bharucha (2003), "Environmental Studies", University Publishing Company, New Delhi. | |

2. J.G. Henry and G.W. Heinke (2004), “Environmental Science and Engineering”, Second Edition, Prentice Hall of India, New Delhi
3. G.M. Masters (2004)” Introduction to Environmental Engineering and Science”, Second Edition, Prentice Hall ofIndia, New Delhi

**REFERENCE BOOKS**:

1. Text Book of Environmental Studies by Deeshita Dave&P. UdayaBhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada.
3. Environmental Studies, P.N. Paliniswamy, P. Manikandan,A. Geeta and K. Manjula Rani, Pearson Education, Chennai.

**B.Tech. (Civil Engineering)**
**Semester III (Second Year)**

| Sl. No. | Course Category | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|---|
| 1. | **BSC** | 18CEMAT3010 | Engineering Mathematics - III | 3 | 1 | 0 | 4 |
| 2. | **ESC** | 18CMCET3020 | Engineering Mechanics | 3 | 1 | 0 | 4 |
| 3. | **PCC** | 18CECET3030 | Engineering Geology | 2 | 0 | 0 | 2 |
| 4. | **PCC** | 18CECET3040 | Surveying & Geomatics | 3 | 0 | 0 | 3 |
| 5. | **PCC** | 18CECET3050 | Building materials & Concrete Technology | 3 | 0 | 0 | 3 |
| 6. | **PCC** | 18CECEL3060 | Engineering Geology Lab | 0 | 0 | 3 | 1.5 |
| 7. | **PCC** | 18CECEL3070 | Surveying field work Lab | 0 | 0 | 3 | 1.5 |
| 8. | **PCC** | 18CECEL3080 | Computer- aided civil Engineering Drawing Lab | 0 | 0 | 3 | 1.5 |
| 9. | **MC** | 18CEECN3090 | Basic Electronics | 3 | - | - | - |
| | | | | | | **Total Credits** | **20.5** |

**B.Tech. (Civil Engineering)**
**Semester IV (Second Year)**

| Sl. No. | Course Category | Course Category | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|---|
| 1. | **PCC** | 18CECET4010 | Fluid Mechanics | 3 | 0 | 0 | 3 |
| 2. | **PCC** | 18CECET4020 | Strength of Materials | 3 | 0 | 0 | 3 |
| 3. | **PCC** | 18CECET4030 | Environmental Engineering | 3 | 0 | 0 | 3 |
| 4. | **PCC** | 18CECET4040 | Transportation Engineering | 3 | 0 | 0 | 3 |
| 5. | **HSMC** | 18CMMST4050 | Engineering Economics and Financial Management | 3 | 0 | 0 | 3 |
| 6. | **PCC** | 18CECEL4060 | Strength of Materials Lab | 0 | 0 | 3 | 1.5 |
| 7. | **PCC** | 18CECEL4070 | Environmental Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8. | **PCC** | 18CECEL4080 | Material Testing Lab | 0 | 0 | 3 | 1.5 |
| | | | | | | **Total Credits** | **19.5** |

| ENGINEERING MATHEMATICS – III<br>SEMESTER - III | | | |
|---|---|---|---|
| Subject Code | **18CMMAT3010** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 04** | | | |

**Course Objectives:**

This course will enable students to:

1. To find the function of a complex variable
2. To evaluate complex integration and expand functions using Taylor & Maclaurin's series
3. To evaluate integrals using Residues
4. To find the statistical parameters for distributions
5. To test the hypothesis

| **Unit -1** | **Hours** |
|---|---|
| **Function of a complex variable**<br>Introduction –continuity –differentiability- analyticity – properties – Cauchy – riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method. | **10** |
| **Unit -2** | |
| **Integration and series expansions**<br>Complex integration: Line integral – Cauchy's integral theorem, Cauchy's in integral formula, generalized integral formula (all without proofs) Radius of convergence – expansion in Taylor's series, Maclaurin's series and Laurent series | **10** |
| **Unit – 3** | |
| **Singularities and Residue Theorem**<br>Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m**,** Evaluation of real definite integrals: Integration around the unit circle**,** Integration around semi-circle, Indenting the contours having poles on the real axis. | **10** |
| **Unit – 4** | |
| **Discrete Random variables and Distributions:** Introduction-Random variables-Discrete Random variable-Distribution function- Expectation. Discrete distributions: Binomial, Poisson and Geometric distributions and their fitting to data.<br>**Continuous Random variable and distributions:** Introduction-Continuous Random variable-Distribution function- Expectation-Continuous distribution: Uniform, Exponential and Normal distributions, Normal approximation to Binomial distribution | **10** |
| **Unit – 5** | |
| **Test of Significance:** Introduction - Population and samples- Sampling distribution of means ($\sigma$-known) t-distribution- Sampling distribution of means($\sigma$-unknown), chi-square and F- test Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two- tail tests- Tests concerning one mean and proportion, two means-Proportions and their differences - ANOVA for one – way and two – way classified data | **10** |

**Course outcomes:**

On completion of this course, students are able to

1. Find the function of a complex variable
2. Evaluate complex integration and expand functions using Taylor & Maclaurin‟s series
3. Evaluate integrals using Residues
4. Find the statistical parameters for discrete distributions
5. Find the statistical parameters for continuous distributions
6. Test the hypothesis

**Text Books:**

1. B.S. Grewal, **"Higher Engineering Mathematics"**, Khanna publishers, 44th edition, 2016.
2. Erwin Kreyszig, **"Advanced Engineering Mathematics**, Wiley, 9th Edition, 2013

**Reference Books**:

1. B.V. Ramana, **"Higher Engineering Mathematics"**, Tata Mc Graw-Hill, 2006
2. N.P.Bali and Manish Goyal, **"A text book of Engineering mathematics"**, Laxmi publications, 7th Edition.
3. H.K. Dass and Er. RajnishVerma, **"Higher Engineerig Mathematics"**, S.Chand publishing, 1st edition, 2011.
4. Dr. B.Rama Bhupal Reddy**, "Probability and Statistics for Engineers",** Research India Publications , 2015.

| ENGINEERING MECHANICS<br>SEMESTER - III | | | |
|---|---|---|---|
| Subject Code | **18CMCET3020** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 04** | | | |

**Course Objectives:**

This course will enable students to:

1. Gain Knowledge on system of forces and moments
2. Describe the various types of friction
3. Draw free-body diagrams and solve statics problems
4. Acquire knowledge on centre of gravity and moment of inertia for different sections
5. Calculate velocity and acceleration of particles having rectilinear or curvilinear motion
6. Analyze the problems on work energy method and impulse-momentum method

| **Unit -1** | **Hours** |
|---|---|
| Introduction to Engg. Mechanics – Basic Concepts. Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient Of friction, cone of friction | **10** |
| **Unit -2** | |
| Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces, condition of equilibrium, analysis of plane trusses (Method of joints only) | **10** |
| **Unit -3** | |
| Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications.<br>Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections | **10** |
| **Unit -4** | |
| Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.<br>Kinetics: Analysis of a Particle and Rigid Body in Translation– Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies. | **10** |
| **Unit -5** | |
| Work – Energy Method: Equations for Translation, Work- Energy Application to Particle Motion, Connected System- Fixed Axis Rotation and Plane Motion. Impulse momentum method. | **10** |

**Course Outcomes:**

On completion of the course student will be able to

1. Determine the resultant force and moment for a given system of forces
2. Apply laws of friction to simple mechanisms with consideration of friction
3. Draw free-body diagrams and solve statistics problems
4. Determine centroid and moment of inertia of simple and composite bodies
5. Calculate the motion characteristics of a body subjected to a given force system
6. Solve the problems using work energy method and impulse –momentum method

**Text Books:**


1. Engg. Mechanics - S.Timoshenko&D.H.Young., 4th Edn - Mc Graw Hill publications.
2. Engineering Mechanics-Statics and Dynamics by A Nelson, Tata McGraw HillEducation Private Ltd, NewDelhi, 2009.
3. A Text book of Engineering Mechanics by S S Bhavikatti, New age international publ., 2012


**Reference Books:**


1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, Tayal, Umesh publ.
3. Mechanics For Engineers, statics - F.P.Beer&E.R.Johnston 5th Edn Mc Graw Hill Publ.
4. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
5. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best& W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
6. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.

| ENGINEERING GEOLOGY<br>SEMESTER - III | | | |
|---|---|---|---|
| Subject Code | **18CECET3030** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 02 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 02** | | | |

**Course Objectives:**

This course will enable students to:

1. Origin, Internal and surface structures of the earth.
2. Identification of the minerals types of clay minerals their properties and effects on engineering project.
3. Types of rock (Igneous, Sedimentary, and Metamorphic), Civil engineering importance of rock forming minerals.
4. Sedimentary processes (Weathering, erosion, deposition), Metamorphism and volcanic eruptions.
5. Rock engineering concept and approaches in the design and construction of underground openings.

| **Unit -1** | **Hours** |
|---|---|
| Introduction to General Geology: Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Ground Water: origin, groundwater table, porosity and Permeability. Aquifers, Groundwater Moment and Water, Bearing Properties of Rocks. | **8** |
| **Unit -2** | |
| **Mineralogy:** Mineral definition, physical properties of minerals. Study of important rock forming minerals: Silicate structures, Quartz, Feldspars, Pyroxenes, Amphiboles, Micas and Clays.<br>**Petrology:** Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic Igneous rocks like Granite, Rhyolite or Tuff, Felsite, Pegmatite, etc. Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite, and Basalt. Engineering aspect to Basalt. Sedimentary petrology- Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone. Metamorphic petrology- Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration | **12** |
| **Unit -3** | |
| **Physical Geology& Structural Geology:**<br>Physical Geology- Weathering. Erosion and Denudation. Factors affecting Weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Laterite (engineering aspects), Desert Landform, Residual deposits of Clay with flints, Mudflows, Coastal deposits.<br>Structural Geology: Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop Fold- Types and Criteria for their recognition in field. Faults: | **10** |

| | |
|---|---|
| Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible and importance. Importance of structural elements in engineering operations | |
| **Unit -4** | |
| **Geological Hazards & Geophysical Methods**: Geological Hazards-. Types of landslide. Classification of earth movements, causes, effects and preventive measures. Earthquake: Magnitude and intensity of earthquake. Consequences of failure as Earthquake and Subsidence.<br>Geophysical Methods: Principles of Geophysical Methods, Electrical, Seismic, Gravity and Magnetic. Principle of Resistivity method and configurations. Applications of Resistivity Method: Soil Profile, Hard rock and Ground Water Table. Principles of Seismic refraction and reflections methods and their applications to Civil Engineering problems. | **10** |
| **Unit -5** | |
| Geological Investigations: Geological investigation for dam and reservoir, Tunnels, bridges and multi-storeyed structures, highways and railway lines site-Required geological consideration for selecting site. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the site and treatment giving to such structures. | **10** |

**Course outcomes:**

Upon the completion of this course, the students will be able to:

1. Identify and classify the geological minerals.
2. Identify and classify the various rocks engineering properties.
3. Classify and measure the earthquake prone areas to practice the hazard zonation.
4. Classify, monitor and measure the geological hazards.
5. Prepares, analyse and interpret the Engineering Geologic maps.
6. Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

**Text Books:**


1. Engineering and General Geology by Parbin Singh – Katson Publishing House
2. Engineering Geology by N.Chennakesavulu, Mc-Millan, India Ltd. 2009
3. Engineering Geology by Subinoy Gangopadhyay,oxford university press - 2013


**Reference Books:**


1. Engineering Geology by K.M.Bangar.
2. Fundamentals of Engineering Geology by F.G. Bell, Button Wortus Lando
3. Engineering Geology by D.Venkat Reddy, Vikas Publications
4. Principles of Engineering Geology by K.V.G.K Gokhale, B S Publications

| SURVEYING AND GEOMATICS<br>SEMESTER - III | | | |
|---|---|---|---|
| Subject Code | **18CECET3040** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**
This course will enable students to:

1. Describe the function of surveying in civil engineering construction
2. Operate an automatic level to perform differential and profile levelling; properly record notes; mathematically reduce and check levelling measurements
3. Effectively communicate with team members during field activities; identify appropriate safety procedures for personal protection; properly handle and use measurement instruments.
4. Calculate, design and layout horizontal and vertical curves, Understand, interpret, and prepare plan, profile, and cross- section drawings, Work with cross-sections
5. Operate a total station to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system.

| **Unit -1 Introduction to Surveying** | **Hours** |
|---|---|
| **Introduction**-definition- objectives of surveying Over view of plane surveying Principles of surveying Classifications Errors in surveying<br>**Chain & Tape:** Introduction to chain and tape surveying and their types- Field work with chain -Basic problems in chain surveying-Obstacles in chain and ranging<br>**Compass**: Introduction of compass Types of compass- Types of bearing - Designations of bearing,- Method of measuring angles Errors in compass surveying .Elimination of errors in compass surveying<br>**Plane Table Surveying:** Introduction to plane table surveying Advantages and disadvantages of plane table surveying | **8** |
| **Unit -2 Modern Instruments** | |
| **Theodolite Surveying :**<br>Definitions and terms - Measurements of horizontal and vertical angles Principles& construction of electronic theodolite<br>**Trigonometric levelling** :<br>Basics of Trigonometric Levelling Base of the object accessible Base of the object inaccessible<br>**Tachometric Surveying:**<br>Stadia and tangential methods of tacheometry -Distance and elevation formulas for staff held vertical position | **12** |
| **Unit – 3 Applications** | |
| Levelling : Concept of levelling and terminology, Adjustments of levelling Methods in levelling Contouring: Introduction Characteristics and uses of contours Method of conducting contour surveying Uses of contour map | **10** |

| | |
|---|---|
| **Unit – 4 Curves** | |
| **Curves:** Introduction to curves Design and setting out simple and compound curves Types vertical curves Measurement of areas and volumes: Introduction to areas and volumes general methods of determining areas and volumes | **10** |
| **Unit – 5 Modern Field Survey Systems** | |
| **Total Station:** Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey<br>**Global Positioning:** Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations, fundamentals in VPS | **10** |

**Course outcomes:**

On completion of the course student will be able to

1. Calculate angles, distances
2. Finding of reduced Level Identify data collection methods and prepare field notes
3. Understand the working principles of survey instruments applications errors
4. Estimate measurement errors and apply corrections and will give proposed plane
5. Operation& application of advance equipment
6. Understand the application of GIS knowledge in field

**Text Books:**


1. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications, 2005.
2. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.
3. Chandra A. M., Higher Surveying, New Age International Publishers, 2007


**Reference Books**:


1. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Fundamentals of surveying, S.K. Roy – PHI learning ltd.
3. Surveying and Levelling (Oxford Higher Education) by R. Subramanian

| BUILDING MATERIALS AND CONCRETE TECHNOLOGY<br>SEMESTER - III | | | |
|---|---|---|---|
| Subject Code | **18CECET3050** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Learn the concepts of Concrete production and its behaviour in various environments.
2. Learn the test procedures for the determination of properties of concrete.
3. Understand durability properties of concrete in various environments.

| **Unit -1 Introduction to Building Materials** | **Hours** |
|---|---|
| **Wood**: Wood Based Products: cross section details of trees, their general properties, various types of defects, Methods of seasoning and their importance, various Mechanical Properties of timber, preservation methods, common Indian trees and their uses. Wood based Products: Veneers, Plywood and its types.<br>**Finishing's** Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Properties- methods-preparation of stones, bricks, tiles and aggregates, Glass –Types-Preparation Methods | **10** |
| **Unit -2 Concrete Materials** | |
| Aggregates – Coarse and fine aggregates-particle shape and texture–Bond and Strength of aggregate –Specific gravity–Bulk Density, porosity and absorption –Moisture content of Aggregate- Bulking of sand– Sieve analysis and sizes<br>**Cement:** Portland cement-Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance–various tests for cement as per IS code. Storing of cement in the field and godowns. | **10** |
| **Unit – 3 Properties of Concrete** | |
| **Concrete**: Properties of fresh concrete-Workability, Measurement of workability by different tests, Segregation & bleeding –Water / Cement ratio, Strength in tension & compression, Relation between compression & tensile strength–Testing of Hardened Concrete – Compression tests – Tension tests – Flexure tests –Splitting tests.<br>**Admixtures** – Chemical Admixtures – accelerators, Retarders, air entrainers, plasticizers, Super plasticizers, Mineral Admixtures - Fly ash and silica fume | **10** |
| **Unit – 4 Concrete Mix Design** | |
| Factors in the choice of mix proportions –Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design. Elasticity of concrete, Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –Types of shrinkage. | **10** |

| **Unit – 5 Concrete & Special Concretes**: | |
|---|---|
| Special Concretes - Ready mixed concrete, Shot Crete - Lightweight aggregate concrete – Cellular concrete – No- fines concrete, High-density concrete, Fibre reinforced concrete – Different types of fibers – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete– Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, Self-healing concrete. | **10** |

**Course Outcomes:**

On completion of the course student will able to

1. Understand the properties of various building materials.
2. Discriminate the elastic properties of concrete
3. Apply concept of admixtures in manufacturing of concrete.
4. Design the concrete mix by BIS method.
5. Test the fresh concrete properties and the hardened concrete properties.
6. Analyse the importance and effect of special Concrete in construction field

**Text Books:**

1. Building Construction by B.C.Punmia, Laxmi Publications(p) ltd.
2. Building Materials by B.C. Punmia, Laxmi Publications private ltd.
3. Concrete technology By M.S.Shetty., S.CHAND Publications.
4. Building Construction by S.S. Bhavikatti, Vices publications House private ltd.

**Reference Books**:

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning(P) ltd.
3. Concrete technology by A.R.Santha Kumar, OXFORD Publications.
4. Properties of Concrete by A.M.Neville, PEARSON Publications

**ENGINEERING GEOLOGY LAB**
SEMESTER – III

| | | | |
|---|---|---|---|
| Subject Code | **18CECEL3060** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course Objectives:**
This course will enable students to:
1. Identify the formation of minerals
2. Understand the mega-scopic identification of rocks and minerals
3. Understand the importance of geophysical methodologies
4. Understand the geological maps.

| | |
|---|---|
| 1. Study of physical properties and identification of rock minerals.<br>2. Study of physical properties and identification of ore minerals.<br>3. Identification of igneous rocks and their Engineering properties<br>4. Identification of sedimentary rocks and their Engineering properties<br>5. Identification of metamorphic rocks and their Engineering properties<br>6. Description and Identification of Geomorphologic models<br>7. Interpretation and drawing of section for geological maps<br>8. Description and Identification of Structural models<br>9. Simple Structural Geology problems<br>10. Bore hole data problems<br>11. Geophysical methods – Electrical Resistivity & Seismic Methods<br>12. Field work and report submitted. | **36 Hours** |

**Course outcomes:**
On completion of the course, student will be able to
1. Elucidate the mega-scopic identification of rocks
2. Categorize the rocks according to mega-scopic description
3. Interpret geological maps Estimate the types of subsurface formation by using geophysical methods

**SURVEYING FIELD WORK LAB**
SEMESTER – III

| | | | |
|---|---|---|---|
| Subject Code | **18CECEL3070** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course Objectives:**
This course will enable students to:

1. Familiar with various plane surveying instruments and determining areas by Chains and tapes
2. Understand the concept of bearing and angles in various traverses by using Compass and the theodolite
3. Determine Reduced level by using dumping level, Auto level and setting out Curves
4. Become familiar with modern Surveying Equipment's like Total Station

| **List of Experiments** | **Hours** |
|---|---|
| 1. Determination of Area by Chain Triangulation and Cross Staff Survey<br>2. Determination of Inaccessible Distance between 2 points by Chain & Compass<br>3. Determination of Bearing ,Angles and Area in a Closed Traverse<br>4. Finding the Area of a given boundary by the method Radiation and Intersection<br>5. Location of exact Station Point by Two Point and Three Point Problem Using Plane Table Surveying<br>6. Determination of Reduced Level by Height of Instrument Method<br>7. Determination of Reduced Level by Rise & Fall Method<br>8. Determining the horizontal and vertical angle by the method of repetition and Method of Reiteration<br>9. Determination of Height of the Object by Trigonometric Leveling<br>10. Determination Of Distance and Elevation By Tachometer<br>11. Setting out Curve by Two Theodolite Method and Offsets from Long Chord<br>12. Plotting Out a building and determine its area, height, distance between any two Inaccessible Points and Contour Maps By Total Station<br>13. Demonstration on application of GPS in civil Engineering | **36** |

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

1. Find the area of Plot by using Various method employed in Chain Survey
2. Determine Bearings and Angles in Closed Traverse
3. Find out Distance between two points which are not accessible directly
4. Determine Height of the building, vertical and horizontal angles by using Theodolite
5. Locate Exact position of point by 2 point and 3 Point Problems
6. Set out Curves on Roads, area by Total Station

**COMPUTER-AIDED CIVIL ENGINEERING DRAWING LAB**
SEMESTER – III

| | | | |
|---|---|---|---|
| Subject Code | **18CECEL3080** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course Objectives:**
This course will enable students to:

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

| | |
|---|---|
| **Module 1:** Building Byelaws and Regulations Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.<br>**Module2**: Residential Buildings Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions<br>**Module 3:** MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall<br>**Module 4:** Building Drawing: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity | **16 Hours** |
| 1. Buildings with load bearing walls including details of doors and windows.<br>2. RCC framed structures<br>3. Planning of single roomed residential building<br>4. Planning of two-roomed residential building<br>5. Planning of any two types in public buildings | **20 Hours** |

**Course outcomes:**
On completion of the course, student will be able to

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

**Hardware/Software Requirements:**

1. AutoCAD or any other equivalent software
2. Computer lab with required configuration

**BASIC ELECTRONICS**
(Mandatory Course)
SEMESTER – III

| Subject Code | **18CEECN3090** | Internal Marks | 30 |
|---|---|---|---|
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – Nil**

**Course Objectives:**

This course will enable students to:

1. Understand the characteristics and applications of Electronic Devices
2. Describe different types of transistor amplifiers
3. Determine the functionality of Operational Amplifiers

| **Unit -1** | **Hours** |
|---|---|
| **Diodes and Applications:** Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications. | **12** |
| **Unit -2** | |
| **Transistor Characteristics:** Bipolar Junction Transistor (BJT)-Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits | **7** |
| **Unit – 3** | |
| **Transistor Amplifiers:** Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit | **7** |
| **Unit – 4** | |
| **Feedback Amplifiers**: Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non- Sinusoidal type Oscillators | **12** |
| **Unit – 5** | |
| **Operational Amplifiers and Applications:** Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op Amp, Concept of Virtual Ground. | **12** |

**Course outcomes:**

On completion of the course, student will be able to:

1. Understand the characteristics of Diodes.
2. Understand the characteristics of transistors.
3. Describe different types of transistor amplifiers.
4. Interpret different types of feedback amplifiers.

5. Summarize different types of Oscillators.
6. Determine the functioning of OP-AMP

**Text Books:**

1. Integrated Electronics - Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd

**Reference Books**:

1. Electronic Devices & Theory - Robert L Boyelstad, Louis Nashelsky, 10th edition
2. Electronic Devices and Circuits- J. Millman, C. Halkias, 3rd Edition, Mc-Graw Hill.
3. Electronic Devices and Circuits – K Venkata Rao ,K Rama Sudha, Tata Mc-Graw Hill.
4. Electronic Devices and Circuits - Salivahanan, Kumar, Vallavaraj, 2nd Edition, Tata Mc-Graw Hill.

**Web References:**

1. https://nptel.ac.in/courses/117101106/
2. https://nptel.ac.in/courses/108102095/

**FLUID MECHANICS**
SEMESTER – IV

| | | | |
|---|---|---|---|
| Subject Code | **18CECET4010** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**
This course will enable students to:

1. To understand the properties of fluids and fluid statics
2. To derive the equation of conservation of mass and its application
3. To solve kinematic problems such as finding particle paths and stream lines
4. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
5. To analyze laminar and turbulent flows
6. To understand the various flow measuring devices& Boundary layer theory

| **Unit -1 Introduction** | **Hours** |
|---|---|
| Basic Concepts and Definitions – Dimensions and units; Distinction between a fluid and a solid; Physical properties of fluids – density, specific gravity, viscosity, surface tension, bulk modulus of elasticity, vapour pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers. | **9** |
| **Unit -2 Hydrostatics** | |
| **Fluid Statics**: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure.<br>**Fluid Kinematics:** Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non- uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, Buoyancy and stability of floating bodies(No analytical question). | **11** |
| **Unit – 3 Fluid Dynamics** | |
| Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Momentum principle; Forces exerted by fluid flow on pipe bend | **09** |
| **Unit – 4 Laminar Flow And Turbulent Flows** | |
| Reynold's experiment – Characteristics of Laminar & Turbulent flows, Laws of Fluid friction, Hagen- Poiseulle Formula, Flow through circular pipe, Flow between parallel plates; hydrodynamically smooth and rough flows.<br>**Closed Conduit Flow:** Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula, HardCross Method. | **11** |
| **Unit – 5 Measurement of Flow** | |
| Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches - –Broad crested weirs.<br>**Boundary layer:** Basic concepts-Definitions; Energy thickness, momentum thicknes | **10** |

| | |
|---|---|
| and displacement thickness. | |

**Course Outcomes:**

On completion of the course student will be able to

1. Understand definitions of the basic terms used in fluid mechanics and various properties of fluids and can solve manometer problems
2. Calculate the forces that act on submerged planes and curves; and solve Fluid kinematic problems
3. Apply the continuity, momentum and energy principles to solve simple problems identify various types of fluid flows
4. Apply appropriate equations and principles to analyze a variety of pipe flow problems
5. Apply the concepts of measurement of flows

**Text Books:**

1. Hydraulics and Fluid Mechanics, P N Modi and S M Seth, Standard Book House
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill

**Reference Books:**

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi
3. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore,
4. International Student Edition, Mc Graw Hill.

**STRENGTH OF MATERIALS**

SEMESTER – IV

| | | | |
|---|---|---|---|
| Subject Code | **18CECET4020** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

This course will enable students to:

1. Basic concepts of Strength of Materials, Principles of Elasticity, and Plasticity Stress strain behaviour of materials and their governing laws.
2. Concepts of stresses developed in the cross section due to bending and shear forces.
3. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
4. Classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

| | |
|---|---|
| **Unit -1: Simple Stresses And Strains** | |
| Concept of Statically determinacy and indeterminacy ,Elasticity and plasticity, Types of stresses and strains, Hooke's law, stress – strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic Moduli and the relationship between them, Bars of varying section, composite bars, Temperature stresses. | **Hours – 10** |
| **Unit -2:Shear Force And Bending Moment** | |
| Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads, Point of Contra flexure, Relation between S.F., B.M and, rate of loading at a section of a beam, Principles of Superposition. | **Hours – 10** |
| **Unit – 3:Bending Theory** | |
| Theory of simple bending, Assumptions, Derivation of bending equation: M/I = f/y = E/R, Neutral axis, Determination of bending stresses for I, T, Angle and Channel sections, Design of simple beam sections.<br>**Shear Stresses:** Derivation of formula, Shear stress distribution across various beam Sections, built up beams. | **Hours – 10** |
| **Unit – 4:Deflection Of Beams** | |
| Bending into a circular arc, slope, deflection and radius of curvature, Differential equation for the elastic line of a beam, Double integration and Macaulay's methods, Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L. Uniformly varying load. Mohr's theorems, Moment area method, application to simple cases including overhanging beams. | **Hours – 10** |
| **Unit – 5:Direct and Bending Stresses** | |
| Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis. Stresses in beams subjected to unsymmetrical bending | **Hours – 10** |

**Course outcomes:**

On completion of the course, student will be able to

1. Understand the principles, theory of elasticity including strain/displacement and Hooke's law relationships.
2. Determination of shear force and bending moment in the beams due to various loading conditions

3. Determination of stresses developed in the beams due to various loading conditions.
4. Evaluate the slope and deflection at any point on a beam subjected to a various loads
5. Determination of direct stresses developed in the beams due to various loading conditions.

**TEXT BOOKS**


1. StrengthofMaterials",S.S. Rattan, TataMcGraw Hill Education Pvt.,Ltd.,
2. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
3. S.B.Junarkar and H.J.Shah, Mechanics of Structures, Charotar Publishers, Anand, 1998


**REFERENCES**


1. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson
2. Prentice Hall, 2004
3. Beer and Johnston, Mechanics of Materials, McGraw Hill International Edition, 1995.
4. "Strength of materials" R.K. Rajput, S.Chand & Co, New Delhi, 2012.

**ENVIRONMENTAL ENGINEERING**
SEMESTER - IV

| | | | |
|---|---|---|---|
| Subject Code | **18CECET4030** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**
This course will enable students to:

1. Outline planning and the design of water supply systems for a community/town/city
2. Provide knowledge of water quality requirement for domestic usage and other usage
3. Impart understanding of importance of protection of water source quality
4. Selection of valves and fixture in water distribution systems for water supply system.
5. Impart knowledge on design of water distribution network

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|---|---|
| **Unit -1 Introduction** | |
| Water:- Water Supply systems, Need for planned water supply schemes, Sources of Water, Water demand and Potable, industrial and agricultural water requirements. Role of Environmental Engineer. | **Hours – 08** |
| **Unit -2 Importance and Necessity of Protected Water Supply systems** | |
| Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Agency activities Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting. | **Hours – 12** |
| **Unit – 3 Treatment of Water:** | |
| Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration. Disinfection: Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and manganese removal – Adsorption-fluoridation and deflouridation–aeration– Reverse Osmosis-Iron exchange–Ultra filtration | **Hours – 10** |
| **Unit – 4 Sewage** | |
| Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, recycling of sewage – quality requirements for various purposes. | **Hours – 10** |
| **Unit – 5 Building Plumbing** | |
| Building Plumbing-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used. Government authorities and their roles in water supply, sewerage disposal. Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts | **Hours – 10** |

**Course outcomes:**

On completion of the course, student will be able to

1. Plan and design the water and distribution networks and sewerage systems
2. Identify the water source and select proper intake structure
3. Characterization of water
4. Select the appropriate appurtenances in the water supply
5. Selection of suitable treatment flow for raw water treatments
6. Analyze the suitability of water distribution methods in various regions.

**Text Books:**

1. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson / Brooks/Cole; Second Edition 2008
2. Introduction to Environmental Engineering, Vesilind, PWS Publishing Company 2000

**Reference Books**:

1. Water Supply and Sewerage, E.W. Steel
2. CPHEEO Manual on Water Supply & Treatment
3. Manual on Water Supply and Treatment, (latest Ed.), Ministry of Works & Housing, New Delhi.
4. Plumbing Engineering. Theory, design and Practice, S.M. Patil, 1999
5. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
6. Environmental Engineering by H.S.Peavy, D.R. Rowe, G.Tchobanoglous; 1991, Tata-McGraw

| TRANSPORTATION ENGINEERING<br>SEMESTER - IV | | | |
|---|---|---|---|
| Subject Code | **18CECET4040** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**
This course will enable students to:
1. Impart different concepts in the field of Highway Engineering.
2. Acquire design principles of Highway Geometrics and Pavements
3. Learn various highway construction and maintenance procedures.

| | |
|---|---|
| **Unit -1 Highway Planning & Alignment** | |
| **Highway Network Planning:** Different modes of transportation, role of highway transportation, classification, network patterns, planning surveys, preparation of plans, final report, master plan, 20 year road development plans, salient features.<br>**Highway Alignment:** Principles of highway alignment, requirements, controlling factors, engineering surveys, Drawings and Reports | **Hours – 08** |
| **Unit -2 Highway Geometric Design** | |
| Importance of geometric design, design controls and criteria, cross section elements, pavement surface characteristics, Sight distance, Considerations, Design of horizontal alignment, Design of vertical alignment. | **Hours – 08** |
| **Unit – 3 Traffic Engineering** | |
| Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies, Speed studies – spot speed and speed & delay studies; Parking Studies; Road Accidents - Causes and Preventive measures-Condition Diagram and Collision Diagrams; PCU Factors, Capacity of High ways– Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals– Webster Method–IRC Method | **Hours – 12** |
| **Unit – 4 Pavement Materials & Pavement Design** | |
| Pavement Materials and Mix Design: Sub grade soil properties, CBR test, aggregates, desirable properties, tests, bituminous materials, bitumen and tar, tests. Bituminous mixes, requirements, design, Marshall Method.<br>Design of Pavements: Types of pavement structures, functions of pavement components, design factors. Design of flexible pavements, methods, GI method, CBR method, IRC method, Burmister's method. Design of rigid pavements, design considerations, wheel load stresses, temperature stresses, frictional stresses, design of joints, IRC method of rigid pavement design. | **Hours – 12** |
| **Unit – 5 Highway Construction & Maintenance** | |
| Highway Construction: Types of highway construction, construction of earth roads, gravel roads, WBM roads. Bituminous pavements, Cement concrete pavements.<br>Highway Maintenance: Pavement failures, causes. Maintenance of highways, routine maintenance, periodic maintenance, special repairs. Strengthening of existing pavements, evaluation, overlay design. Highway drainage, surface and sub-surface drainage. | **Hours – 10** |

**Course outcomes:**
On completion of this course, students will be able to
1. Plan highway networks
2. Design highway geometrics

3. Design intersections and prepare traffic management plans
4. Analyse quality of pavement material
5. Design flexible and rigid pavements
6. Understand the principle of construction and maintenance of highway pavements

**Text Books:**


1. Khanna, S.K. and C.E.G. Justo Highway Engineering, Nem Chand and Bros, Roorkee, India, 2001.
2. Kadiyali L.R. Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, India, 1997.
3. Kadiyali L.R. and Dr.N.B.Lal Principles and practice of Highway Engineering, Khanna Publishers, New Delhi


**Reference Books:**


1. Highway Engineering by Srinivasa Kumar R, Universities Press, Hyderabad.
2. Principles of Transportation Engineering by Partha Chakroborthy and Animesh Das, PHI Learning Private Ltd

| ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT<br>SEMESTER IV | | | |
|---|---|---|---|
| Subject Code | **18CMMST4050** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course objectives:**

This course will enable the students to

1. Understand the concept and nature of Managerial Economics and Concept of Demand and Demand forecasting.
2. Analyse the Cost Concepts, Cost-Volume-Profit Analysis and Market structures.
3. Learn different Accounting Systems, preparation of Financial Statements and Capital Budgeting proposals by using different methods.

| | |
|---|---|
| **Unit -1** | |
| **Introduction to Managerial Economics and demand Analysis:** Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Concept of Demand-Types-Determents-Law of Demand its Exception-Elasticity of Demand-Types and Measurement- Demand forecasting and its Methods. | **Hours – 10** |
| **Unit –2** | |
| **Production and Cost Analysis**: Production function-Isoquants and Isocost-Law of Variable proportions- Cobb-Douglas Production function- Economics of Sale-Cost Concepts- Opportunity Cost-Fixed vs Variable Costs-Explicit Costs vs Implicit Costs- Cost Volume Profit analysis- Determination of Break-Even Point | **Hours – 10** |
| **Unit-3** | |
| **Introduction To Markets, Pricing Policies & forms Organizations and Business Cycles**: Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price Output Determination – Methods of Pricing: Market Skimming Pricing, And Internet Pricing: Flat Rate Pricing. Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle | **Hours – 12** |
| **Unit –4** | |
| **Introduction to Accounting & Financing Analysis:** Introduction to Double Entry Systems– Preparation of Financial Statements- Analysis and Interpretation of Financial Statements-Ratio Analysis (Simple Problems) | **Hours – 10** |
| **Unit-5** | |
| **Capital and Capital Budgeting:** Capital Budgeting: Meaning of Capital-Capitalization- Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting- Traditional and Modern Methods. | **Hours – 08** |

**Course outcomes:**

On completion of the course student will be able to:

1. Equipped with the knowledge of managerial economics and estimating demand for a product.
2. Examine the Production Concept and familiar with the concepts of iso-quants, iso-cost lines and MRTS
3. Predict the cost of production and its relevance to managerial decision making
4. Prepare Financial Statements along with Analysis
5. Analyse and interpret various investment project proposals with the help of Capital Budgeting

techniques.

**Text Books:**

1. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011.
2. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial
3. Economics & Financial Analysis, Himalaya Publishing House 2011.

**Reference Books:**

1. Dr. P. Vijaya Kumar & Dr. N. Apparao Management Science Cengage, Delhi, 2012.
2. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
3. Vanitha Agarwal : Managerial Economics, Pearson Publications 2011.

**Web References:**

1. https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_MEFA_LECTURE_NOTES_1.pdf
2. https://www.edx.org/course/introduction-to-managerial- economics

| STRENGTH OF MATERIALS LAB<br>SEMESTER – IV | | | |
|---|---|---|---|
| Subject Code | **18CECEL4060** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course Objective:**

Students learn about the procedures to determine the properties of solid materials such as mild steel, tor steel and wood etc.

| | |
|---|---|
| 1. To study the stress -strain characteristics of (a) Mild Steel and (b) Tor steel by conducting tension test on U.T.M.<br>2. To find the Compressive strength of wood and concrete<br>3. To find the Brinnel's and Rockwell's hardness numbers of (a) Steel (b) Brass (c) Aluminum<br>(d) Copper by conducting hardness test.<br>4. To determine the Modulus of rigidity by conducting Torsion test on a Solid shafts<br>5. To find the Modulus of rigidity of the material of a spring by conducting Compression test.<br>6. To find the Energy absorbed by material by conducting Izod and Charpy impact test.<br>7. Shear & Punching Shear test on Mild Steel rods, Thin Plates.<br>8. Verification of Maxwell's Reciprocal theorem on beams.<br>9. To determine the Young's modulus of the material by conducting deflection test on a simply supported beam.<br>10. To determine the Modulus of elasticity of the material by conducting deflection test on a Cantilever beam.<br>11. To determine the Modulus of elasticity of the material by conducting deflection test on a continuous beam<br>12. Use of Electrical resistance strain gauges | **36 Hours** |

**Course outcomes:**

After studying this course, students will be able to:

1. Find the basic parameters of Mild steel and Tor steel such strength parameters and etc.,
2. Determine strength parameters of spring, wood and concrete
3. determine flexural and torsion values & elastic constants of Solid material
4. Determine hardness of metals

| | |
|---|---|
| **Hardware/Software Requirements:**<br>1. UTM for conducting tension test on rods<br>2. Compression testing machine<br>3. Brinnel's / Rock well's hardness testing machine<br>4. Torsion testing machine<br>5. spring testing machine<br>6. Izod Impact machine | 7. Shear testing machine<br>8. Beam setup for Maxwell's theorem verification.<br>9. simply supported wooden beam setup<br>10. Cantilever steel beam setup<br>11. Continuous beam setup<br>12. Electrical Resistance gauges. |

**ENVIRONMENTAL ENGINEERING LAB**

SEMESTER – IV

| | | | |
|---|---|---|---|
| Subject Code | **18CECEL4070** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course objectives:**

1. Estimation some important characteristics of water and wastewater in the laboratory
2. It also gives the significance of the characteristics of the water and wastewater

| | |
|---|---|
| 1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.<br>2. Determination and estimation of Total Hardness–Calcium & Magnesium.<br>3. Determination of Alkalinity/Acidity<br>4. Determination of Chlorides in water and soil<br>5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.<br>6. Determination of Iron.<br>7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.<br>8. Determination of N, P, K values in waste water<br>9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.<br>10. Determination of C.O.D.<br>11. Determination of Optimum coagulant dose.<br>12. Determination of Chlorine demand.<br>13. Presumptive Coliform test. | **36 Hours** |

**Course outcomes:**

After studying this course, students will be able to:

1. Estimation some important characteristics of water and wastewater in the laboratory
2. Draw some conclusion and decide whether the water is potable or not.
3. Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
4. Estimation of the strength of the sewage in terms of BOD and COD

| | |
|---|---|
| **Hardware/Software Requirements:**<br>1. pH meter<br>2. Turbidity meter<br>3. Conductivity meter<br>4. Hot air oven<br>5. Muffle furnace<br>6. Dissolved Oxygen meter | 7. U–V visible spectrophotometer<br>8. COD Reflux Apparatus<br>9. Jar Test Apparatus<br>10. BOD incubator<br>11. Autoclave<br>12. Laminar flow chamber<br>13. Hazen's Apparatus |

**MATERIAL TESTING LAB**

SEMESTER – IV

| | | | |
|---|---|---|---|
| Subject Code | **18CECEL4080** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course objectives:**

Students learn about the basic properties ingredients of concrete, fresh and hardened concrete properties.

| **List of Experiments** | **Hours** |
|---|---|
| 1. Tests on Aggregate(Fine Aggregate & Coarse Aggregate)<br>a. Shape test<br>b. Fineness modulus<br>c. Crushing strength<br>d. Impact Strength<br>e. Abrasion & attrition<br>f. Specific gravity & water adsorption<br>2. Tests on Binding Material<br>3. Cement:<br>i. Specific Gravity & Soundness<br>ii. Normal consistency & Setting Time<br>iii. Compressive Strength of Cement<br>b. Bitumen<br>i. Viscosity<br>ii. Ductility<br>iii. Flesh &Fire Point<br>iv. Softening Point<br>v. Penetration Point<br>4. Tests on Mix<br>a. Workability of Concrete-Slump, Compaction factor& Vee-bee Consist value<br>b. Strength Characteristics of Herded Concrete-Compressive strength, Split tensile Strength & Flexural strength<br>c. Marshal Mix Stability analysis | **36** |

**Course Outcomes:**

After studying this course, students will be able to:

1. Determine the basic properties of cement such Fineness Index, Normal consistency, setting time & compressive strength of cement.
2. Determine the workability of cement concrete by slump cone, compaction factor and Vee–Bee tests
3. Determine the specific gravity & Fineness modulus of coarse aggregate and f i n e aggregate by Sieve analysis.
4. Determine the strength Characteristics of Aggregate
5. Determine the basic properties of Binding material used in pavement construction
6. Determine the strength characteristics of concrete

**Hardware/Software Requirements:**

1. Standard set of sieves for coarse aggregate and fine aggregate
2. Vicat's apparatus
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. Vee- Bee test apparatus
8. Universal testing Machine (UTM)/Compression Testing Machine
9. Crushing Value Testing Equipment
10. Impact Testing Mould
11. Pycnometer
12. Density Basket
13. Elongation and Flakiness Plates
14. Los Angles Testing Equipment
15. Deval's Equipment
16. Penetration Testing Equipment and mould
17. Ring and Ball Equipment & Viscometer
18. Ductility Testing Equipment
19. Marshal Stability Equipment

**B.Tech. (Civil Engineering)**
**Semester V (Third Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | PCC | 18CECET5010 | Geo Technical Engineering | 3 | 0 | 0 | 3 |
| 2. | PCC | 18CECET5020 | Theory of Structures -I | 3 | 0 | 0 | 3 |
| 3. | PCC | 18CECET5030 | Hydraulic & Hydraulics Machinery | 3 | 0 | 0 | 3 |
| 4. | PCC | 18CECET5040 | Reinforced Concrete Structures | 3 | 0 | 0 | 3 |
| 5. | OE | 18CExxO505x | Open Elective- I | 3 | 0 | 0 | 3 |
| 6. | PE | 18CECEP506x | Professional Elective -I | 3 | 0 | 0 | 3 |
| 7. | PCC | 18CECEL5070 | Geo Technical Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8. | PCC | 18CECEL5080 | Fluid mechanics & Hydraulics Machinery Lab | | | | 1.5 |
| 9. | SOC | 18CEAHS5090 | Soft Skills & Aptitude Builder - 1 | 2 | 0 | 0 | 2 |
| 10 | MC | 18CMBIT5100 | Biology for Engineers | 2 | 0 | 0 | 0 |
| | | | | | | Total Credits | 23 |

**B.Tech. (Civil Engineering)**
**Semester VI (Third Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | PCC | 18CECET6010 | Theory of Structures -II | 3 | 0 | 0 | 3 |
| 2 | PCC | 18CECET6020 | Design of Steel Structures | 3 | 0 | 0 | 3 |
| 3 | OE | 18CExxO603x | Open Elective- II | 3 | 0 | 0 | 3 |
| 4 | PE | 18CECEP604x | Professional Elective -II | 3 | 0 | 0 | 3 |
| 5 | PE | 18CECEP605x | Professional Elective- III | 3 | 0 | 0 | 3 |
| 6 | PCC | 18CECEL6060 | Structural Design and Drawing Lab | 0 | 0 | 3 | 1.5 |
| 7 | PCC | 18CECEL6070 | Software Applications in civil Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8 | PCC | 18CECEL6080 | Surveying Field Camp | 1 | 0 | 2 | 2 |
| 9 | SOC | 18CEAHS6090 | Soft Skills & Aptitude Builder - 2 | 2 | 0 | 0 | 2 |
| | | | | | | Total Credits | 22 |

| GEO-TECHNICAL ENGINEERING<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECET5010** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. To enable the student to find out the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the seepage discharge.
3. To enable the students to differentiate between compaction and consolidation of soils and to determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, assessment of the shear parameters of sands and clays and the areas of their application.

| | |
|---|---|
| **Unit -1 Introduction** | |
| **Soil formation** – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship –Relative density, Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.<br>**Index Properties Of Soils**: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification | **Hours – 10** |
| **Unit -2 Permeability** | |
| Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace's equation - Seepage through soils. | **Hours – 10** |
| **Unit – 3 Consolidation** | |
| Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (cv) - Over consolidated and normally consolidated clays | **Hours – 10** |
| **Unit – 4 Shear Strength & Stress Distribution In Soils** | |
| **Stress Distribution In Soils:** Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method.<br>**Shear Strength of Soils:** Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behaviour of Sands - Critical Void Ratio – Stress-Strain behaviour of clays – Shear Strength determination- various drainage conditions | **Hours – 10** |
| **Unit – 5 Stability of Slopes** | |
| Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts. | **Hours – 10** |

**Course outcomes:**

Upon the successful completion of this course, the students will be able to:

1. Evaluate factor of safety of infinite slopes based on different ground conditions
2. Understand the significance of shear strength parameters in various geotechnical analyses
3. Determine various consolidation parameters of soil through laboratory test

4. Differentiate among various field methods of compaction and their usage based on the type of soil.
5. Understand the effect of capillary action and seepage flow direction on the effective stress at a point in the soil mass
6. Analytically calculate the effective permeability of anisotropic soil mass

**Text Books:**

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

**Reference Books:**

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.
2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.
3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi.

| THEORY OF STRUCTURES-I<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECET5020** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. To give concepts of Principal stresses and strains developed in cross-section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories
2. To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
3. To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures
4. Impart concepts for determination of Forces in members of plane pin-jointed perfect trusses by different methods

| **Unit -1 Analysis of Pin jointed Trusses** | |
|---|---|
| Determination of Forces in members of plane pin-jointed perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections. | **Hours – 10** |
| **Unit -2 Principal Stresses, Strains And Theories Of Failures** | |
| Introduction -Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions, Theories of failures.<br>Strain Energy – Resilience, Gradual, sudden, impact and shock loadings, simple Applications. | **Hours – 10** |
| **Unit – 3 Torsion Of Circular Shafts And Springs** | |
| Theory of pure torsion Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.<br>Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs | **Hours – 10** |
| **Unit – 4 Thin and Thick Cylinders** | |
| Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses, hoop, longitudinal and Volumetric strains, changes in diameter, and volume of thin cylinders, Thin spherical shells.<br>Thick Cylinders: Introduction Lame's theory for thick cylinders, Derivation of Lame's Formulae, distribution of hoop and radial stresses across thickness, design of thick cylinders, compound cylinders, Necessary difference of radii for shrinkage, Thick spherical shells. | **Hours – 10** |
| **Unit – 5 Columns & Struts** | |
| Introduction – Types of columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical | **Hours – 10** |

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| load formulae for various end conditions – slenderness ratio – Euler's critical stress – Rankine – Gordon formula – Long columns subjected to eccentric loading – Empirical formulae – Laterally loaded struts – subjected to uniformly distributed and concentrated loads –Maximum B.M. and stress due to transverse and lateral loading. | |

**Course outcomes:**

On completion of this course, students are able to

1. To assess stresses across section of the thin cylinders to arrive at optimum sections to withstand the internal pressure.
2. To assess stresses across section of the thick cylinders to arrive at optimum sections to withstand the internal pressure
3. Analyse the portal frames by using general methods
4. Analyse the crippling load carries by columns in various end conditions
5. Determination of torsional resistance offered by various members

**TEXT BOOKS**


1. Theory of Structures by R.S. Kurmi , S.Chand and Co.
2. Theory of Structures by Bhavakatti , Vikas Publishing House
3. Strength of materials by R. K Rajput, S.Chand and Co.


**REFERENCES**


1. Strength of Materials by R. Subramanian, Oxford Publications
2. Mechanics of Materials by B.C Punmia, Jain and Jain.
3. Strength of materials by R. K. Bansal, Lakshmi Publications
4. Theory of Structures by S.ramamrutham ,Dhanapat Rai Publishing Co

| HYDRAULIC & HYDRAULICS MACHINERY<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECET5030** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:** To enable the students to apply the knowledge of Hydraulic Engineering in Civil engineering field by making them to learn the following:

1. To study about uniform and non uniform flows in open channel and also to learn about the characteristics of hydraulic jump
2. To introduce dimensional analysis for fluid flow problems
3. To understand the working principles of various types of hydraulic machines and Pumps.

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| **Unit -1** | |
| **Introduction to open channel flow:** Types of channels –Types of flows - Velocity distribution<br>**Uniform Flow:** Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow; Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient 'n'. Most economical section of channel. Computation of Normal and critical depth. | **Hours – 10** |
| **Unit -2** | |
| **Non uniform flow:** Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by direct Step method; Hydraulic Jump- Theory of hydraulic jump, length and height of jump, location of jump; Energy dissipation. | **Hours – 10** |
| **Unit – 3** | |
| **Hydraulic similitude:** Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers.<br>Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat , inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency. | **Hours – 10** |
| **Unit – 4** | |
| **Hydraulic turbines :** Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines-Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-cavitation. | **Hours – 10** |
| **Unit – 5** | |
| **Centrifugal-pumps:** Pump installation details-classification-work done-Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves NPSH- Cavitation.<br>Reciprocating pumps: Introduction, classification, components, working, discharge, indicator diagram, work done and slip. | **Hours – 10** |

**Course outcomes:**
On completion of this course, students are able to

1. Solve uniform open channel flow problems.
2. Solve non-uniform open channel flow problems.
3. Compute flow profiles in channel transitions and analyse hydraulic transients.
4. Apply the principals of dimensional analysis and similitude in hydraulic model testing.
5. Understand the working principles of various hydraulic turbines.
6. Understand the working principles of various pumps.

**Text Books:**

1. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
2. A text of Fluid mechanics and hydraulic machines, R.K.Bansal - Laxmi Publications (P) ltd., New Delhi

**Reference Books**:

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Higher Education.

| REINFORCED CONCRETE STRUCTURES<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECET5040** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. Familiarize Students with different types of design philosophies
2. Equip student with concepts of design of flexural members
3. Understand Concepts of shear, bond and torsion
4. Familiarize students with different types of compressions members and Design
5. Understand different types of Slab and their design

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| **Unit -1 Introduction** | |
| Introduction: Working stress method Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams. Limit State Design: Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters | **Hours – 10** |
| **Unit -2 Design for Flexure** | |
| Design for Flexure: Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange Behaviour- Analysis and Design. | **Hours – 12** |
| **Unit – 3 Design for Shear, Torsion and Bond** | |
| Design for Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing. Limit state design for serviceability: Deflection, cracking and code provision, Design of formwork for beams and slabs. | **Hours – 8** |
| **Unit – 4 Slabs** | |
| Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist slab staircase | **Hours – 10** |
| **Unit – 5 Design of Compression members** | |
| Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uni-axial bending and biaxial bending – Braced and un-braced columns – I S Code provisions | **Hours – 10** |

**Course Outcomes:** upon successful completion of the Course students will be able to,

1. Work on different types of design philosophies [B.T.L-2] **understand**
2. Carryout analysis and design of flexural members and detailing [B.T.L-4] **Analysis**
3. Design structures subjected to shear, bond and torsion [B.T.L-6] **Design.**
4. Design different type of slabs [B.T.L-6] **Design**
5. Design different type of compression members [B.T.L-6] **Design**
6. Workout on design of Flexural members by using Working stress method [B.T.L-6]

**Text Books:**

1. Limit State Design, A. K. Jain
2. Design of Reinforced concrete Structures, N. Subrahmanyian
3. Reinforced Concrete Structures, S. Unnikrishna Pillai & Devdas Menon, Tata Mc.Graw Hill, New Delhi.

**Reference Books:**

1. R C C Design, B.C Punmia, A. K. Jain and A. K Jain. Lakshmi Publications
2. Reinforced Concrete Structures, N. Krishna Raju & R. N. Pranesh, New Age Publications.

| GEO-TECHNICAL ENGINEERING LAB<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECEL5070** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |
| **Credits – 1.5** | | | |

**Course objectives:**

1. To impart knowledge of determination of index properties required for classification of soils
2. To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests; to determine permeability of soils.
3. To teach how to determine shear parameters of soil through different laboratory tests

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|---|---|
| 1. Specific gravity,<br>2. Atterberg's Limits.<br>3. Field density-Core cutter and Sand replacement methods<br>4. Grain size analysis by sieving<br>5. Hydrometer Analysis Test<br>6. Permeability of soil - Constant and Variable head tests<br>7. Compaction test<br>8. Consolidation test (to be demonstrated)<br>9. Direct Shear test<br>10. Triaxial Compression test (UU Test)<br>11. Unconfined Compression test<br>12. Vane Shear test<br>13. Differential free swell (DFS)<br>14. CBR Test | 36 Hours |

**Course outcomes:** After studying this course, students will be able to:

1. Determine index properties of soil and classify them.
2. Determine permeability of soils.
3. Determine Compaction, Consolidation and shear strength characteristics

**Hardware/Software Requirements:**

- Casagrande's liquid limit apparatus.
- Apparatus for plastic and shrinkage limits
- Field density apparatus for a) Core cutter method b) Sand replacement method
- Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
- Hydrometer
- Permeability apparatus for a) Constant head test b) Variable head test
- Universal auto compactor for I.S light and heavy compaction tests.
- Shaking table, funnel for sand raining technique.
- Apparatus for CBR test
- 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
- One dimensional consolation test apparatus with all accessories.
- Triaxial cell with provision for accommodating 38 mm dia specimens.
- Box shear test apparatus
- Laboratory vane shears apparatus.
- Hot air ovens (range of temperature 500 - 1500C

**FLUID MECHANICS & HYDRAULIC MECHINERY LAB**
SEMESTER - V

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|---|---|---|---|
| Subject Code | **18CECEL5080** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course objectives:**

1. Determination of flow of fluids
2. Determination of coefficient of discharge and loss of head in flow
3. Determination of the efficiency of various turbines and pumps

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|---|---|
| 1. Calibration of Venturimeter & Orifice meter<br>2. Determination of Coefficient of discharge for a small orifice by a constant head method.<br>3. Determination of Coefficient of discharge for an external mouth piece by variable head method.<br>4. Calibration of contracted Rectangular Notch and /or Triangular Notch<br>5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.<br>6. Verification of Bernoulli's equation.<br>7. Impact of jet on vanes<br>8. Study of Hydraulic jump.<br>9. Performance test on Pelton wheel turbine<br>10. Performance test on Francis turbine.<br>11. Efficiency test on centrifugal pump.<br>12. Efficiency test on reciprocating pump | 36 Hours |

**Course outcomes:** After studying this course, students will be able to:

1. Determine rate of flow in fluids
2. Determine coefficient of discharge and loss of head in flow
3. Determine the efficiency of various turbines and pumps

**Hardware/Software Requirements:**

- Venturimeter setup.
- Orifice meter setup.
- Small orifice setup.
- External mouthpiece setup.
- Rectangular and Triangular notch setups.
- Friction factor test setup.
- Bernoulli's theorem setup
- Impact of jets.
- Hydraulic jump test setup.
- Pelton wheel and Francis turbines.
- Centrifugal and Reciprocating pumps

| SOFT SKILLS & APTITUDE BUILDER - 1 | | | |
|---|---|---|---|
| Subject Code | **18CEAHS5090** | IA Marks | 15 |
| Number of Practice Hours/Week | 4 | Exam Marks | 35 |
| Total Number of Practice Hours | 64 | Exam Hours | 3 |
| **Credits - 2** | | | |
| **Section A**<br>**Soft Skills** | | | |
| **Unit – 1: Intrapersonal Communication** | | | **Hours** |
| Introduction to Soft Skills and its Significance<br>**Personal Effectiveness**: Who am I and What am I; My Strengths and Weaknesses; SWOT Analysis; SMART Goal Setting; Being Proactive<br>**Principles of Personal Vision**: Beginning with the End in Mind; Time Management: Understanding Priorities; Put First-Things-First<br>**Activity**: Psychometric Tests and SWOT Analysis, SMART Goal Setting | | | **11** |
| **Unit 2: Interpersonal Communication** | | | |
| **Principles of Creative Cooperation and Organisation Skills**: Think Win-Win; Seek First to Understand then to be Understood; Synergize; Life-Long Learning<br>**Emotional Intelligence**: Self-Awareness, Self-Regulation, Empathy, Assertiveness, Adoptability, Managing Emotions<br>**Activity**: Resolving a Conflict with your Friend/Colleague/Family Member; Group Discussions & Debates | | | **11** |
| **Unit – 3: 21st Century Skills** | | | |
| **What are 21st Century Skills? Learning Skills- Digital Literacy- Life Skills**<br>**Critical Thinking**: Active Listening, Observation, Introspection, Analytical Thinking, Open Mindedness<br>**Problem Solving**: Understanding the Complexity of the Problem, Defining the Problem, Cause and Effect Analysis, Exploring Possible Solutions, Planning Actions, Analysing Results of your Actions, Getting Feedback, Redefining the Problem, The Problem Solving Cycle<br>**Decision Making**: Managing Conflict, Conflict Resolution, Methods of Decision Making, Effective Decision Making in Teams – Methods & Styles<br>**Activity**: Case Study | | | **10** |
| **Section B**<br>**Aptitude Builder** | | | |
| **Unit – 4: Ratios & Percentages** | | | |
| Definition of Ratio, Properties of Ratios, Comparison of Ratios, Problems on Ratios, Compound Ratio, Problems on Proportion, Mean Proportional and Continued Proportion.<br>**Partnership:** Introduction, Relation between Capitals, Period of Investments and Shares<br>**Number System:** Classification of Numbers, Divisibility Rules, Finding the Units Digit, Finding Remainders in Divisions Involving Higher Powers, LCM and HCF Models<br>**Percentages:** Introduction, Converting a Percentage into Decimals, Converting a Decimal into Percentage, Percentage Equivalent of Fractions, Problems on Percentages<br>**Profit And Loss:** Problems on Profit and Loss Percentage, Relation between Cost Price and Selling Price, Discount and Marked Price, Two Different Articles Sold at Same Cost Price, Two Different Articles Sold at Same Selling Price | | | **16** |

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| Gain% / Loss% on Selling Price<br>**Problems on Ages:** Introduction, Problems based on Ages<br>**Averages:** Definition of Average, Rules of Average, Problems on Average , Problems on Weighted Average, Finding Average using Assumed Mean Method<br>**Alligation and Mixture:** Problems on Mixtures, Alligation Rule, Problems on Alligation | |
| **Unit – 5: Mental Ability** | |
| Difference Series, Product Series, Squares Series, Cubes Series, Alternate Series Combination Series, Miscellaneous Series, Place Values of Letters<br>**Number and Letter Analogies:** Definition of Analogy, Problems on Number Analogy, Problems on Letter Analogy, Problems on Verbal Analogy<br>**Odd Man Out:** Problems on Number Odd Man Out, Problems on Letter Odd Man Out, Problems on Verbal Odd Man Out<br>**Coding and Decoding:** Coding using Same Set of Letter, Coding using Different Set of Letters, Coding into a Number, Problems on R-Model<br>**Blood relations:** Defining the Various Relations among the Members of a Family, Solving Blood Relation Puzzles, Solving the Problems on Blood Relations using Symbols and Notations<br>**Direction Sense:** Solving Problems by Drawing the Paths, Finding the Net Distance Travelled, Finding the Direction, Problems on Clocks ,Problems on Shadows | **16** |
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| **Section-A: Text (T) / Reference (R ) Books:** | |
| **For Units 1, 2, & 3** | |
| T1 | English and Soft Skills, Dr. S. P. Dhanvel, Orient Blackswan, 2011 |
| R1 | Seven Habits of Highly Effective People, Stephen R Covey |
| R2 | Emotional Intelligence, Daniel Goleman, Bantom Book, 2006 |
| R3 | 21st Century Skills: Learning for Life in our Times, Bernie Trilling, Charles Fadel; John Wiley & Sons |
| **For Units 4&5** | |
| T1 | R S Agarwal, S Chand, 'Quantitative Aptitude' |
| T2 | R S Agarwal, S.Chand , 'A Modern Approach to Logical Reasoning' |
| R1 | Quantitative Aptitude for CAT By Arun Sharma |
| R2 | GL Barrons, Mc Graw Hills, Thorpe's Verbal Reasoning, LSAT Materials |
| **Course Outcomes: On completion of this course, students can** | |
| **Section A: Soft Skills** | |
| **CO1** | re-engineer attitude and understand its influence on behaviour |
| **CO 2** | develop interpersonal skills and be an effective goal oriented team player |
| **CO 3** | develop holistic personality with a mature outlook to function effectively in different circumstances |
| Section B: Aptitude Builder | |
| **CO 4** | solve the real-time problems for performing job functions easily |
| **CO 5** | analyse the problems logically and critically |

| BIOLOGY FOR ENGINEERS<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CMBIT6000** | IA Marks | 30 |
| Number of Lecture Hours/Week | 02 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry
2. To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.
3. To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"
4. To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine
5. To convey that without catalysis life would not have existed on earth
6. The molecular basis of coding and decoding genetic information is universal
7. How to analyses biological processes at the reductionistic level
8. The fundamental principles of energy transactions are the same in physical and biological world.

| **Unit -1 Introduction** | **Hours** |
|---|---|
| Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry | **10** |
| **Unit -2 Classification** | |
| Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultra-structure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophy, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. Musculus | **10** |
| **Unit – 3 Genetics & Bio molecules** | |
| Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.<br>**Molecules of life:** In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids. | **10** |

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| **Unit – 4 Enzymes & Information Transfer Purpose** | |
| **Enzymology:** How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.<br>Information Transfer Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosides. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination | **10** |
| **Unit – 5 Microbiology & Metabolism** | |
| Macromolecular analysis Purpose: How to analyses biological processes at the reductionistic level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.<br>Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge<br>**Concept of single celled organisms**. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics | **10** |

**Course outcomes:**

On completion of this course, students are able to

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
4. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
5. Classify enzymes and distinguish between different mechanisms of enzyme action.

**TEXT BOOKS**


1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons


**REFERENCES**


1. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
2. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

| THEORY OF STRUCTURES-II<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | 18CECET6010 | IA Marks | 30 |
| Number of Lecture Hours/Week | 3 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
2. To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions
3. The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
4. The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section

| **Unit -1 Introduction to statically indeterminate beams** | **Hours** |
|---|---|
| Types of structures, Indeterminacy-external ,internal, frames, trusses<br>**Propped Cantilevers** Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.<br>**Fixed Beams** : Analysis of Fixed beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support | **10** |
| **Unit -2 Slope Deflection Method and Clapeyron's Methods** | |
| Slope Deflection Equations Derivation, application to continuous beams with and without settlement of supports.<br>Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams | **10** |
| **Unit – 3 Moment Distribution and Kani's Method** | |
| **Moment Distribution:** Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycle.<br>**Kani's Method** :Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway | **10** |
| **Unit – 4 Energy Theorems:** | |
| Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed trusses. | **10** |
| **Unit – 5 Moving Loads And Influence Lines** | |
| Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load- | **10** |

| | |
|---|---|
| Focal length.<br>INFLUENCE LINES: Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses. | |

**Course outcomes:**

On completion of this course, students are able to

1. Distinguish between the determinate and indeterminate structures.
2. Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure.
3. Estimate the bending moment and shear forces in beams for different fixity conditions.
4. Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.
5. Draw the influence line diagrams for various types of moving loads on beams/bridges.
6. Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.

**TEXT BOOKS**


1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
3. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi


**REFERENCES**


1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai
5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli, Yesdee Publishing Pvt Limited, Chennai

| DESIGN OF STEEL STRUCTURES<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECET6020** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Familiarize Students with different types of Connections and relevant IS codes
2. Equip student with concepts of design of flexural members
3. Understand Design Concepts of tension and compression members in trusses
4. Familiarize students with different types of columns and column bases and their Design
5. Familiarize students with Plate girder and Gantry Girder and their Design

| **Unit -1** | **Hours** |
|---|---|
| Properties of materials; loads and stresses, Optimization Design of Industrial Structures; Connections ,Welded and Riveted Built-up sections Design of tension members subjected to axial tension and bending, splicing of tension members | **10** |
| **Unit -2** | |
| Design of compression members, Design of columns accounting to Lateral Buckling | **10** |
| **Unit – 3** | |
| Design of Column Splices and built up Columns with lacing and battening. Design of column base: Slab base and Gusseted base, Design of Eccentric Connections | **10** |
| **Unit – 4** | |
| Design of Beams: Laterally supported and laterally unsupported beams - Bending Strength of Beams, check for shear and deflection, web buckling and web crippling, Modes of Failures. | **10** |
| **Unit – 5** | |
| Design of Plate Girder and Gantry Girder. | **10** |

**Course Outcomes**:

On successful completion of this course, students will be able to

1. Design with different types of connections.
2. Design of columns with and without lateral buckling
3. Design of column bases.
4. Design the beams.
5. Design the plate girder.
6. Design the gantry Girder

**TEXT BOOKS**


1. Steel Structures Design and Practice, N. Subramanian, Oxford University Press-2008
2. Design of steel structures, S. K. Duggal, Tata McGraw Hill, New Delhi- 2017
3. Design of Steel Structures S. S. Bhavikatti, I. K International Publishing House Pvt. Ltd-2009.


**REFERENCES**


1. Structural Design in Steel, Sarwar AlamRaz, New Age International Publishers, New
1. Delhi
2. Design of Steel Structures, M. Raghupathi, Tata Mc. Graw-Hill

3. Structural Design and Drawing, N. Krishna Raju; University Press,

**IS Codes:**

1. Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi, 2008.
2. IS: 800- 2007, IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5), Bureau of Indian standards.
3. Steel Tables.

These codes and steel tables are permitted to use in the examinations.

| STRUCTURAL DESIGN AND DRAWING LAB<br>SEMESTER - VI | | | |
|---|---|---|---|
| **Subject Code** | **18CECEL6060** | **Internal Marks** | 15 |
| **Number of Lecture Hours/Week** | 03 | **External Marks** | 35 |
| **Total Number of Lecture Hours** | 36 | **Exam Hours** | 03 |
| **Credits – 1.5** | | | |

**Course objectives:** To understand design principles and drawing of various concrete structures and steel structures

| | |
|---|---|
| **Foundations: Footings, Columns**<br>**Beams:** Types, design principles of Singly and doubly reinforced beams<br>**Slabs**: Types, design principles of One way and two way slabs<br>**Steel Built-up Columns**: Types and design principles of built-up columns with lacing and battens.<br>**Steel Column Bases:** Types and design principles (slab base and gusseted base).<br>**Plate Girders:** Types and design of plate girder. | **12 Hours** |
| 1. Foundation: Footings<br>2. Columns<br>3. Singly and Doubly reinforced beam<br>4. One way slab<br>5. Two way slab<br>6. Staircase<br>7. Built up steel column with lacing and battening<br>8. Slab base, Gusseted base<br>9. Plate girder | **24 Hours** |

**Course outcomes:** On successful completion of this course, students will be able to design principles and drawing of various concrete structures and steel structures

**Hardware/Software Requirements:**

1. Mini drafter
2. Drawing tools

**SOFTWARE APPLICATIONS IN CIVIL ENGINEERING LAB**
SEMESTER - VI

| | | | |
|---|---|---|---|
| Subject Code | **18CECEL6070** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**Credits – 1.5**

**Course objectives:**

1. Introduce image processing and GIS software
2. familiarize structural analysis software
3. learn to analyze 2 D and 3D frame steel tubular truss using structural analysis software

| | |
|---|---|
| **GIS SOFTWARES:**<br>1. Arc GIS 9.0<br>2. ERDAS 8.7<br>3. MapInfo 6.5<br>4. QCAD<br>Any one or Equivalent.<br>**EXCERCISES IN GIS:**<br>1. Digitization of Map/Toposheet<br>2. Creation of thematic maps.<br>3. Estimation of features and interpretation<br>4. Developing Digital Elevation model<br>5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.<br>**COMPUTER AIDED DESIGN AND DRAWING:**<br>**SOFTWARE:**<br>1. STAAD Pro / Equivalent/<br>2. STRAAP<br>3. STUDDS<br>**EXCERCISIES:**<br>1. 2-D Frame Analysis and Design<br>2. Steel Tabular Truss Analysis and Design<br>3. 3-D Frame Analysis and Design<br>4. Retaining Wall Analysis and Design<br>5. Simple Tower Analysis and Design | **36 Hours** |

Course outcomes: After studying this course, students will be able to:

1. Work comfortably on GIS software
2. Digitize and create thematic map and extract important features
3. Develop digital elevation model
4. Use structural analysis software to analyze and design 2D and 3D frames
5. Design and analyze retaining wall and simple towers using CADD software.

**Hardware/Software Requirements:**

Computer lab with all required facilities

| SURVEYING FIELD CAMP<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject code | **18CECEL6080** | Internal Marks | 15 |
| Number of Hours/Week | 03 | Exam Marks | 35 |
| Total Number of Lecture hours | 36 | Exam Hours | 3 |
| **Credits -1.5** | | | |

**Course Objectives:**

This course will enable students to:

Familiar with basic principles of surveying and surveying instruments

**Course outcomes:**

On completion of this course, the students will be able to

1. Apply basic principles of surveying in plotting and measuring of area, length etc.
2. Use of various surveying instruments in plotting and prepare of maps such as contours, road profile, layout map etc.

| SOFT SKILLS & APTITUDE BUILDER - 2 | | | |
|---|---|---|---|
| Subject Code | 18CEAHS6090 | IA Marks | 15 |
| Number of Practice Hours/Week | 4 | Exam Marks | 35 |
| Total Number of Practice Hours | 64 | Exam Hours | 3 |
| **Credits - 2** | | | |
| **Section A**<br>**Soft Skills** | | | |
| **Unit – 1: Communicative Competence** | | | **Hours** |
| Verbal Reasoning: Selecting Words, Spotting Errors, Ordering of Words, Sentence Formation, Paragraph Formation, Ordering of Sentences, Reading Comprehension, Completing Statements, Verbal Analogies, Cause and Effect, Syllogism, Logical Sequence of Words, Verbal Reasoning, Analysing Arguments, Verification of Truth, Matching Definitions, Theme Detection<br>E-Mail Etiquette, Reporting News<br>Activity: Completing Textual Exercises | | | **16** |
| **Unit 2: Career and Employability Skills** | | | |
| What is a Career: Career vs Job, Career Values & Grid, Skills vs Strengths, Spotting Skills/Reflection of Present Skills, Meeting the Expectation of your Employer, Matching your Skills with the Required Skills, Preparing Resume, Preparing for Interviews & Structuring Answers<br>Activity: Resume Building, Interviews, Presentations, Digital Resumes | | | **16** |
| **Section B**<br>**Aptitude Builder** | | | |
| **Unit – 3: Time and Work** | | | |
| **Pipes and Cisterns:** Problems on Unitary method, Relation between Men, Days, Hours and Work, Problems on Man-Day-Hours Method, Problems on Alternate Days, Problems on Pipes and Cisterns.<br>**Time , Distance and Speed, Problems on Trains, Boats and Streams:** Relation between Speed, Distance and Time, Converting km/h into m/s and vice versa , Problems on Average Speed, Problems on Relative Speed, Problems on Circular Tracks, Problems on Races<br>**Problems on Trains:** Two Trains Moving in Opposite Direction, Two Trains Moving in same Direction, A Train Crossing a Stationary Object of a Given Length like a Platform or Bridge, A Train Crossing a Stationary Object like a Pole or a Man **Boats and Streams:** Time Based, which can be considered as a Point Object Speed Based, Distance Based, Average Speed Based | | | **11** |
| **Unit – 4: Logical and Analytical Reasoning** | | | |
| **Seating Arrangement:** Linear Arrangement, Circular Arrangement, Tabler, Triangular Arrangement, Complex Arrangement**.**<br>**Clocks :** Finding the Angle When the Time is Given, Finding the Time When the Angle is Known, Relation between Angles, Minutes and Hours, Position of Hands of the Clock, Time Gained or Lost by the Clock, Mirror /Water Image-based Time.<br>**Calendars :** Definition of a Leap Year, Finding the Number of Odd Days, Framing the Year Code for Centuries, Finding the Day of any Random Calendar Date<br>**Syllogisms:** Finding the Conclusions using Venn Diagram Method, Finding the Conclusions using Syllogism Method | | | **11** |

| | |
|---|---|
| **Simple Interest:** Definitions, Problems on Interest and Amount, Problems when Rate of Interest and Time Period are Numerically Equal<br>**Compound Interest:** Definition and Formula for Amount in Compound Interest, Difference between Simple Interest and Compound Interest for 2 Years on the Same Principle and Time Period. | |
| **Unit – 5: Permutations, Probability, Areas and Volumes** | |
| Definition of permutation , Problems on Permutations , Definition of Combinations , problems on Combinations<br>**Probability:** Definition of Probability, Problems on Coins, Problems on Dice, Problems on Deck of Cards , Problems on Years<br>**Mensuration - 2D:** Formulas for Areas, Formulas for Volumes of Different Solids, Problems on Areas<br>**Mensuration - 3D:** Problems on Volumes, Problems on Surface Areas | **10** |
| **Text (T) / Reference (R ) Books:** | |
| **For Units 1 & 2** | |
| **T1** | R.S. Agarwal, Verbal & Non-Verbal Reasoning, S. Chand & Co., Latest ed. 2003 |
| **T2** | Soft Skills: Enhancing Employability: Connecting Campus with Corporate by MS Rao, IK International Publishing House |
| **R2** | How to Prepare for Verbal Ability and Reading Comprehension, Arun Sharma, Meenakshi Upadhay, Mc Graw Hill |
| **For Units 3, 4, & 5** | |
| T1 | R S Agarwal, S Chand, 'Quantitative Aptitude' |
| T2 | R S Agarwal, S.Chand , 'A modern approach to Logical reasoning' |
| R1 | Quantitative Aptitude for CAT By Arun sharma |
| R2 | GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials |
| **Course Outcomes: On completion of this course, students can** | |
| **Section A: Soft Skills** | |
| **CO 1** | learn and practice effective communication skills |
| **CO 2** | develop broad career plans, evaluate the employment market, and become industry ready |
| Section B: Aptitude Builder | |
| **CO 3** | develop accuracy on time and distance and units related solutions |
| **CO 4** | solve the real-time problems for performing job functions easily |
| **CO 5** | solve problems related to permutations and combinations, probability, areas and volumes |

## Professional Elective Courses:

| | | |
|---|---|---|
| Elective -I | 18CECEP506a | Solid and Hazardous Waste management |
| | 18CECEP506b | Architecture & Town Planning |
| | 18CECEP506c | Advanced Transportation Engineering |
| | 18CECEP506d | Sustainable construction methods for buildings |
| Elective -II | 18CECEP605a | Transportation Economics |
| | 18CECEP605b | Advanced Concrete Technology |
| | 18CECEP605c | Remote Sensing & GIS Applications |
| | 18CECEP605d | Foundation Engineering |
| Elective -III | 18CECEP606a | Ground Improvement Techniques |
| | 18CECEP606b | Surface water Hydrology |
| | 18CECEP606c | Offshore Engineering |
| | 18CECEP606d | Rural Water Supply and Onsite Sanitation Systems |

| SOLID AND HAZARDOUS WASTE MANAGEMENT<br>SEMESTER – V | | | |
|---|---|---|---|
| Subject Code | **18CECEP506a** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Impart the basic knowledge of solid waste management.
2. Know the various methods solid waste collection.
3. Knowledge about waste minimization.
4. Study the design and operation of solid waste disposal.
5. Understand the hazardous waste management techniques.

| **Unit -1** | **Hours** |
|---|---|
| Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities, Terms related ISWM like WTE, ULB, TLV etc.. | **10** |
| **Unit -2** | |
| Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system. | **10** |
| **Unit – 3** | |
| Transfer, Transport and Transformation of Waste: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements. Unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization. Warm composting, vermin composting | **10** |
| **Unit – 4** | |
| Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation. Case studies. | **10** |
| **Unit – 5** | |
| Hazardous Waste Management: sources, collection, transport, treatment and disposal methods. Incineration, Biomedical waste management, e-waste management and nuclear waste management. | **10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Understand the different solid waste management techniques.
2. Choose appropriate method of solid waste.
3. Suggest the solid waste minimization technique.
4. Design the solid waste management method.
5. Suggest the appropriate hazardous waste management technique.

**Text Books:**

1. Integrated Solid Waste Management, George Techobanoglous, McGraw Hill Publication, 1993
2. Solid Waste Engineering, Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
3. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995

**Reference Books**:

1. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distriburs. New Delhi, 2016.
2. Solid Waste Engineering, William A Worrell, P Aarue Vesilind, Cengage Learning, New Delhi 2016.

| ARCHITECTURE & TOWN PLANNING<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECEP506b** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.
4. To enable the student to understand town planning from ancient times to modern times.
5. To impart the concepts of town planning standards, land scaping and expansion of towns.

| **Unit -1** | **Hours** |
|---|---|
| **History of Architecture:** Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas Hindu temples: Dravidian and Indo Aryan Styles-Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb. | **10** |
| **Unit -2** | |
| **Architectural Design**: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression | **10** |
| **Unit – 3** | |
| **Principles of Planning:** Principles of planninga residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.<br>**Post-classic Architecture:** Introduction of post-classic architecture-contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping | **10** |
| **Unit – 4** | |
| **Historical Back Ground of Town Planning:** Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjo-Daro, Pataliputra | **10** |
| **Unit – 5** | |
| **Modern Town Planning:** Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning-Neighbourhood Planning.<br>**Standards of Town planning:** Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations. | **10** |

**Course Outcomes:** upon successful completion of the Course students will be able to,

1. Distinguish architectural styles of eastern and western world.

2. Understand the importance of orders o f architecture.
3. Understand the principals of Composition
4. Should be able to compose spaces of buildings using design concepts, planning principles.
5. Should understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

**Text Books:**

1. The great ages of World Architecture' by G.K. Hiraskar.
2. Planning and Design of Buildings by Section of Architecture' by Y.S. Sane
3. Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
4. Fundamentals of Town Planning'by G.K. Haraskar

**Reference Books:**

1. Drafting and Design for Architecture' by Hepler, Cengage Learning
2. Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. Mordern Ideal Homes for India' by R. S. Deshpande.
4. Town and County Planning'by A.J.Brown and H.M.Sherrard.
5. Town Design'by Federik Glbbard, Architectural press, London.

| ADVANCED TRANSPORTATION ENGINEERING<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECEP506c** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Know various components and their functions in a Railway Track
2. Know the construction and maintenance of a Railway Track including Signaling
3. Know the construction and maintenance of harbors and docks.
4. Acquire strong base in planning principles of airport geometrics and pavements
5. Acquire strong base in design principles of airport geometrics and pavements

| **Unit -1** | **Hours** |
|---|---|
| **Permanent way:** Functions and requirements of permanent way - components - typical cross sections - gauges - functions and requirements of components of permanent way - sleeper density - coning of wheels creep and wear in rails - rail fasteners - defects, failures and joints in rails - Geometric design of railway track - horizontal curves - super elevation - cant deficiency - negative super elevation | **10** |
| **Unit -2** | |
| **Signaling and interlocking:-** Signal control systems - points and crossings - track junctions – track circuiting - track alignment<br>**Railway Track construction and maintenance:-** Construction of railway track- earth work plate laying and packing-maintenance of track - alignment - gauge-renewal of component parts-drainage - modern methods of track maintenance. | **10** |
| **Unit – 3** | |
| **Airport Planning and Characteristics:** Airport classification based on ICAO, airport components, Aero plane components; Air–craft characteristics; Selection of site for airport; Surveys for site selection<br>**Airport Obstructions:** Zoning laws, Imaginary surfaces, Approach zone, turning zone,<br>**Run Ways:** . orientation- cross wind component, wind rose diagram, types of wind rose; Basic runway length; Corrections for elevation, Temperature and gradient | **10** |
| **Unit – 4** | |
| **Runway Design:** Principles of Runway design.<br>**Structural Design of Pavement Flexible Pavement:** Various design factors, Design methods for flexible airfield Pavement-CBR Method, Mcleod Method and Burmister's Method.<br>**Structural Design of Rigid Pavement:** Rigid pavement Design- PCA Method; LCN Method of pavement design. | **10** |
| **Unit – 5** | |
| **Elements of harbor** - ports - various design considerations of a harbour - classifications - site selection factors - wet and dry docks - lock and lock gates - site selection, configuration and types of breakwaters - details of quays, piers, fenders, dolphins, slipways - transit shed and warehouse - navigational aids | **10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Design Geometrics of a Railway Track
2. Understands the concepts of Signaling and Railway track Maintenance.
3. Design the flexible and rigid runways.
4. Construct and Maintain Docks and Harbor
5. Understand & Evaluate airport & aircraft characteristics

**Text Books:**

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora – Nemchand Bros, New Delhi
3. Docks and Harbour Engineering by Bindra S.P – Dhanpathi Rai & Sons, New Delhi

**Reference Books**:

1. Railway Engineering by Saxena & Arora – Dhanpat Rai Publishers, New Delhi
2. Airport Engineering by Virendra Kumar, – Dhanpat Rai Publishers, New Delhi
3. Transportation Engineering by Srinivasa Kumar R, University Press, Hyderabad
4. Relevant Indian Standard Codes

| SUSTAINABLE CONSTRUCTION METHODS FOR BUILDINGS<br>SEMESTER - V | | | |
|---|---|---|---|
| Subject Code | **18CECEP506d** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 03**

**Course Learning Objectives:**

This course will enable students to:

1. Know the factors to be considered in planning and construction of buildings.
2. Familiarize the precast construction practices and techniques
3. Know building form work and staging
4. Know about cutting edge sustainable construction materials.
5. Acquaint with the techniques of fire resistance and thermal insulation

| **Unit -1** | **Hours** |
|---|---|
| Functional Planning of buildings: General aspects to consider for planning, bye-laws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its different elements, Components of building | **10** |
| **Unit -2** | |
| Types of foundations and construction methods: Basics of form work and staging, common building construction methods(conventional walls and slab, conventional framed structure with block work walls), Modular construction methods for repetitive works , precast concrete construction methods, , Basics of slip form for tall Structures , Basics of construction methods for bridges. | **10** |
| **Unit – 3** | |
| Precast Doors and Windows: Location of roofs and windows, Definition of technical terms, Size of doors and windows, Door frames, Types of doors and windows, Ventilators, Fixtures and fastenings.<br>Floors and Roofs: Components of a floor, materials used for floor construction, Different types of flooring, Ground floor and upper floors, Types of roofs, Basic roofing elements and Roof coverings. | **10** |
| **Unit – 4** | |
| Identification of cutting edge sustainable construction materials, technologies and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative Environmental impacts of construction activity Masonry. | **10** |
| **Unit – 5** | |
| Fire protection and Thermal insulation: Causes and effect of dampness on buildings, Fire hazards, Grading of buildings according to fire resistance, Fire resisting properties of common building materials, Fire resistant construction, General methods of thermal insulation and thermal insulating materials, Safety and Security measures.. | **10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Identify the factors to be considered in planning and construction of buildings.
2. Understand the precast construction practices and techniques
3. Plan the building form work and staging.
4. Describe the cutting edge sustainable materials and activities.

5. Understand the techniques of fire resistance and thermal insulation

**Text Books:**

1. Varghese P. C. Building construction, PHI Learning Pvt. Ltd., 2008.
2. Punmia B. C., Jain A. J. and Jain A. J. Building construction, Laxmi Publications, 2005.

**References:**

1. Arora S. P., and Bindra S. P. The text book of building construction, Dhanpat Rai Publications, 2010.

| TRANSPORTATION ECONOMICS<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP605a** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Study the concepts in transportation decision making.
2. Learn about transportation costs.
3. Understand the vehicle operating cost
4. Familiarize with the formulation of project alternatives and applying the economic analysis methods
5. Understand the principles and procedure of financing of road projects.

| **Unit -1** | |
|---|---|
| Introductory Concepts in Transportation Decision Making: Overall transportation project development, budgeting, financial planning, the process of transportation project development, models associated with transportation impact evaluation. | **Hours – 10** |
| **Unit -2** | |
| Transportation costs - Classification of transportation costs, transportation agency costs, transportation user costs, general structure and behavior of cost functions and road pricing. Estimating Transportation Demand and Supply - supply equilibration, dynamics of transportation demand and supply, elasticity of travel demand and supply, classification of elasticity. | **Hours – 10** |
| **Unit – 3** | |
| Vehicle operating costs: Fuel costs - Maintenance and spares, Depreciation - Crew costs - Value of travel time savings - Accident costs. Economics of traffic congestion - Pricing policy. | **Hours – 10** |
| **Unit – 4** | |
| Economic analysis of projects - Methods of evaluation - Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods; Indirect costs and benefits of transport projects. | **Hours – 10** |
| **Unit – 5** | |
| Financing of road projects - methods – Private Public Partnership (PPP) - ll collection - Economic viability of Design-Build-Operate-Transfer Schemes – Risk Analysis – B/C Ratio Analysis-Value for Money analysis - Case Studies. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Understand the concepts of decision making in finance budgeting
2. Assess transportation demand and supply
3. Estimate vehicle operation cost and accident cost
4. Perform economic analysis of a transportation project
5. Apply various financing methods in road projects

**Text Books:**


1. Winfrey, Economic analysis for Highways, International Textbook Company, Pennsylvania, 1969.
2. Traffic Engineering and Transport Planning - L.R Kadiyali, Khanna Publishers.

3. CRRI, Road User Cost Study in India, New Delhi, 1982
4. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007

**Reference Books**:

1. Road Project Appraisal, for Developing Countries, J.W.Dickey ,John Wiley & Sons.
2. a). Chisty Fundamental of T.P. Engineering, by C.J. Chisty.
   b). Transportation Engineering & Planning by C.S. Papacostas.

| ADVANCED CONCRETE TECHNOLOGY<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP605b** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Identify the aggregate and cement properties
2. Understand the behavior of fresh and hardened concrete.
3. Make aware the recent developments in concrete technology
4. Understand factors affecting the strength, workability and durability of concrete
5. Impart the methods of proportioning of concrete mixtures.

| | |
|---|---|
| **Unit -1** | |
| Aggregates: Geology aspects, Review of types; sampling and testing; effects on properties of concrete, production of artificial aggregates. Introduction ASR.<br>Special Cements: Review of types of cements, chemical composition; properties and tests, chemical and physical process of hydration, | Hours – 10 |
| **Unit -2** | |
| Mineral Admixtures: Chemical Admixtures, Flyash, ground granulated blast furnace slag, metakaolin, rice-husk ash and silica fume; chemical composition; physical characteristics; effects on properties of concrete; advantages and disadvantages; proportioning of concrete mixtures: Factors considered in the design of mix; BIS Method, ACI method, Durability aspects. | Hours – 10 |
| **Unit – 3** | |
| Durability of concrete: Durability concept; factors affecting, reinforcement corrosion; fire resistance; frost damage; sulphate attack; alkali silica reaction; concrete in sea water, statistical quality control, acceptance criteria as per BIS code | Hours – 10 |
| **Unit – 4** | |
| Non-destructive testing of concrete: Surface Hardness, Ultrasonic, Penetration resistance, Pull-out test, chemical testing for chloride and carbonation- core cutting - measuring reinforcement cover. Basics on Thermal studies. | Hours – 10 |
| **Unit – 5** | |
| Special concretes- Special processes and technology for particular types of structure - Roller compacted concrete – Ready mix concrete, Sprayed concrete; underwater concrete, mass concrete; slip form construction, Prefabrication technology, Viscosity and air entrained agents. | Hours – 10 |

**Course outcomes:**

On successful completion of this course, students will be able to

1.Understand the testing of concrete materials as per IS code
2. Know the procedure to determine the properties of fresh and hardened of concrete
3. Design the concrete mix using ACI and IS code methods
4. Select and Design special concretes depending on their specific applications
5. Acquaint with non-destructive testing of concrete

**Text Books:**

1. Neville A.M.,"Properties of Concrete", Trans-Atlantic Publications, Inc.; 5e, 2012
2. Job Thomas., " Concrete Technology", Cengage learning,
3. R. Santhakumar „ Concrete Technology", Oxford Universities Press, 2006
4. Shetty M. S., Concrete Technology", S. Chand & Co., 2006
5. All relavent IS Codes in each Material.

**Reference Books:**

1. Mehta and Monteiro, "Concrete-Micro structure, Properties and Materials", McGraw Hill Professional
2. Neville A. M. and Brooks J. J., Concrete Technology, Pearson Education, 2010
3. Lea, "Chemistry of Cement and Concrete", Butterworth-Heinemann Ltd, 5e, 2017
4. Bungey, Millard, Grantham – Testing of Concrete in Structures- Taylor and Francis, 2006

| REMOTE SENSING & GIS APPLICATIONS<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP605c** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives**

1. Introduce the basic principles of Remote Sensing and GIS techniques and Learn various types of sensors and platforms
2. Learn visual image interpretation & processing of digital image
3. Understand the concept of GIS and Understand different types of spatial data
4. Understand the principles of spatial analysis
5. Appreciate application of RS and GIS to Civil engineering
6. Appreciate application of RS and GIS to water management

| **Unit -1 Introduction** | |
|---|---|
| Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems.<br>**Sensors and platforms:** Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT. | **Hours – 10** |
| **Unit -2 Image analysis** | |
| **Image analysis: I**ntroduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification unsupervised classification | |
| **Unit – 3 Geographic Information System:** | |
| **Geographic Information System:** Introduction, key components, application areas of GIS, map projections. **Data entry and preparation**: spatial data input, raster data models, vector data models. | **Hours – 10** |
| **Unit – 4 Spatial data analysis**: | |
| **Spatial data analysis**: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing | **Hours – 10** |
| **Unit – 5 RS and GIS applications** | |
| **RS and GIS applications General**: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.<br>**Application to Hydrology and Water Resources: F**lood zoning and mapping, groundwater prospects and potential recharge zones, watershed management | **Hours – 10** |

**Course Outcomes**

1. An idea about basic process of Remote sensing and Be familiar with ground, air and satellite based sensor platforms(B.T.L-1)
2. Interpret the aerial photographs and satellite imageries(B.T.L-1)
3. GIS as an emerging tool for several civil engineering applications and Raster and Vector formats of data and their usage in GIS(B.T.L-3)
4. Create and input spatial data for GIS application(B.T.L-2)
5. Apply RS and GIS concepts in land use and land cover operations(B.T.L-3)
6. Apply RS and GIS concepts in water resources engineering(B.T.L-3)

**Text Books:**


1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.


**Reference Books:**


1. Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006
3. Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.

| FOUNDATION ENGINEERING<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP605d** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. To impart to the student knowledge of types of shallow foundations and theories required for the determination of their bearing capacity.
2. To enable the student to compute immediate and consolidation settlements of shallow foundations.
3. To impart the principles of important field tests such as SPT and Plate bearing test.
4. To enable the student to imbibe the concepts of pile foundations and determine their load carrying capacity.

| **Unit -1 Soil Exploration** | |
|---|---|
| Need- Methods of Soil exploration -Sampling methods – Field tests – Penetration Tests – Pressure meter –planning of Programme and preparation of soil investigation report. | **Hours – 10** |
| **Unit -2 Earth And Earth-Retaining Structures**: | |
| Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes - Stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions<br>Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils | **Hours – 10** |
| **Unit – 3 Shallow Foundations –** | |
| **Bearing Capacity Criteria**: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods.<br>**Settlement Criteria:** Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures | **Hours – 10** |
| **Unit – 4 Pile Foundation**: | |
| Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays | **Hours – 10** |
| **Unit – 5 Well Foundations:** | |
| Types – Different shapes of well – Components of well – functions – forces acting on well foundations - Design Criteria – Determination of steining thickness and plug - construction and Sinking of wells – Tilt and shift. | **Hours – 10** |

**Course Outcomes:** Upon successful completion of the Course students will be able to,

1. Understand the various types of shallow foundations and decide on their location based on soil characteristics.
2. Compute the magnitude of foundation settlement and decide on the size of the foundation accordingly.
3. Use the field test data and arrive at the bearing capacity
4. Compute Stability of slopes of dams and embankments at different conditions
5. Apply the principles of bearing capacity of piles and design them accordingly.

**Text Books:**

1. Principles of Foundation Engineering' by Das, B.M., - (2011) –6th edition (Indian edition) Cengage learning
2. Basic and Applied Soil Mechanics' by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd, (2004).

**Reference Books:**

1. Foundation Analysis and Design' by Bowles, J.E., (1988) – 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited

| GROUND IMPROVEMENT TECHNIQUES<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP606a** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Know the need of ground improvement and feasibility of different techniques
2. Adopt different Ground Modification Techniques for improving the properties of remolded and in-situ soils by adopting different techniques
3. Learn the concepts, purpose and effects of grouting.
4. Understand the how chemical admixtures are useful in stabilization.
5. Understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
6. Know how geo textiles and geo synthetics can be used to improve the engineering performance of soils.

| **Unit -1** | |
|---|---|
| Need and objectives of Ground Improvement, Classification of Ground Modification Techniques – suitability and feasibility; Mechanical Modification , In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns. | **Hours – 10** |
| **Unit -2** | |
| Hydraulic Modification : Methods of dewatering, sumps and interceptor ditches – single and multi-stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis | **Hours – 10** |
| **Unit – 3** | |
| Physical and chemical modification: Stabilisation with admixtures like cement, lime, calcium chloride, fly ash, GGBS, polymer and bitumen. Grouting – materials and methods, Stabilization with Deep soil mixing, and stone columns. | **Hours – 10** |
| **Unit – 4** | |
| Reinforced Earth Technology: Concept of soil reinforcement, Reinforcing materials, Backfill criteria, Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing. | **Hours – 10** |
| **Unit – 5** | |
| Geotextiles: Overview on Geosynthetics – Geotextiles, Functions, properties and applications – geogrids , geomembranes and gabions - properties and applications. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Possess the knowledge of various methods of ground improvement
2. Check the suitability of various methods to different field hydraulic situations.
3. Choose different grouting methods.
4. Acquire knowledge to suggest suitable admixtures to stabilize the ground.

5. Design a reinforced earth embankment and to check its stability.
6. Apply various functions of Geosynthetics in Civil Engineering practice.

**Text Books:**

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

**Reference Books**:

1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA
2. Designing with Geosynethetics, R. M Koerner, Prentice Hall

| SURFACE WATER HYDROLOGY<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP606b** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Gain knowledge on hydrological (rainfall and runoff) cycle
2. Know the concept of measurements in watersheds
3. Understand the estimation of various hydrological parameters
4. Predict volume and rates of runoff with tools like hydrographs and unit hydrographs,
5. Understand concept of watershed management.

| | |
|---|---|
| **Unit -1** | |
| **Introduction-** Description of Hydrologic Cycle, Overview of application of hydrology in engineering. Basic concepts of weather systems, characteristics of precipitation in India. | **Hours – 10** |
| **Unit -2** | |
| Determination of net effective rainfall infiltration indices- ø &W Runoff-definition-components - direct runoff and base flow, overload flow and interflows, pictorial representation Runoff Introduction-components,. Factors affecting run off.. Runoff characteristics of streams – perennial, intermittent and ephemeral streams, Measurement of stream flows. | **Hours – 10** |
| **Unit – 3** | |
| Measurement of stage and velocities, staff gauge, wire gauge, automatic stage recorders, current meters , discharge measurement by area- velocity method, ,moving boat method ,calibration (V= a Ns + b). Rainfall-Runoff relations (R=a P + b), curve fitting and determination of 'a' and 'b' and (correlation coefficient), Stage-discharge relationship, Estimation of peak runoff and design peak runoff rate, rational method and curve number techniques. | **Hours – 10** |
| **Unit – 4** | |
| Snyder's synthetic unit hydrograph, IUH, SCS Triangular Hydrograph. The conversion of unit hydrograph duration, methods for unit hydrographs of different durations. | **Hours – 10** |
| **Unit – 5** | |
| Application of Hydrology - Flood control and Regulation, Flood mitigation, Flood plain mapping, Retards. Applications of Hydrology in land and water management, watershed management. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Acquire the knowledge of hydrological cycle(rainfall and runoff)
2. Workout the measurements in watersheds
3. Determine various hydrological parameters with appropriate techniques
4. Calculate volume and rates of runoff with tools like hydrographs and unit hydrographs,
5. Apply appropriate measures for watershed management.

**Reference Books:**

1. Engineering Hydrology. Subramanyam K. 1984. Tata Mc. Graw – Hill Publishing Co., Limited, New Delhi.
2.Hydrology for Engineers Linsley R.K. Kholer A. & Paul Hus J.L.H. 1988, Mc-Graw Hill Book Co. New Delhi.
3.Watershed Management. Dhruvanarayana, VV. 1990. ICAR Publication, New Delhi.

| OFFSHORE ENGINEERING<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | **18CECEP606c** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Understand underwater construction practice
2. Study Marine Hydrodynamics
3. Analyze marine engine systems on board the ships such as pumps, and pumping systems
4. Understand structure and properties of materials, their possible corrosion responses, and then show you how to apply these knowledge specific applications.
5. Analyze various loads which the offshore structure is subjected, types of offshore structures and various equipment's on the offshore structure loading mechanisms, mooring hardware components etc.
6. Understand ships machinery, lubrication systems, engine dynamics, relationship of engine the propeller

| **Unit -1** | |
|---|---|
| Offshore Engineering: Introduction to offshore structures, codes of practice, offshore project management, deep water, offshore site investigations, geophysical methods; offshore sediment. | **Hours – 10** |
| **Unit -2** | |
| Loads on offshore structures Wind Loads; Wave and Current Loads; Calculation based on Maximum base Shear and Overturning Moments; Design Wave heights and Spectral Hydrodynamic Application floating and submerged bodies, Hydrodynamic damping. | **Hours – 10** |
| **Unit – 3** | |
| **Marine Hydrodynamics :** Fluid pressure and centre of pressure – estimation of weight and centre of gravity – conditions of equilibrium – definition of meta-centre – hydrostatic particulars – stability at small angles of inclinations – problems of heel and trim-free surface effect. | **Hours – 10** |
| **Unit – 4** | |
| Blast Mitigation-Blast walls; Collision of Boats and energy absorption; Platform survival capacity and Plastic design methods. | **Hours – 10** |
| **Unit – 5** | |
| Soil mechanics of seabed: Geotechnical studies of sea floor sediments – Stability – Bearing capacity features of foundation of gravity structures – Bearing capacity and settlement under dynamic loads – Immediate and long term behaviour liquefaction under cyclic loads. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Understand offshore construction
2. Understand offshore structures and various equipments.

3. Analyze offshore structure loading mechanisms.
4. Design mooring hardware components.
5. Appraise Marine Hydrodynamics.
6. Understand behaviour of Floating Structures.

**Text Books:**


1. BC Grewick, Jr. Construction of marine and offshore structure, CRC Press, 2000.
2. RD Blevins, Flow induced vibrations, Van Nostrand Reinhold, 1990.
3. N Barltrop, Floating structures: A Guide for design and analysis, OPL, 1998.


**Reference Books:**


1. EE Allimendinger, Submersible vehicle systems design. SNAME, 1990.
2. HO Bordeaux, Buoy engineering, John Wiley, 1975.

| RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM<br>SEMESTER - VI | | | |
|---|---|---|---|
| Subject Code | 18CECEP606d | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

This course will enable students to:

1. Learn the concept of sanitation in rural areas.
2. Understand the water treatment methods.
3. Use important concepts of water supply systems and apply the same to problems
4. Understand the aspect of sanitary engineering.
5. Understand the various public sanitation systems.

| | |
|---|---|
| **Unit -1** | |
| Concept of Environmental and scope of sanitation in rural areas. Magnitude of problem of water Supply and sanitation – population to be covered and difficulties National policy. Various approaches for planning of water supply systems in rural areas. | **Hours – 10** |
| **Unit -2** | |
| Specific problem in rural water supply and treatment e.g. iron, manganese, fluorides etc. Low cost treatment, appropriate technology for water supply and sanitation. Improvised method and compact system of treatment of surface and ground waters. Water supply through spot sources, hand pumps, open dug–well. | **Hours – 10** |
| **Unit – 3** | |
| Planning of distribution system in rural areas; Water supply during fairs, festivals and emergencies. Treatment and disposal of wastewater/sewage. Various methods of collection and disposal of night soil-Pipe design by .EPA Net software. | **Hours – 10** |
| **Unit – 4** | |
| On site sanitation system and community latrines. Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tanks, soakage pits etc. | **Hours – 10** |
| **Unit – 5** | |
| Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings- Hospitals- Eating establishments- Swimming pools – cleanliness and maintenance and comfort- Industrial plant sanitation | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Understand definitions of the basic concept of sanitary engineering.
2. Apply suitable methods of water treatment for rural areas.
3. Understand the importance of water supply in rural areas.
4. Apply the sanitary engineering concept and principals.
5. Apply the different public sanitation methods in rural areas.

**Text Books:**


1. Low cost on site sanitation option, Hoffman & Heijno Occasional Nov.1981 paper No.21, P.O. Box 5500 2280
2. HM Rijswijk, the Netherlands offices, J.C. Mokeniaan, 5

**Reference Books**:

1. Rijswijk (the Haque). Wagner, E.G. and Lanoik, J.N. water supply for rural areas and smallCommunities, Geneva: W.H.O.1959.

**B.Tech. (Civil Engineering)**
**Semester VII (Fourth Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | **L** | T | P | |
| **1** | **PCC** | **18CECET7010** | Contracts, Specifications & Project Management | 3 | 0 | 0 | **3** |
| **2** | **PCC** | **18CECET7020** | Hydrology and water resource Engineering | 3 | 0 | 0 | **3** |
| **3** | **OE** | **18CExxO703x** | Open Elective III | 3 | 0 | 0 | **3** |
| **4** | **OE** | **18CExxO704x** | Open Elective IV | 3 | 0 | 0 | **3** |
| **5** | **PE** | **18CECEP705x** | Professional Elective IV | 3 | 0 | 0 | **3** |
| **6** | **PE** | **18CECEP706x** | Professional Elective V | 3 | 0 | 0 | **3** |
| **7** | **PCC** | **18CECEL7070** | Irrigation Engineering & Drawing Lab | 0 | 0 | 4 | **2** |
| **8** | | **18CECEL7080** | Internship with Seminar | 0 | 0 | 3 | **3** |
| **9** | **SOC** | **18CECES7090** | STAAD.Pro | 1 | 0 | 2 | **2** |
| | | | | | | **Total Credits** | **25** |

**Semester VIII (Fourth Year)**

| S.No | Course Category | Course Code | Subjects | Hours Per Week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | **L** | T | P | |
| **1.** | | | **Project** | 0 | 0 | 0 | **12** |

| CONTRACTS, SPECIFICATIONS AND PROJECT MANAGEMENT<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | **18CECET7010** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 3 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Understand the Basics of Contracts
2. Understand Technical specifications for various works
3. Estimate the total quantity and rates of materials required for the Construction
4. Analyze various units and rates of quantities utilized as a part of estimation
5. Plan the construction activities with different techniques.
6. Understand the network structure of scheduling at different stages.

| | |
|---|---|
| **Unit -1** | |
| Detailed Estimation of Buildings; using individual wall method and centerline method, Valuation of buildings. Estimation of R.C.C elements, Detailed bar bending schedule, Estimation of cost of materials, concepts and statistical measurements of the factors involved in direct costs, over head costs. | **Hours – 10** |
| **Unit -2** | |
| Rate Analysis – Working out data for various items of work over head and contingent charges. – Standard Schedule of Rates – Rate analysis for different items of work. | |
| **Unit – 3** | |
| Contracts: Introduction, Types of contracts as per Indian Contract Act 1872., Contract specifications, Contract documents, Conditions of contracts, E.P.C, L.S, International Contracts, FIDIC contract regulations specifications for different items of Building Construction. PPP Mode. | **Hours – 10** |
| **Unit – 4** | |
| **Project Management and Safety**: Definition of Projects; Stages of project planning: pretender planning, pre -construction planning, detailed construction planning, role of client and contractor, level of detail. concept of productivities, estimating durations,<br>Sequence of activities, activity utility data; Techniques of planning-<br>**Safety equipment , Safety management in laying of** in laying of RCC, earthwork, Case Study ( Polavaram Project). | **Hours – 10** |
| **Unit – 5** | |
| Work Break down Structure: Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion. | **Hours – 10** |

**Course Outcomes**:

On successful completion of this course, students will be able to

1. Illustrate about contract and tender documents
2. Understand technical specifications for various works
3. Identify various units utilized as a part of estimation
4. Compute the quantity of the different material plan details sheet.

5. Analyze the cost of the different material plan details sheet
6. Plan, control and minor construction projects with respect to time and cost.

**Text Books:**

1. Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016
2. Estimating and Costing by G.S. Birdie Dhanpat Rai Publishing Company
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.
4. Project Management by K.N.Jha
5. Construction Project Management by Chytkara.

**Reference Books**:

1. A Textbook of Estimating and Costing by R.C.Kohli, S Chand
2. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006

| HYDROLOGY AND WATER RESOURCES ENGINEERING<br>SEMESTER - VII | | | |
|---|---|---|---|
| Subject Code: | **18CECET7020** | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. Understand the concept of the hydrological cycle and Run off
2. Learn about hydrograph analysis and measurement of flood
3. Understand the measurement of ground water & irrigation system.
4. Learn about canal structures and diversion head works.
5. Learn about different types of dams and reservoirs and its site locations.
6. Understand the concept of spillways, its types and its components.

| | |
|---|---|
| **Unit -1 Introduction** | |
| **Introduction** to Hydrology and Hydrological cycle. Precipitation, Evaporation Transpiration, Evapo transpiration, Infiltration. Rain gauge network, Depth Area curves, Probable Maximum Precipitation.<br>**Runoff:** Factors affecting runoff, Stream gauging, flow mass curve and flow duration curve. | **Hours – 10** |
| **Unit -2 Hydrograph analysis & flood routing** | |
| **Hydrograph analysis:** Components of hydrograph, Unit hydrograph, S-Hydrograph, Synthetic unit hydrograph.<br>**Floods and flood routing**: Reservoir capacity and channel routing, Gumbel's And Log Pearson type-III Distribution methods. Muskingum & Puls methods of routing. Applications of Darcy's law. | **Hours – 10** |
| **Unit – 3 Water withdrawals and uses** | |
| **Ground Water:** forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests<br>**Irrigation:** Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation. | **Hours – 10** |
| **Unit – 4 Distribution systems** | |
| Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods. | **Hours – 10** |
| **Unit – 5 Dams and spillways** | |
| **Dams:** Types of dams, selection of type of Dam, selection of site for a dam. Gravity dams, Causes and failures. Forces acting on a gravity dam. Types of Earth dams, causes of failures. Yield and storage capacity of a reservoir, Reservoir sedimentation theory.<br>**Spillways:** Classifications of Spillways, Components of spillways. Types of gates for spillway crests. | **Hours – 10** |

**Course Outcomes:** after completion of this course students will able to.

1. **Remember** the hydrological cycle and its relevance to civil engineering. Make the student understand physical process in hydrology and components of hydrologic cycle, **Remember** [B.T.L-1]
2. **Understand** theory for physical process and interaction. **Understand** [B.T.L-2]
3. **Applications** of hydrologic cycle Unit hydrograph. **Application**[B.T.L-3]
4. Understand flood frequency analysis, **analysis** of design flood, flood routing [B.T.L-4]
5. **Applications** of ground water movement and well hydraulics. **Applications** [B.T.L-3]
6. **Analysis** of dams, reservoirs and components of spillways. **Analysis** [B.T.L-4]

**Text Books:**

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd

**Reference Books:**

1. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
2. Applied hydrology, Chow V. T., D. R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
3. Water Resources Engineering, Mays L.W, Wiley India Pvt. Ltd, (2013)

| IRRIGATION ENGINEERING DRAWING LAB<br>SEMESTER –VII | | | |
|---|---|---|---|
| Subject Code | **18CECEL7070** | Internal Marks | 15 |
| Number of Lecture Hours/Week | 03 | External Marks | 35 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |
| **Credits – 2** | | | |
| **Course objectives:** To understand design principle of various irrigation structures | | | |
| **Falls:** Types and location, design principles of Sarda type fall and straight glacis fall.<br>**Regulators:** Head and cross regulators, design principles<br>**Cross Drainage Works:** Types, selection, design principles of aqueduct, siphon aqueduct and super passage.<br>**Diversion Head Works:** Types of diversion head works, weirs and barrages, layout of diversion head works, components | | | **12 Hours** |
| 1. Surplus weir<br>2. Tank sluice with a tower head<br>3. Canal drop-Notch type<br>4. Canal regulator<br>5. Under tunnel<br>6. Syphon aqueduct type III | | | **24 Hours** |
| **Course outcomes:** After studying this course, students will be able to design various irrigation structures. | | | |
| **Hardware/Software Requirements:**<br>1. Mini drafter<br>2. Drawing Tools | | | |

| STAAD. Pro (SOC)<br>SEMESTER - VII | | | |
|---|---|---|---|
| Subject code | **18CECES7090** | Internal Marks | 15 |
| Number of Hours/Week | 03 | Exam Marks | 35 |
| Total Number of Lecture hours | 36 | Exam Hours | 3 |
| **Credits -2** | | | |

**Course Objectives:**

This course will enable students to:

1. To teach the students to understand the details of STAAD. Pro software package.
2. To enable the students to prepare input data for RCC &Steel structures.
3. To enable the students to design different components of structures.

**LIST OF EXPERIMENTS:**

1. Design of simply supported RCC beam.
2. Design of cantilever RCC beam.
3. Design of continuous RCC beam.
4. Design of simply supported Steel beam.
5. Design of continuous Steel beam.
6. Design of RCC columns with different end conditions.
7. Design of Steel columns with different end conditions.
8. Design of steel trusses.
9. Design of RCC portal frames.
10. Design of steel portal frames.

**Course outcomes:**

On completion of this course, the students will be able to

1. Understand the details of STAAD. Pro software package.
2. To prepare input data of STAAD. Pro.
3. Run STAAD. Pro for analysis and desing of structures.

**Text Book**

1. N. Vazirani & M. M. Ratwani, Analysis of Structures, Khanna Publishers

Reference Books

1. R. L. Jindal, Indeterminate Structures, Tata McGraw Hill Publishing House.
2. G. S. Pandit & Gupta S. P., Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.
3. Wang C. K., Matrix Method of Structural Analysis, Jon Wiley publications. 4. IS:456 -2000, IS:800-2007.

**Professional Elective Courses**

| | | |
|---|---|---|
| Elective -IV | 18CECEP705a | Advanced Structural Analysis |
| | 18CECEP705b | Environmental Impact Assessment and Environment Management Planning |
| | 18CECEP705c | Engineering with Geo-synthetics |
| | 18CECEP705d | Urban Hydrology |
| Elective -V | 18CECEP706a | Pre-Stressed Concrete |
| | 18CECEP706b | Repairs and Rehabilitation of Structures |
| | 18CECEP706c | Ground Water development & Management |
| | 18CECEP706d | Air and Noise Pollution and Control |

| ADVANCED STRUCTURAL ANALYSIS<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | **18CECEP705a** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Understand the basics of plain stress and plain strain.
2. Derive the equation of Bending of Simple and Cantilever beams
3. Analyses direct and indirect Model analysis.
4. Introduction to Finite element method for structural analysis
5. Understand the Application of finite element methods

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| **Unit -1** | |
| Elasticity: Introduction, components of stress and strain, Hook's law plain stress and plain strain, equations of equilibrium, compatibility, boundary conditions. Direct and Indirect methods, problem solving. | **Hours – 10** |
| **Unit -2** | |
| Two dimensional problems in rectangular and polar coordinates, Bending of simple and cantilever beams | **Hours – 10** |
| **Unit – 3** | |
| Model Analysis: Structural similitude, Direct and indirect model analysis, Model material and model making, Measurement for forces and deformations-strain gauges | **Hours – 10** |
| **Unit – 4** | |
| Introduction Finite element method for structural analysis; Review of principle of virtual work, Ritz method, Discretization of domain, Basic element shape, Discretization process | **Hours – 10** |
| **Unit – 5** | |
| Application of finite element method to one and two dimensional plane stress strain elements. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Understand the basics of structural Analysis
2. Derive the equation for Bending of Simple and Cantilever beams
3. Analyse Model material and model making
4. Understand Finite element method for structural analysis
5. Understand the Application of finite element method to one dimensional and two dimensional elements.

**Text Books**


1. A first course in the Finite Element Method, Daryl L. Logan, Thomson Publications.
2. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D.Belgundu, PHI publications.
3. Introduction to Finite Element Method, Desai & Abel CBS Publications
4. Mechanics of Solids by Aravind kumar Singh
5. Advanced Mechanics of Solids, L.Srinath, Mc Graw Hil, 3rd Edition
6. Theory of Elasticity by Timoshenko and Goodier

**Reference Books:**


1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha,John Wiley & sons Publication
2. Theory of elasticity by K.Sadhu singh

**ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENT MANAGEMENT PLANNING**

SEMESTER – VII

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|---|---|---|---|
| Subject Code | **18CECEP705b** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

This course will enable students to:

1. Impart knowledge on different concepts of Environmental Impact Assessment.
2. Know the procedures of risk assessment.
3. Learn the EIA methodologies and the criterion for the selection of EIA methods.
4. Learn the pre requisites for ISO certification.
5. Learn the procedures for Environmental clearance and audit.
6. Appreciate the importance of stake holders participation in EIA

| | |
|---|---|
| **Unit -1** | |
| Basic Concepts of EIA: Elements of EIA, Factors affecting EIA, Factors affecting EIA, Classification of Environmental parameters, Role of stake holders in the EIA preparation, stages in EIA- preparation of EIA base map. | **Hours – 10** |
| **Unit -2** | |
| EIA-Methodologies: Introduction, Criteria for the selection of the EIA methodology, EIA methods-Ad-hoc method, Matrix method, Network method, Environmental Media Quality Index method, Overlay method, Cost/Benefit Analysis-EIS & EMP. | **Hours – 10** |
| **Unit – 3** | |
| Impact of Development activities and Land use change: Introduction and methodology for assessment of soil and water-Delineation of study area, identification of activities- Application of Remote sensing and GIS for EIA | **Hours – 10** |
| **Unit – 4** | |
| EIA with reference surface water, air and biological environment, methodology for assessment of impacts surface water environment, generalized approach for the assessment of air pollution impact, Assessment of impact development activities on vegetation and wild life, Environmental impact of deforestation. | **Hours – 10** |
| **Unit – 5** | |
| Environmental Risk Assessment and Risk Management in EIA: Key stages in Environmental risk assessment, Advantages of Environmental Risk Assessment, EIA Notification by Ministry of Environment and Forest ( Govt. of India), Procedure for Environmental Clearance, Procedure for conducting Environmental impact assessment, evaluation of EIA report; Environmental legislation, objectives, preparation of audit report, post audit activities, Concept of ISO and IS0 14000. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Prepare EMP, EIS and EIA reports.
2. Identify the risks and impact of the project.
3. Select an appropriate EIA methodology.
4. Conduct and Evaluate the EIA report.
5. Estimate the cost benefit/ratio of the project.

6. Know the audit procedures in the in the impact assessment.

**Text Books:**

1. Environmental Impact Assessment, Canter Larry W.,McGraw-Hill Education Edi (1966)
2. Environmental Impact Assessment Methodologies, Anjaneyulu , B.S Publications, Sultan Bazar, Hyderabad.

**Reference Books**:

1. Environmental Science and Engineering, by J.Glynn and GarryW. Hein Ke- Prentice Hall Publishers.
2. Environmental Science and Engineering , by Suresh S.K.Dhameja-S.K.Katania & Sons Publications, New Delhi.

| ENGINEERING WITH GEOSYNTHETICS<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | **18CECEP705c** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Impart the basic knowledge of Geosynthetics.
2. Learn about design with Geosynthetics for various Geotechnical problems.
3. Learn the different construction methods with Geotextiles and Geogrids for various Geotechnical problems.
4. Understand the concepts of designing Geosynthetics for various drainage problems.
5. Additional advantages of various natural Geotextiles.
6. Application of Geosynthetics in infrastructural facilities.

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| **Unit -1** | |
| **Geosynthetics-** Introduction to Geosynthetics- Basic description- Polymeric materials- Uses and Applications- Properties of Geotextiles- Geogrids- Geomembranes- Geocomposites | **Hours – 10** |
| **Unit -2** | |
| **Geotextiles & Geogrids-** Design criteria for Separation- Reinforcement- Stabilization- Filtration- Drainage and Moisture barriers- Designing for Reinforcement- Stabilization- Designing Gabions- Construction methods | **Hours – 10** |
| **Unit – 3** | |
| **Geomembranes & Geocomposites-** Pond Liners- Covers for Reservoirs- Canal Liners- Landfill Liners- Caps and closures- moisture barriers- An added advantage- Geocomposites in Separation- Reinforcement- Filtration- Geocomposites as Geowebs and Geocells | **Hours – 10** |
| **Unit – 4** | |
| **Natural Geotextiles-**Natural fibres as geotextiles- factors governing the use jute fibres- coir geotextiles- bamboo/timber- combination of geotextiles | **Hours – 10** |
| **Unit – 5** | |
| **Applications of Geosynthetics-** Geosynthetics in road ways-Role of sub grade conditions-Application in paved roads-Reinforced Earth Retaining Walls-Components-External stability-Internal stability | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Realize the importance of geosynthetic materials.
2. Design various geosynthetic components.
3. Understand different methods with geosynthetics.
4. Understand concepts of designing geosynthetics for various drainage problems.
5. Understand various additional advantages of natural geo textiles.
6. Apply the knowledge of geosynthetics in infrastructure facilities.

**Text Books:**


1. 'Designing with Geosynthetics by Robert M. Koerner, Prantice Hall, Eaglewood Cliffs, NJ 07632.
2. 'An Introduction to Soil Reinforcement and Geosynthetics' by G.L.Sivakumar Babu (2009), Universities Press (India) Pvt. Ltd.

3. ‘Engineering with Geosynthetics’, by G. Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.

**Reference Books**:

1. ‘Construction and Geotechnical Engineering using Synthetic Fabries’ by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
2. ‘Foundation Analysis and Design’ by J.E. Bowles McGraw Hill Publications.

| URBAN HYDROLOGY<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | **18CECEP705d** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Appreciate the impact of urbanization on catchment hydrology
2. Understand the importance of short duration rainfall runoff data for urban hydrology studies.
3. Learn the techniques for peak flow estimation for storm water drainage system design.
4. understand the concepts in design of various components of urban drainage systems
5. Learn some of the best management practices in urban drainage.
6. understand the concepts of preparation master urban drainage system

| **Unit -1** | |
|---|---|
| **Introduction:** Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanization on hydrology<br>**Precipitation Analysis:** Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF)curves, design storms for urban drainage systems. | **Hours – 10** |
| **Unit -2** | |
| **Approaches to urban drainage**: Time of concentration, peak flow estimation approaches , rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse , major and minor systems. | **Hours – 10** |
| **Unit – 3** | |
| **Elements of drainage systems**: Open channel, underground drains, appurtenances, pumping, source control | **Hours – 10** |
| **Unit – 4** | |
| **Analysis and Management:** Storm water drainage structures, design of storm water network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management | **Hours – 10** |
| **Unit – 5** | |
| **Master drainage plans**: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning , use of models in planning | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Develop intensity duration frequency curves for urban drainage systems
2. Develop design storms to size the various components of drainage systems.
3. Apply best management practices to manage urban flooding.
4. Prepare master drainage plan for an urbanized area.

**Text Books:**


1..GeigerW.F.,JMarsalek,W.J.Rawls and F. C. Zuidema, (1987 - 2 volumes), UNESCO, ManualonDrainageinUrbanisedarea

2.Hall M J (1984), Elsevier Applied SciencePublisher.Urban Hydrology

3.Wanielista M P and Eaglin (1997), Wiley andSons,Hydrology – Quantity and Quality Analysis,

4.Akan A.O and R.L. Houghtalen (2006), WileyInternational,Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling


**Reference Books**:


1.Storm water Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, PrenticeHall.

2.Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO,Paris(http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf)

3.Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWAPublishing

| PRESTRESSED CONCRETE<br>SEMESTER – VIII | | | |
|---|---|---|---|
| Subject Code | **18CECEP706a** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Familiarize Students with concepts of prestressing
2. Understand about different systems and devices used in prestressing
3. Understand the different losses of prestress including short and long term losses
4. Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion
5. Analyze the application of Prestressed concrete to Civil engineering
6. Understand the anchorage zone Stresses in Post tensioned members

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|---|---|
| **Unit -1** | |
| Introduction to Pre-stressed concrete: basic concepts and general principles, materials used and their properties, methods and techniques of pre-stressing. Advantages and applications of Prestressed Concrete. Shrinkage, Creep, Deformation; Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems | **Hours – 10** |
| **Unit -2** | |
| Analysis of Pre-stressed concrete sections: Basic Assumptions. Design & Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.<br>Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage & creep of concrete , Relaxation of steel, slip in anchorage, frictional losses- Total losses allowed for design. | **Hours – 10** |
| **Unit – 3** | |
| Design of Pre-stressed Concrete sections for flexure. Design approaches in working stress method and limit stress method. Code procedures. Control of deflections- Factors influencing- Prediction of short term and long term deflections. | **Hours – 10** |
| **Unit – 4** | |
| Design for Shear and torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for torsion, Design for Combined bending, shear and torsion. | **Hours – 10** |
| **Unit – 5** | |
| Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Understand the different methods of prestressing
2. Estimate effective prestress including the short and long term losses
3. Analyze and design prestressed concrete beams under flexure and shear

4. Understand the relevant IS Codal provisions for prestressed concrete
5. Apply pre tensioning post tensioning concepts in different constructions.

**Text Books:**

1. Pre stressed Concrete, N. Krishna Raju, Tata McGraw hill
2. Pre stressed Concrete by Raja Gopal
3. IS: 1343 -2012

**Reference Books**:

1. Pre stressed Concrete, T. Y. Lin & Burns, Wiley Publications
2. Pre stressed Concrete by E.G. Navy Neni

| REPAIR AND REHABILITATION OF STRUCTURES<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | 18CECEP706b | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Familiarize Students with deterioration of concrete in structures
2. Equip students with concepts of NDT and evaluation
3. Understand failures and causes for failures in structures
4. Familiarize different materials and techniques for repairs
5. Understand procedure to carryout physical evaluation of buildings and prepare report.
6. Know the case studies related to rehabilitation of different structures

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| **Unit -1** | |
| **Maintenance and Repair Strategies.** Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance.<br>Deterioration of concrete in structures: Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures - Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures. | Hours – 10 |
| **Unit -2** | |
| **Non Destructive Testing**- Nondestructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting- Corrosion: Methods for corrosion measurement. | Hours – 10 |
| Unit -3 | |
| **Failure of buildings:** Definition of building failure-types of failures- Causes of Failures- Faulty Design, Accidental over Loading, Poor quality of material and Poor Construction practices- Fire damage - Various aspects of Inspection, Methodology for investigation of failures-diagnostic testing methods and equipments-repair of cracks in concrete. | Hours – 10 |
| **Unit -4** | |
| **Materials for repair and rehabilitation -Admixtures-** types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation | Hours – 10 |
| **Unit -5** | |
| **Repair Techniques:** Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes<br>Case studies: case studies related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures | Hours – 10 |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Explain deterioration of concrete in structures
2. Carryout analysis using NDT and evaluate structures
3. Assess failures and causes of failures in structures
4. Apply different materials and techniques for repairs
5. Carryout physical evaluation and submit report on condition of the structure.
6. Explain how rehabilitation to be done in different structures

**Text Books:**

1. Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina.

**Reference Books:**

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. CPWD Manuals FOR Repair and Rehabilitation
3. CWC –Manuals and CWPRS Nodal Station (Pune)

| GROUND WATER IMPROVEMENT & MANAGEMENT<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | **18CECEP706c** | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Recognize groundwater as an important natural resource.
2. Understand flow towards wells in confined and unconfined aquifers.
3. Understand the principles involved in design and construction of wells.
4. Create awareness on improving the groundwater potential using various recharge techniques.
5. Know the importance of saline water intrusion in coastal aquifers and its control measures.
6. Understand ground water modeling.

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| **Unit -1** | |
| **Introduction:** Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation.<br>**Well Hydraulics:** Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Application of Darcy's law. | **Hours – 10** |
| **Unit -2** | |
| **Well Design:** Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery. | **Hours – 10** |
| **Unit – 3** | |
| **Well Construction and Development:** Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance. | **Hours – 10** |
| **Unit – 4** | |
| **Artificial Recharge** Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge<br>**Saline Water Intrusion** Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of saline water intrusion. | **Hours – 10** |
| **Unit – 5** | |
| **Groundwater Modeling and Management:** Basic principles of groundwater modeling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models. | **Hours – 10** |

**Course outcomes:**

On successful completion of this course, students will be able to

1. Estimate aquifer parameters and yield of wells
2. Analyse radial flow towards wells in confined and unconfined aquifers.
3. Design wells and understand the construction practices.
4. Determine the process of artificial recharge for increasing groundwater potential.

5. Apply appropriate measures for groundwater management.
6. Develop various ground water Models.

**Text Books:**


1. Groundwater, Raghunath H M, New Age International Publishers,2005.
2. Groundwater Hydrology, dd D. K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology, dd D K and L W Mays, CBS Publications,2005.


**References:**


1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. Groundwater Resources Evaluation, Waln W C, McGraw Hill Book Company, 1978

| AIR, NOISE POLLUTION AND CONTROL<br>SEMESTER – VII | | | |
|---|---|---|---|
| Subject Code | 18CECEP706d | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to:

1. Know the analysis of different air pollutants.
2. Know the Thermodynamics and kinetics of air pollution
3. Understand Air quality management and Emission standards
4. Understand the control of Air Pollution
5. Understand the Noise pollution, Noise standards and Control
6. Understand the air pollution control equipment.

| | |
|---|---|
| **Unit -1** | |
| Air pollution, samples and analysis of pollutants, Conversion of ppm in $\mu g/m^3$, Definition of terms related to air pollution and control, secondary air pollutants-indoor air pollutants-climatic change and its impact –carbon trade. | **Hours – 12** |
| **Unit -2** | |
| Thermodynamics and kinetics of air pollution: Application in the removal of gases like $SO_X$, $NO_X$, CO and HC-Air fuel ratio- Computation and control of products of combustion, automobile pollution, odors pollution control and flares. | **Hours – 10** |
| **Unit – 3** | |
| Ambient Air Quality Management: Monitoring of SPM, $SO_2$, $NO_X$ and CO-Stack monitoring for flue gases-micro meteorological monitoring –weather station-Emission standards- Gaussian model and fume dispersion. | **Hours – 10** |
| **Unit – 4** | |
| Air pollution control-Control OF $NO_X$ & $SO_X$ emissions-Control of particulates-control at sources, process changes, Equipment modification, design ,operation of control equipments, settling chambers, cyclone separators, fabric filters, scrubbers, electrostatic precipitators | **Hours – 10** |
| **Unit – 5** | |
| Noise pollution and control: Noise standards, Measurement and control methods-Reducing and residential and industrial noise-ISO-14000 series | **Hours – 8** |

**Course outcomes:**

On successful completion of this course, students are able

1. Judge the ambient air quality based on the analysis of air pollutants
2. Apply particulate and gaseous control measures for an industry
3. Understand the flume behavior in a prevailing Environmental condition
4. Estimate carbon credits for various day to day activities
5. Describe the noise pollution measures to be taken to control the noise pollution.
6. Select the proper noise control measures

**Text Books:**


1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, New Delhi,2015
2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

**Reference Books**:


1. An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner - Harper & Row, New York.
3. Environmental Science and Engineering by S.K.Dhameja

# Open Elective Courses offered by All the Departments

# Open Elective Courses Offered by Civil to other Departments

| S.No | Subject Code | Subject |
|---|---|---|
| 1 | 18XXCEOXXXX | Civil Engineering-Societal & Global Impact |
| 2 | 18XXCEOXXXX | Introduction to Civil Engineering |
| 3 | 18XXCEOXXXX | Disaster Management |
| 4 | 18XXCEOXXXX | Environmental Pollution and control |
| 5 | 18XXCEOXXXX | Building Materials |
| 6 | 18XXCEOXXXX | Green Buildings and sustainability |

| CIVIL ENGINEERING -SOCIETAL & GLOBAL IMPACT | | | |
|---|---|---|---|
| Subject Code | 18XXCEOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

Course Objectives:

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

| Unit -1 | Hours |
|---|---|
| Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering | 09 |
| Unit -2 | |
| Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy) | 10 |
| Unit – 3 | |
| Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationary and non- stationary; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability. | 10 |
| Unit – 4 | |
| Built environment – Facilities management, Climate control; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures | 09 |
| Unit-5 | |
| Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Project | 10 |

Course outcomes:

On completion of this course, students are able to:

1. Understand the role of Civil Engineering in Modern World
2. Understand various constructional Infrastructure and their importance in present environment

3. Interpret modern transportation systems and their advantages
4. Effect of global Warming and mitigation measures
5. Understand the importance of Sustainability and Reduction of Green House Gas Emissions

**TEXT BOOKS**


1. Žiga Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
3. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.


**REFERENCES**


1. Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.
2. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options
3. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx
4. Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water Research FR/R0014

| INTRODUCTION TO CIVIL ENGINEERING | | | |
|---|---|---|---|
| Subject Code | 18XXCEOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering
2. To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
3. To expose the students to the various avenues available for doing creative and
4. Innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

| **Unit -1History of Civil engineering** | **Hours** |
|---|---|
| Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers | **10** |
| **Unit -2Fundamentals of Building Materials** | |
| Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Admixture; Structural Steel, High Tensile Steel, Recycling of Construction & Demolition wastes, Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood-Varnish. Form Works and Scaffoldings. | **10** |
| **Unit – 3Basics of Construction Management & Contracts Management** | |
| Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management-Terms in Contract-contract Types | **10** |
| **Unit – 4 Surveying & Geomatics** | |
| **Surveying & Geomatics**: Overview of Surveying, Traditional surveying techniques- , Total Stations; GPS & GIS Applications | **09** |
| **Unit-5 Geotechnical Engineering** | |
| Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunneling | **09** |

**Course outcomes:**

On completion of this course, students are able to:

1. Understand the role of Civil Engineering in Modern World
2. Know the details and working of various building materials
3. Understand the concept of various construction management Techniques
4. Know basic surveying methods and their applications
5. Understand the importance of soil mechanics and rock mechanics in various structural designs

**TEXT BOOKS**


1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. Soil dynamics and machine foundations by K.R. Arora
3. Surveying vol 1&2 byB.C.Punmia, Laxmi publications, 2005
4. Building Materials by P.C.Verghese, PHI learning pvt. Ltd., 2015
5. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset


**REFERENCES**


1. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
2. Avtarsingh (2002), Law of Contract, Eastern Book Co.
3. Dutt (1994), Indian Contract Act, Eastern Law House
4. The National Building Code, BIS, (2017)

| DISASTER MANAGEMENT | | | |
|---|---|---|---|
| Subject Code | 18XXCEOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.
4. Describe the three planning strategies use full in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.

| **Unit -1 Natural Hazards And Disaster Management** | **Hours** |
|---|---|
| Introduction of DM–Inter Disciplinary –nature of the subject–Disaster Management cycle–Five priorities for action. Case study methods of the following: floods, draughts – Earthquakes – global warming, cyclones &Tsunamis – Post Tsunami hazards along the Indian coast– landslides. | **10** |
| **Unit -2 Man Made Disaster And Their Management Along With Case Study Methods Of The Following** | |
| Fire hazards– transport hazard dynamics– solid waste management–post disaster–bio terrotirism- threat in mega cities, rail and aircraft's accidents, and Emerging in factious diseases & Aids and their management. | **09** |
| **Unit – 3RiskAndVulnerability** | |
| Building codes and land use planning –social vulnerability–environmental vulnerability–Macroeconomic management and sustainable development, climate change risk rendition–financial management of disaster– related losses | **09** |
| **Unit – 4 Role Of Technology In Disaster Managements**: | |
| Disaster management for infrastructures, taxonomy of infrastructure–treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earthquakes–flow chart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction. | **10** |
| **Unit-5 Education And Community Preparedness:** | |
| Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery-Community based disaster management and social capital- Designing resilience-building community capacity for action. | **10** |

**Course outcomes:**

On completion of this course, students are able to

1. Affirm the usefulness of integrating management principles in disaster mitigation work.
2. Distinguish between the different approaches needed to manage pre- during and post-disaster periods.
3. Explain the process of risk management.
4. Relate to risk transfer.
5. Prepare community for risk reduction.

**TEXT BOOKS**


1. Disaster Management–Global Challenges and Local Solutions ’by Rajib shah & RKrishnamurthy (2009), Universities press.
2. Disaster Science & Management ’by Tushar Bhattacharya, Tata Mc Graw Hill Education Pvt. Ltd., NewDelhi.
3. Disaster Management–Future Challenges and Opportunities ’by Jagbir Singh(2007),I K International Publishing House Pvt. Ltd.
4. http://ndma.gov.in/ (Home page of National Disaster Management Authority).

| ENVIONMENTAL POLLUTION AND CONTROL | | | |
|---|---|---|---|
| Subject Code | 18XXCEOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid waste management.
2. Provide basic knowledge on sustainable development.
3. Introduces some basics of sanitation methods essential for protection of community health.
4. Differentiate the solid and hazardous waste based on characterization.

| **Unit -1 Introduction** | **Hours** |
|---|---|
| **Air Pollution**: Air pollution Control Methods–Particulate control devices– Methods of Controlling Gaseous Emissions–Air quality standards.<br>**Noise Pollution**: Noise standards, Measurement and control methods– Reducing residential and industrial noise– ISO14000. | **10** |
| **Unit -2 Industrial wastewater Management** | |
| Strategies for pollution control- Volume and Strength reduction– Neutralization –Equalization– Proportioning –Common Effluent Treatment Plants-Recirculation of industrial wastes–Effluent standards. | **09** |
| **Unit – 3SolidWasteManagement** | |
| Solid waste characteristics –basics of on-site handling and collection – separation and processing-Incineration- Composting-Solid waste disposal methods– fundamentals of Land filling. | **09** |
| **Unit – 4 Environmental Sanitation** | |
| Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (mela sand fares),Schools and Institutions, Rural Sanitation-low cost waste disposal methods. | **10** |
| **Unit-5 Hazardous Waste** | |
| Characterization – Nuclear waste– Biomedical wastes– Electronic wastes-Chemical wastes–Treatment and management of hazardous waste-Disposal and Control methods. | **10** |

**Course outcomes:**

On completion of this course, students are able to

1. Identify the air pollutant control devices
2. Have knowledge on the NAAQ standard sand air emission standards.
3. Differentiate the treatment techniques used for sewage and industrial waste water treatment methods.
4. Understand the fundamentals of solid waste management; practices adopted in his town/village and its importance in keeping the health of the city.
5. Appreciate the methods o f environmental sanitation and the management of community facilities without spread of epidemics.

**TEXT BOOKS**

1. Environmental E n g i n e e r i n g , byRuth F. Weiner andRobin Matthews– 4thEditionElesevier,2003.
2. Environmental Science and Engineering byJ.G.HenryandG.W. Heinke–Pearson Education.
3. Environmental Engineering by Mackenzie L Davis &David A Cornwell.McGrawHillPublishing1. Air Pollution and Control by M.N.Rao&H.N.Rao

**REFERENCES**

1. Air Pollution and Control by M.N.Rao&H.N.Rao
2. Solid Waste Management by K.SasiKumar,S.A.GopiKrishna. PHI New Delhi.
3. Environmental Engineering by Gerard Kiley,TataMcGrawHill.
4. Environmental Sanitation by KVSG Murali Krishna, Reem Publications, New Delhi.

## BUILDING MATERIALS

| Subject Code | 18XXCEOXXXX | Internal Marks | 30 |
|---|---|---|---|
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

1. Initiating the student with the knowledge of basic building materials and their properties
2. Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.
3. The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.
4. Imparting the students with the techniques of formwork and scaffolding
5. The students should be exposed to classification of aggregates, moisture content of the aggregate.

| **Unit -1 Introduction** | **Hours** |
|---|---|
| Stones, Bricks And Tiles Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials | **10** |
| **Unit -2Masonry** | |
| Types of masonry, English and Flemish bonds, Rubble and Ashlars Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium | **10** |
| **Unit – 3Lime And Cement Lime** | |
| Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete. | **10** |
| **Unit – 4 Building Components** | |
| Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, and Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre-fabricated roofs | **09** |
| **Unit-5 Finishing's** | |
| Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings. | **09** |

**Course outcomes:**

On completion of this course, students are able to

1. Identify different building materials and their importance in building construction.
2. Differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions.
3. Importance of building components and finishings.
4. Classification of aggregates, sieve analysis and moisture content usually required in building construction.
5. Understand the role of different floors, paints, Damp Proofing, structural elements

**TEXT BOOKS**

1. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
2. Building Construction, S. S. Bhavikatti, Vices publications House private ltd.
3. Building Materials, B. C. Punmia, Laxmi Publications private ltd.
4. Building Construction, B.C. Punmia, Laxmi Publications (p) ltd

**REFERENCES**

1. Building Materials, S. K. Duggal, New Age International Publications.
2. Building Materials, P. C. Verghese, PHI learning (P) ltd.
3. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction, P. C. Verghese, PHI Learning (P) Ltd.

| GREEN BUILDINGS AND SUSTAINABILITY | | | |
|---|---|---|---|
| Subject Code | 18XXCEOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits –03** | | | |

**Course Objectives:**

Enable the students to

1. Know the green building and green energy building materials.
2. Familiarize with different rating agencies and features of green buildings.
3. Understand the term sustainability and sustainable development.
4. Learn sources of greenhouse gases and its impact on climate.
5. Understand and Plan land use confirming to zonal regulations

| **Unit -1** | **Hours** |
|---|---|
| **INTRODUCTION** What is Green Building, Why to go for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, What are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building | **10** |
| **Unit -2** | |
| **GREEN BUILDING CONCEPTS AND PRACTICES** Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency, | **10** |
| **Unit – 3** | |
| **SUSTAINABILITY** Introduction, Human development index, Sustainable development and social ethics, definitions of sustainability, populations and consumptions | **09** |
| **Unit – 4** | |
| **THE CARBON CYCLE AND ENERGY BALANCES** Introduction, Climate science history, carbon sources and emissions, The carbon cycle, carbon flow pathways, and repositories, Global energy balance, Global energy balance and temperature model, Greenhouse gases and Effects, Climate change projections and impacts | **09** |
| **Unit-5** | |
| **SUSTAINABILITY AND BUILT ENVIRONMENT** Introduction, Land use and land cover change, Land use planning and its role in sustainable development-Zoning and land use planning, smart growth, Environmentally sensitive design- low impact development, green infrastructure and conservation design, Green buildings and land use planning, Energy use and buildings | **10** |

**Course outcomes:**

On completion of this course, students are able to:

1. Describe green buildings and green building materials.
2. Acquaint with different rating agencies and energy features of green buildings.
3. Understand the term sustainability and sustainable development.
4. Recognize sources of green house gases emissions and its impact on climate.
5. Plan land use confirming to zonal regulations.

**TEXT BOOKS**

1. Standard for the Design of High-Performance Green Buildings by ASHRAE
2. Engineering Applications in Sustainable Design and Development By Bradley A.Striebig, Adebayo A.Ogundipe and Maria Papadakis. First edition, 2016, CENGAGE Learning.

**REFERENCES**


1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air Conditioning Engineers, 2009. 2.
2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.
3. IGBC - Smart Cities & Green Building Concept in India

# Open Elective Courses offered by CSE,CST & IT to other Departments

**Open Elective Courses offered by CSE**

| S.No. | Subject Code | Name of the subject | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1. | 18XXCSOXXXX | Internet of Things | 3 | 0 | 0 | 3 |
| 2. | 18XXCSOXXXX | Block Chain | 3 | 0 | 0 | 3 |
| 3. | 18XXCSOXXXX | Quantum Computing | 3 | 0 | 0 | 3 |
| 4. | 18XXCSOXXXX | Virtual Reality | 3 | 0 | 0 | 3 |
| 5. | 18XXCSOXXXX | Data Structures through C | 3 | 0 | 0 | 3 |
| 6. | 18XXCSOXXXX | Designing Database Management Systems | 3 | 0 | 0 | 3 |
| 7. | 18XXCSOXXXX | Operating Systems Concepts | 3 | 0 | 0 | 3 |
| 8. | 18XXCSOXXXX | R Programming | 3 | 0 | 0 | 3 |
| 9. | 18XXCSOXXXX | Python Programming | 3 | 0 | 0 | 3 |
| 10. | 18XXCSOXXXX | Java Programming | 3 | 0 | 0 | 3 |
| 11. | 18XXCSOXXXX | App Technologies | 3 | 0 | 0 | 3 |
| 12. | 18XXCSOXXXX | Web Technologies | 3 | 0 | 0 | 3 |
| 13. | 18XXCSOXXXX | Artificial Intelligence | 3 | 0 | 0 | 3 |

**Open Electives Courses Offered by CST & IT to other Departments**

| S.No | Subject Code | Name of the subject | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1 | 18XXCTOXXXX | Internet of Things | 3 | 0 | 0 | 3 |
| 2 | 18XXCTOXXXX | Block Chain | 3 | 0 | 0 | 3 |
| 3 | 18XXCTOXXXX | Quantum Computing | 3 | 0 | 0 | 3 |
| 4 | 18XXCTOXXXX | Virtual Reality | 3 | 0 | 0 | 3 |
| 5 | 18XXCTOXXXX | Data Structures Through C | 3 | 0 | 0 | 3 |
| 6 | 18XXCTOXXXX | Designing Database Management Systems | 3 | 0 | 0 | 3 |
| 7 | 18XXCTOXXXX | Operating Systems Concepts | 3 | 0 | 0 | 3 |
| 8 | 18XXCTOXXXX | R Programming | 3 | 0 | 0 | 3 |
| 9 | 18XXCTOXXXX | Python Programming | 3 | 0 | 0 | 3 |
| 10 | 18XXCTOXXXX | Java Programming | 3 | 0 | 0 | 3 |
| 11 | 18XXCTOXXXX | App Technologies | 3 | 0 | 0 | 3 |
| 12 | 18XXCTOXXXX | Web Technologies | 3 | 0 | 0 | 3 |
| 13 | 18XXCTOXXXX | Artificial Intelligence | 3 | 0 | 0 | 3 |

| INTERNET OF THINGS | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
3. Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
4. Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

| **Unit -1: The Internet of Things** | **Hours** |
|---|---|
| An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles for Connected Devices | **09** |
| **Unit -2 :Business Models** | |
| Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability | **10** |
| **Unit – 3:Design Principles for the Web Connectivity** | |
| Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices. | **10** |
| **Unit – 4:Internet Connectivity Principles** | |
| Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet. Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems. | **10** |
| **Unit – 5:Data Collection** | |
| Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based | **09** |

| | |
|---|---|
| services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World. | |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education |
| T2 | Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015 |
| R1 | Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley |
| R2 | Getting Started with the Internet of Things CunoPfister , Oreilly |
| W1 | https://www.coursera.org/specializations/internet-of-things |
| W2 | https://alison.com/course/internet-of-things-and-the-cloud |
| **Course Outcomes:** On completion of this course, students can | |
| CO1 | Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things |
| CO2 | Conceptually identify vulnerabilities in Internet of Things |
| CO3 | Conceptually identify recent attacks, involving the Internet of Things |
| CO4 | Develop critical thinking skills |
| CO5 | Compare and contrast the threat environment based on industry and/or device type. |

| BLOCK CHAIN TECHNOLOGY | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. To assess blockchain applications in a structured manner.
2. To impart knowledge in block chain techniques and able to present the concepts clearly and structured.
3. To get familiarity with future currencies and to create own crypto token.

| **Unit -1: Introduction** | **Hours** |
|---|---|
| Overview of Block chain, public ledgers, bitcoin, smart contracts, block in a block chain, transactions, distributed consensus, public vs private block chain, understanding crypto currency to block chain, permissioned model of block chain, overview of security aspects of block chain, cryptographic hash function, properties of a hash function, hash pointer and Merkle tree, digital signature, public key cryptography, a basic crypto currency. | **10** |
| **Unit -2 :Understanding block chain with crypto currency** | |
| Creation of coins, payments and double spending, bitcoin scripts, bitcoin P2P network, transaction in bitcoin network, block mining, block propagation and block relay, distributed consensus in open environments, consensus in a bitcoin network, Proof of Work (PoW)- Basic Introduction, hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of burn and proof of elapsed time, the life of a bitcoin miner, Mining- Difficulty, mining pool. | **10** |
| **Unit – 3:Permissioned Block Chain** | |
| Permissioned model and usecases, design issues for permissioned block chains, execute contracts, state machine replication, overview of consensus models for permissioned block chain, Distributed consensus in closed environment, paxos, RAFT consensus, Byzantine general problem, Byzantine fault tolerance system, Lamport-Shostak-Pease BFT algorithm, BFT over Asynchronous systems. | **10** |
| **Unit – 4:Enterprise application of Block chain** | |
| Cross border payments, Know Your Customer, Food security, Mortgage over block chain, Block chain enabled trade, trade finance network, supply chain financing, identity on block chain. | **09** |
| **Unit – 5:Block chain application development** | |
| Hyperledger fabric- architecture, identities and policies, membership and access control, channels, transaction validation, writing smart contract using Hyperledger fabric, writing smart contract using Ethereum, overview of Ripple and Corda. | **09** |
| **Text(T) / Reference(R) Books:** | |

| | |
|---|---|
| T1 | Block Chain: Blueprint for a new economy, Melanie Swan, O'Reilly, 2015. |
| T2 | Block Chain: The Block Chain for Beginners- Guide to Block Chain Technology and Leveraging Block Chain Programming, Josh Thompsons |
| R1 | Block Chain Basics, Daniel Drescher, Apress; 1st edition, 2017 |
| R2 | Block Chain and Crypto Currencies, Anshul Kaushik, Khanna Publishing House, Delhi. |
| R3 | Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Imran Bhashir, Packt Publishing. |
| W1 | https://www.edx.org/learn/blockchain |
| W2 | https://www.coursera.org/courses?query=blockchain |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Understand block chain technology. |
| CO2 | Develop block chain-based solutions |
| CO3 | Write smart contract using Hyperledger Fabric and Ethereum frameworks. |
| CO4 | Build and deploy block chain application for on premise and cloud-based architecture. |
| CO5 | Integrate ideas from various domains and implement them. |

| QUANTUM COMPUTING | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

- This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

| **Unit -1:Introduction to Quantum computing** | **Hours** |
|---|---|
| Motivation for studying Quantum computing,, Mojor players in industry, Origin of Quantum Computing, overview of major concepts in Quantum Computing. | **09** |
| **Unit -2 :Math Foundation for Quantum Computing** | |
| Matrix algebra- Basic vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, dirac notation, Eigen values and Eigen vector | **09** |
| **Unit – 3: Building Blocks for Quantum Program** | |
| Architectures of a Quantum Computing Platform, Details of q-bit system of information representation- Block sphere, Multi-qubits states, Quantum superposition of qubits, Quantum entanglement, Useful states from quantum algorithmic perceptive, Operations on qubits, Quantum Logic gates and circuits, Programming model for a Quantum Computing Program- Steps performed on classical computer, steps performed on Quantum computer, Moving data between bits and qubits. | **10** |
| **Unit – 4: Quantum Algorithms** | |
| Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks | **10** |
| **Unit – 5: Algorithms** | |
| Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm, IBM Quantum Experience, Microsoft Q, Rigetti PyQuil | **10** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Quantum Computation and Quantum Information, Michael A. Nielsen, Cambridge University Press. |
| R1 | Quantum Computation Explained, David Mc Mahon, Wiley |
| W1 | https://quantumcurriculum.mit.edu/ |
| W2 | https://www.coursera.org/courses?query=quantum%20computing |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | To explain the working of Quantum computing program. |
| CO2 | To explain architecture and program model. |

| | |
|---|---|
| CO3 | Develop Quantum logic gate circuits |
| CO4 | Develop quantum algorithm |
| CO5 | Program Quantum algorithm on major toolkits. |

**Virtual Reality**

| | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

The learning objectives of this course are:

1. Understand how the design of VR technology relates to human perception and cognition.
2. Discuss applications of VR to the conduct of scientific research, training, and industrial design.
3. Gain first-hand experience with using virtual environment technology, including 3D rendering software, tracking hardware, and input/output functions for capturing user data.
4. Learn the fundamental aspects of designing and implementing rigorous empirical experiments using VR.
5. Learn about multimodal virtual displays for conveying and presenting information and techniques for evaluating good and bad virtual interfaces.

| **Unit -1:Virtual reality and Virtual Environment** | **Hours** |
|---|---|
| Introduction, Computer graphics, Real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark. 3D Commuter Graphics: Introduction, virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, simple 3D modelling, Illumination models, reflection models, shading algorithms, radiosity, hidden surface removal, realism- stereographic image. | **10** |
| **Unit -2 :Geometric Modelling** | |
| Introduction, from 2D to 3D, 3D space curves, 3D boundary representation. Geometric transformation: Introduction, frames to reference, modelling transformations, instances, picking, flying, scaling the VE, Collision and detection. Generic VR system: Virtual environment, computer environment, VR technology- models of interaction, VR systems. | **10** |
| **Unit – 3:Animating the Virtual Environment** | |
| Introduction, the dynamics of numbers, linear and non-linear and non-linear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system. Physical Simulation: Objects falling in a gravitational field, rotating wheels, elastic collisions, projectiles, simple pendulum, springs, flight dynamics of an aircraft | **09** |
| **Unit – 4:Human Factors** | |
| the eye, the ear, the somatic senses. VR Hardware: Sensor hardware, head-coupled displays, acoustic hardware, integrated VR systems. VR Software: Modelling virtual world, physical simulation, VR toolkits, Introduction to | **09** |

| | |
|---|---|
| VRML. | |
| **Unit – 5:VR Applications** | |
| Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm, IBM Quantum Experience, Microsoft Q, Rigetti PyQuil | **12** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Virtual Reality Systems, John Vince, Pearson Education Asia, 2007. |
| T2 | Augmented and Virtual Reality, Anand R, Khanna Publishing House. Delhi |
| R1 | Visualizations of Virtual Reality, Adams, Tata Mc Graw Hill, 2000 |
| R2 | Virtual Reality Technology, Grigore C. Burdea, Philippe Coieffet, Wiley Inter Science, 2nd edition, 2006. |
| W1 | https://www.coursera.org/courses?query=virtual%20reality |
| W2 | https://www.classcentral.com/tag/virtual-reality |
| **Course Outcomes:** On completion of this course, students can | |
| CO1 | Understand geometric modelling |
| CO2 | Understand Virtual environment |
| CO3 | Study about Virtual Hardware and Software |
| CO4 | Study about Software needed for developing virtual reality environment. |
| CO5 | Develop Virtual Reality applications. |

| DATA STRUCTURES THROUGH C | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. Operations on linear data structures and their applications.
2. The various operations on linked lists.
3. The basic concepts of Trees, Traversal methods and operations.
4. Concepts of implementing graphs and its relevant algorithms.
5. Sorting and searching algorithms.

| **Unit -1: INTRODUCTION TO DATA STRUCTURE** | **Hours** |
|---|---|
| Data Management concepts, Data types – primitive and non-primitive, Performance Analysis and Measurement (Time and space analysis of algorithms-Average, best- and worst-case analysis), Types of Data Structures-Linear & Non-Linear Data Structures.<br>Sorting and Searching:<br>Sorting – Bubble Sort, Selection Sort, Quick Sort, Merge Sort<br>Searching –Sequential Search and Binary Search | **10** |
| **Unit -2 :LINEAR DATA STRUCTURE** | |
| Array: Representation of arrays, Applications of arrays, sparse matrix and its representation<br>Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion.<br>Queue: Representation Of Queue, Operations On Queue, Circular Queue, Double Ended Queue, Applications of Queue. | **10** |
| **Unit – 3: LINKED LIST** | |
| Linked List: Singly Linked List, Doubly Linked list, Circular linked list ,Linked implementation of Stack, Linked implementation of Queue, Applications of linked list. | **09** |
| **Unit – 4:NONLINEAR DATA STRUCTURE** | |
| Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Binary search trees, Conversion of General Trees To Binary Trees, Applications of Trees. | **09** |
| **Unit – 5:GRAPH, HASHING AND FILE STRUCTURES** | |
| Graph-Matrix Representation Of Graphs, Elementary Graph operations, (Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree)<br>Hashing: The symbol table, Hashing Functions, Collision Resolution Techniques, File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization, Indexing structure forindex files, hashing for direct files, Multi-Key file organization and accessmethods. | **10** |

| Text(T) / Reference(R) Books: | |
|---|---|
| T1 | Data Structures using C -By Reema Thareja - OXFORD Higher Publication |
| T2 | Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International |
| R1 | Fundamentals of Computer Algorithms by Horowitz, Sahni,Galgotia Pub. 2001 ed |
| R2 | Fundamentals of Data Structures in C++-By Sartaj Sahani. |
| R3 | Data Structures: A Pseudo-code approach with C -By Gilberg & Forouzan Publisher Thomson Learning |
| W1 | https://www.coursera.org/specializations/data-structures-algorithms |
| W2 | https://online-learning.harvard.edu/course/data-structures-and-algorithms |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Choose appropriate data structure as applied to specified problem definition. |
| CO2 | Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures |
| CO3 | Apply concepts learned in various domains like DBMS |
| CO4 | Apply concepts learned in various domains like compiler construction |
| CO5 | Use linear and non-linear data structures like stacks, queues , linked list |

| DESIGNING DATABASE MANAGEMENT SYSTEMS | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1.To introduce about database management systems

2.To give a good formal foundation on the relational model of data and usage of Relational Algebra

3.To introduce the concepts of basic SQL as a universal Database language

4.To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization

5. To provide an overview of database transactions and concurrency control.

| **Unit -1: Database system architecture** | **Hours** |
|---|---|
| Introduction to Databases: Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications. Overview of Database Languages and Architectures: Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Users , Architecture for DBMS. | **10** |
| **Unit -2 : E-R Models** | |
| The E-R Models,TheRelationalModel,IntroductiontoDatabaseDesign,DatabaseDesign and Er Diagrams, Entities Attributes, and Entity Sets, Relationship and Relationship Sets, Conceptual Design with the Er Models, The Relational Model Integrity Constraints Over Relations, Key Constraints, Foreign Key Constraints, General Constraints. | **10** |
| **Unit - 3: Relational Algebra** | |
| Relational Algebra, Selection and Projection, Set Operation, Renaming, Joins, Division, More Examples of Queries, Relational Calculus: Tuple Relational Calculus, Domain Relational Calculus.<br>The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database. | **10** |
| **Unit - 4: Normalization** | |
| Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form (BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF). | **09** |
| **Unit - 5: Transaction Management** | |
| Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point. Concurrency control for lost updates, Uncommitted data, inconsistent retrievals and the | **09** |

| | |
|---|---|
| Scheduler. Concurrency control with locking methods, lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering: Wait/Die and Wound/Wait Schemes, Database Recovery management. | |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | In Introduction to Database Systems, CJDate, Pearson. |
| T2 | Database Management Systems,3rdEdition,Raghurama Krishnan, Johannes Gehrke, TATAMcGrawHill. |
| T3 | Database Systems-TheCompleteBook,H GMolina,J DUllman,J WidomPearson. |
| T4 | Database Management Systems,6/e Ramez Elmasri, Shamkant B. Navathe, PEA |
| R1 | DatabaseSystemsdesign,Implementation,andManagement,7thEdition,PeterRob&CarlosCoronel |
| R2 | Database System Concepts, 5th edition, Silberschatz, Korth, TMH |
| R3 | The Database Book Principles & Practice Using Oracle/MySQL, Narain Gehani, University Press. |
| W1 | https://onlinecourses.nptel.ac.in/noc18_cs15/preview |
| W2 | https://www.coursera.org/courses?query=database |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Understand the basic elements of a relational database management system. |
| CO2 | Draw entity relationship and convert entity relationship diagrams into RDBMS. |
| CO3 | Create, maintain, and manipulate a relational database using SQL. |
| CO4 | Designs and applies normalization techniques for logical schema model. |
| CO5 | Solves concurrent issues and problems through locking mechanism. |

| OPERATING SYSTEMS CONCEPTS | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. Introduce the basic concepts of operating systems, its functions and services.
2. To provide the basic concepts of process management and synchronization.
3. Familiarize with deadlock issues.
4. Understand the various memory management skills.
5. Give exposure over I/O systems and mass storage structures.

| **Unit -1: Operating Systems Overview** | **Hours** |
|---|---|
| Computer system organization, Operating system structure, Process, memory, storage management, Protection and security, Distributed systems, Computing Environments, Open-source operating systems, OS services, User operating-system interface. | **09** |
| **Unit -2 :System Calls & IPC** | |
| System calls, Types, System programs, OS structure, OS generation, System Boot Process concept, scheduling (Operations on processes, Cooperating processes, Inter-process communication), Multi-threading models | **09** |
| **Unit - 3: Process Management** | |
| Basic concepts, Scheduling criteria, Scheduling algorithms, Thread scheduling, Multiple processor scheduling Operating system, Algorithm Evaluation, The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical regions, Monitors. | **10** |
| **Unit - 4:Memory Management & Dead lock** | |
| System model, Deadlock characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock detection, Recovery from deadlock.<br>Storage Management: Swapping, Contiguous memory allocation, Paging, Segmentation Virtual Memory Background, Demand paging, copy on write, Page replacement and various Page replacement algorithms, Allocation of frames, Thrashing. | **10** |
| **Unit - 5:I/O Systems** | |
| File concept, Access methods, Directory structure, Filesystem mounting, Protection, Directory implementation, Allocation methods, Free-space management, Disk scheduling, Disk management, Swap-space management, Protection. | **10** |

| Text(T) / Reference(R) Books: | |
|---|---|
| T1 | Operating System Concepts Essentials, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, John Wiley & Sons Inc., 2010. |
| T2 | Operating System Concepts, 9th Edition, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, John Wiley and Sons Inc., 2012 |
| T3 | Operating Systems, Second Edition, S Halder, Alex A Aravind, Pearson Education, 2016 |
| T4 | Operating Systems – Internals and Design Principles, 7th Edition, William Stallings, Prentice Hall, 2011 |
| R1 | Modern Operating Systems, Second Edition, Andrew S. Tanenbaum, Addison Wesley, 2001. |
| R2 | Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata McGraw Hill Education, 1996. |
| R3 | Operating Systems: A Concept-based Approach, Second Edition, D M Dhamdhere, Tata McGraw-Hill Education, 2007 |
| R4 | Operating Systems: Internals and Design Principles, Seventh Edition, William Stallings, Prentice Hall, 2011 |
| W1 | https://www.coursera.org/courses?query=operating%20system |
| W2 | https://onlinecourses.nptel.ac.in/noc16_cs10/preview |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Demonstrate knowledge on Computer System organization and Operating system services. |
| CO2 | Design solutions for process synchronization problems by using System calls and Inter process communication. |
| CO3 | Identify the functionality involved in process management concepts like scheduling and synchronization. |
| CO4 | Design models for handling deadlock and perform memory management. |
| CO5 | Analyze services of I/O subsystems and mechanisms of security & protection. |

| R PROGRAMMING | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. Use R for statistical programming, computation, graphics, and modeling.
2. Write functions and use R in an efficient way.
3. Fit some basic types of statistical models.
4. Use R in their own research.
5. Be able to expand their knowledge of R on their own.

| **Unit -1:** Introduction | **Hours** |
|---|---|
| How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes**.** | **09** |
| **Unit -2 :** | |
| R Programming Structures, Control Statements, Loops,-Looping Over Nonvector Sets,- If-Else,Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree. | **10** |
| **Unit – 3:**Math and Simulation in R | |
| Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima-Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files | **10** |
| **Unit – 4:**Graphics | |
| Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files, Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA. | **10** |
| **Unit – 5:**Linear Models | |
| Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests | **09** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | The Art of R Programming, Norman Matloff, Cengage Learning |
| T2 | R for Everyone, Lander, Pearson |
| R1 | R Cookbook, PaulTeetor, Oreilly |
| R2 | R in Action, Rob Kabacoff, Manning |
| W1 | https://www.edx.org/learn/r-programming |
| W2 | https://www.coursera.org/learn/r-programming |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | List motivation for learning a programming language |
| CO2 | Access online resources for R and import new function packages into the R workspace |
| CO3 | Import, review, manipulate and summarize data-sets in R |
| CO4 | Explore data-sets to create testable hypotheses and identify appropriate statistical tests |
| CO5 | Perform appropriate statistical tests using R Create and edit visualizations |

| PYTHON PROGRAMMING | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. Introduction to Scripting Language.
2. Exposure to various problems solving approaches of computer science.

| **Unit -1: Introduction** | **Hours** |
|---|---|
| History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation | **09** |
| **Unit -2 : Types, Operators and Expressions** | |
| Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass. Data Structure**s** Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. | **10** |
| **Unit – 3: Functions** | |
| Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Module**s**: Creating modules, import statement, from. Import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages | **10** |
| **Unit – 4: Object Oriented Programming in Python** | |
| Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error and Exception**s:** Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions | **10** |
| **Unit – 5: Brief Tour of the Standard Library** | |
| Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics Testing:Why testing is required?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests. | **09** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Python Programming: A Modern Approach, Vamsi Kurama, Pearson |
| T2 | Learning Python, Mark Lutz, Orielly |
| R1 | Think Python, Allen Downey, Green Tea Press |
| R2 | Core Python Programming, W.Chun, Pearson |
| R3 | Introduction to Python, Kenneth A. Lambert, Cengage |
| W1 | https://www.coursera.org/courses?query=python |
| W2 | https://www.edx.org/learn/python |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Making Software easily right out of the box |
| CO2 | Experience with an interpreted Language |
| CO3 | To build software for real needs. |
| CO4 | Prior Introduction to testing software |
| CO5 | Experience with implementation in current technologies |

| JAVA PROGRAMMING | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. Understanding the OOP's concepts, classes and objects, threads, files, applets, swings and act.

2. This course introduces computer programming using the JAVA programming language with object-oriented programming principles.

3. Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using Java for network level programming and middleware development.

| **Unit -1: Introduction to OOP** | **Hours** |
|---|---|
| procedural programming language and object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control. | **10** |
| **Unit -2 :Classes and objects** | |
| Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes. | **09** |
| **Unit – 3:Inheritance** | |
| Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class. Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throw, throws and finally block, userdefined exceptions, Assertions | **10** |
| **Unit – 4:Multithreading** | |
| Introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file. | **09** |
| **Unit – 5:Applet** | |
| Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes. AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar. | **10** |

| Text(T) / Reference(R) Books: | |
|---|---|
| T1 | The complete Reference Java, 8th edition, Herbert Schildt, TMH |
| T2 | Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford |
| R1 | Introduction to java programming, 7th edition by Y Daniel Liang, Pearson |
| W1 | https://www.coursera.org/courses?query=java |
| W2 | https://www.udemy.com/java-tutorial/ |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Understand Java programming concepts and utilize Java Graphical User Interface in Program writing. |
| CO2 | Write, compile, execute and troubleshoot Java programming for networking concepts. |
| CO3 | Build Java Application for distributed environment. |
| CO4 | Design and Develop multi-tier applications. |
| CO5 | Identify and Analyze Enterprise applications. |

| APP TECHNOLOGIES | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

- To provide in depth knowledge and hands on experience in application development the latest trends and features.

| **Unit -1: Android Programming Environment** | **Hours** |
|---|---|
| Android programming environment, linking activities using intents, calling built-in applications using intents. | **09** |
| **Unit -2:User Interface** | |
| Creating the user interface programmatically, Listening for UI notifications, build basic views, build picker views, build list views, Using image views, Using menus with views, Saving and loading user preferences | **10** |
| **Unit – 3:Data** | |
| Persisting data to files, Creating and using databases, Study Session, sharing data in android, Using a content provider, Creating a content provider | **10** |
| **Unit – 4: Networking** | |
| SMS messaging, sending emails, Networking, displaying maps, Getting location data | **10** |
| **Unit – 5: Services** | |
| Creating your own services, communicating between a service and an Activity, Binding Activities to Services, A complete lab work for Android service development, Deploy APK files. | **09** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Beginning Android Application Development, Wei-Meng Lee, 1st Ed, Wiley Publishing. |
| T2 | Android: A Programmers Guide, J. F. DiMarzio, McGraw Hill Education (India) Private Limited.1st Edition. |
| R1 | Android for Programmers: An App-Driven Approach, Paul Deitel, 1st Edition, Pearson India |
| R2 | Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India Pvt Ltd |
| W1 | https://www.coursera.org/browse/computer-science/mobile-and-web-development |
| W2 | https://in.udacity.com/course/new-android-fundamentals--ud851 |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | Demonstrate their understanding of the fundamentals of Android operating systems |
| CO2 | Demonstrate their skills of using Android software development tools |
| CO3 | Demonstrate their ability to develop software with reasonable complexity on mobile platform |
| CO4 | Demonstrate their ability to deploy software to mobile devices |
| CO5 | Demonstrate their ability to debug programs running on mobile devices |

| WEB TECHNOLOGIES | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

| **Unit-1: HTML** | **Hours** |
|---|---|
| **HTML:** Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, Html media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.<br>**CSS:** Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3. | **10** |
| **Unit -2: JSON** | |
| Introduction to JSON: JSON, Syntax, Data Types, Schema, Security Concerns, JSON Vs XML, the JavaScript XML Http Request and Web APIs, JSON and Client-Side Frameworks, JSON and NoSQL, JSON on the server side. | **09** |
| **Unit –3: YAML** | |
| Introduction to YAML: YAML, Syntax, Structure, indentation in YAML documents, YAML vs JSON and XML, data types, Using advanced features like anchors in a YAML. | **9** |
| **Unit -4: PHP** | |
| **PHP Programming:** Introduction to PHP, Creating PHP script, Running PHP script.<br>**Working with variables and constants:** Using variables, Using constants, Data types, Operators.<br>**Controlling program flow:** Conditional statements, Control statements, Arrays, functions. | **10** |
| **Unit – 5: Laravel** | |
| Introduction to Laravel, Features, routing, controllers, views, Blade template, migration, Laravel Database. | **10** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013 |
| T2 | Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012. |
| T3 | Introduction to JavaScript by Lindsay Bassett, 2015. |
| T4 | Introduction to YAML: Demystifying YAML Data Serialization Format by Tarun Telang |
| T5 | Full-Stack Vue.Js 2 and Laravel 5: Bring the frontend and backend together with Vue, Vuex, and Laravel |
| R1 | Programming world wide web, Sebesta, Pearson |
| R2 | An Introduction to web Design and Programming, Wang, Thomson |
| W1 | https://www.edx.org/learn/web-development |
| W2 | https://www.javatpoint.com/what-is-json |
| W3 | https://www.javatpoint.com/yaml-scalars |
| W4 | https://www.javatpoint.com/laravel-blade-template |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | To develop a dynamic webpage by the use of HTML |
| CO2 | To develop a dynamic webpage by the use of CSS |
| CO3 | To develop a dynamic webpage by the use of JSON |
| CO4 | To develop a dynamic webpage by the use of YML |
| CO5 | Build web applications using PHP |
| CO6 | To develop a dynamic webpage by the use of Laravel |

| ARTIFICIAL INTELLIGENCE | | | |
|---|---|---|---|
| Subject Code | 18XXCSOXXXX | IA Marks | 30 |
| Number of Lecture Hours/Week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

The learning objectives of this course are:

1. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
2. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
3. To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.

| **Unit -1: Introduction to artificial intelligence** | **Hours** |
|---|---|
| Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI. | **09** |
| **Unit -2 : Problem solving: state-space search and control strategies** | |
| Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening a*, constraint satisfaction. | **10** |
| **Unit – 3:Problem reduction, Game playing** | |
| Problem Reduction: Introduction, Problem reduction using AO* algorithm, Towers of Hanoi problem, Matrix Multiplication problem game playing, alpha-beta pruning, two-player perfect information games. | **10** |
| **Unit – 4: Logic Concepts & Knowledge Representation Techniques** | |
| Logic Concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.<br>Introduction to KR techniques, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web. | **10** |
| **Unit – 5: Expert systems and its applications** | |
| Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems, blackboard systems, truth maintenance systems, application of expert systems, list of shells and tools. | **09** |

| **Text(T) / Reference(R) Books:** | |
|---|---|
| T1 | Artificial Intelligence- Saroj Kaushik, CENGAGE Learning |
| T2 | Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA |
| T3 | Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rded, TMH |
| T4 | Introduction to Artificial Intelligence, Patterson, PHI |

| | |
|---|---|
| R1 | Artificial intelligence, structures and Strategies for Complex problem solving, - George F Lugar, 5thed, PEA |
| R2 | Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer |
| R3 | Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier |
| R4 | AI: A Modern Approach, Stuart Russell and Peter Norvig,<br>Additional Readings: Marr, Bishop, occasionally others |
| W1 | https://www.edx.org/learn/artificial-intelligence |
| W2 | https://www.coursera.org/courses?query=artificial%20intelligence |

| **Course Outcomes:** On completion of this course, students can | |
|---|---|
| CO1 | To introduce basic concepts of AI with its working principles. |
| CO2 | To understand different kinds of heuristic search algorithms to get feasible solution for AI problems. |
| CO3 | To understand problem reduction concepts using various problem reduction techniques. (Ex: Problem reduction using AO* algorithm, Towers of Hanoi problem, Matrix Multiplication problem) |
| CO4 | To understand various Knowledge Representation (KR) techniques |
| CO5 | To understand different kinds of Expert Systems. |

# Open Elective Courses Offered by ECE To other Departments

**Open Electives Courses Offered by the ECE to other Departments**

| S.No | Subject Code | Name of the subject | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1 | 18XXECOX0XA | VLSI Design | 3 | 0 | 0 | 3 |
| 2 | 18XXECOX0XB | HDL Programming for IC Design | 3 | 0 | 0 | 3 |
| 3 | 18XXECOX0XC | Principles of Communication Systems | 3 | 0 | 0 | 3 |
| 4 | 18XXECOX0XD | Transducers and Sensors | 3 | 0 | 0 | 3 |
| 5 | 18XXECOX0XE | Fundamentals of Microprocessors and Microcontrollers | 3 | 0 | 0 | 3 |
| 6 | 18XXECOX0XF | Fundaments of Internet of Things | 3 | 0 | 0 | 3 |
| 7 | 18XXECOX0XG | Fundamentals of Digital Image Processing | 3 | 0 | 0 | 3 |
| 8 | 18XXECOX0XH | Signals and Systems | 3 | 0 | 0 | 3 |

**VLSI DESIGN**
(Open Elective)

| | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XA | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

This course will enable students to

1. To learn about various fabrication steps of IC and electrical properties of MOSFET.
2. To learn about specific rules to draw the stick diagrams and Layouts.
3. To analyze circuit concepts and to apply Scaling factors for Device parameters.
4. To learn concept of chip I/O and techniques of testability.
5. To learn about different FPGA designs and implementation

| **Unit -1** | **Hours** |
|---|---|
| **Introduction and Basic Electrical Properties of MOS Circuits:** Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology. | 10 |
| **Unit -2** | |
| **MOS and Bi-CMOS Circuit Design Processes:** MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams Translation to Mask Form. | 10 |
| **Unit -3** | |
| **Basic Circuit Concepts:** Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.<br>**Scaling of MOS Circuits:** Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic. | 10 |
| **Unit – 4** | |
| **Chip Input and Output circuits:** ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip Clock Generation and Distribution.<br>**Design for Testability:** Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self-Test techniques. | 10 |
| **Unit – 5** | |
| **FPGA Design:** FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Altera Flex 10FPGA, Xilinx XC4000 series FPGA, Xilinx Spartan XL FPGA, Xilinx Spartan II | 8 |

| | |
|---|---|
| FPGAs, Xilinx Vertex FPGA. | |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Elaborate the fabrication steps of IC and electrical properties of MOSFET.
2. Justify the concepts of design rules during the layout of a circuit.
3. Apply the circuit concepts and scaling factors for device parameters.
4. Analyze the concepts of chip I/O and techniques of testability.
5. Examine commercial architectures of FPGA.

**Text Books:**


1. Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Essentials of VLSI Circuits and Systems, Prentice-Hall of India Private Limited,2005 Edition.
2. Sung-Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis and Design, Tata McGrawHill Education, 2003.


**Reference Books**:


1. Michael D. Ciletti, Advanced Digital Design with the Verilog HDL, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep Submicron Technology, 3rd edition, David Hodges.
3. A. Shanthi and A. Kavita, VLSI Design, New Age International Private Limited, 2006 First Edition.

| HDL PROGRAMMING FOR IC DESIGN<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XB | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

This course will enable students to

1. Learn different Verilog programming constructs.
2. Familiarize the different levels of abstraction in Verilog HDL.
3. Construct digital circuits and corresponding RTL modeling using different styles along with test bench based verification.
4. Understand Verilog Tasks, Functions and Directives.
5. Understand timing and delay simulation.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to Verilog HDL:** Verilog as HDL, Typical HDL flow, Top-Down and Bottom-up design methodology.<br>Levels of Design Description, Simulation and Synthesis, Function Verification, Module definition. Difference between module and module instances. | 10 |
| **Unit -2** | |
| **Language Constructs and Conventions**: Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators. | 10 |
| **Unit -3** | |
| **Gate Level Modeling**: Modeling using basic Verilog gate primitives, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delay, Strengths and Construction Resolution<br>**Modeling at Dataflow Level**: Continuous Assignment Structure, delay specification, expressions, vectors, operators, operands, operator types | 10 |
| **Unit – 4** | |
| **Behavioral Level Modeling:** Structured procedures, Initial and Always statements, blocking and non-blocking statements, delay control, generate statement, conditional statement, multiway branching, loops, sequential and parallel blocks. | 10 |
| **Unit – 5** | |
| **Switch Level Modeling:** Basic transistor switches, CMOS Switches, bi-directional gates, time delays with switch primitives<br>**Tasks and Functions:** Difference between tasks and functions, declaration, invocation, automatic tasks and functions. | 8 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Demonstrate knowledge on HDL design flow and identify the suitable abstraction level of a particular design
2. Memorizing the constructs and conventions used for Verilog programming
3. Design and develop the combinational and sequential circuits using dataflow modeling
4. Implement sequential logic circuits using behavioral modeling
5. Writing the programs more effectively using tasks and functions

**Text Books:**

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, Second Edition
2. T.R.Padmanabhan, B Bala Tripura Sundari, "Design Through Verilog HDL", Wiley 2009

**Reference Books**:

1. Michael D Ciletti, "Advanced Digital Design with the Verilog HDL", Xilinx Design Series, PearsonEducation.
2. Stephen Brown, Zvonkoc Vranesic, "Fundamentals of Digital Logic with Verilog Design", TMH, 2nd Edition.
3. Donald E. Thomas, Philip R. Moorby, "The Verilog Hardware Description Language", Springer Science + Business Media, LLC, Fifth edition

**PRINCIPLES OF COMMUNICATION SYSTEMS**
(Open Elective)

| Subject Code | 18XXECOX0XC | Internal Marks | 30 |
|---|---|---|---|
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**
This course will enable students to
1. Analyze the performance of angle modulated signals.
2. Characterize analog signals in time domain as random processes and noise
3. Characterize the influence of channel on analog modulated signals
4. Determine the performance of analog communication systems in terms of SNR
5. Understand the concepts of noise and signal.

| **Unit -1** | **Hours** |
|---|---|
| **Amplitude modulation:** Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.<br>**Double side band-suppressed carrier modulation:** Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.<br>**Single side and vestigial side band methods of modulation**: SSB Modulation, VSB Modulation, Frequency Translation, Frequency-Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television | 10 |
| **Unit -2** | |
| **Angle modulation**: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,<br>**Phase–Locked Loop:** Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super-heterodyne Receiver | 10 |
| **Unit -3** | |
| **Random variables & process**: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions.<br>**Noise:**<br>ShotNoise,Thermalnoise,WhiteNoise,NoiseEquivalentBandwidth,NoiseFigure | 10 |
| **Unit – 4** | |
| **Noise in analog modulation:** Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM. | 10 |
| **Unit – 5** | |
| **Digital representation of an analog signals**: Introduction, Why Digitize Analog Sources? The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,<br>**Pulse Code Modulation:** Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing | 8 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise
4. Characterize the influence of channel on analog modulated signals
5. Determine the performance of analog communication systems in terms of SNR

**Text Books:**

1. H Taub& D. Schilling, Gautam Sahe, Principles of Communication Systems –TMH, 2007, 3rd Edition.
2. B.P. Lathi, Communication Systems–BSPublication,20062.
3. Simon Haykin, Principles of Communication Systems –John Wiley, 2 nd Edition

**Reference Books**:

1. George Kennedy and Bernard Davis, Electronics & Communication System –TMH 2004.
2. R.P. Singh, SPSapre, Communication Systems–SecondEditionTMH,2007

**TRANSDUCERS AND SENSORS**
(Open Elective)

| | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XD | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**

This course will enable students to

1. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
2. Predict correctly the expected performance of various sensors
3. Locate different type of sensors used in real life applications and paraphrase their importance
4. Understand and analyze the characteristics of temperature sensors
5. Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers

| **Unit -1** | **Hours** |
|---|---|
| **Introduction**: functional elements of an instrument, generalized performance characteristics of instruments – static characteristics, dynamic characteristics. Zero order, first order, second order instruments – step response, ramp response and impulse response. Response of general form of instruments to periodic input and to transient input Experimental determination of measurement system parameters, loading effects under dynamic conditions | 10 |
| **Unit -2** | |
| **Transducers for motion and dimensional measurements:** Relative displacement, translation and rotational resistive potentiometers, resistance strain gauges, LVDT, synchros, capacitance pickups, Piezo-electric transducers, electro-optical devices, nozzle – flapper transducers, digital displacement transducers, ultrasonic transducers. Magnetic and photoelectric pulse counting methods, relative acceleration measurements, seismic acceleration pickups, calibration of vibration pickups. Gyroscopic sensors | 10 |
| **Unit -3** | |
| **TRANSDUCERS FOR FORCE MEASUREMENT**: Bonded strain guage transducers, Photo-electric transducers, variable reluctance pickup, torque measurement dynamometers.<br>**TRANSDUCERS FOR FLOW MEASUREMENT**: Hot wire and hot-film anemometers, Electro-magnetic flow meters, laser Doppler velocity meter TRANSDUCERS FOR PRESSURE MEASUREMENT: Manometers, elastic transducers, liquid systems, gas systems, very high pressure transducers. Thermal conductivity gauges, ionization gauges, microphone | 10 |
| **Unit – 4** | |
| **TRANSDUCERS FOR TEMPERATURE MEASUREMENT**: Thermal expansion methods, Thermometers (liquid in glass), pressure thermometers, Thermocouples, Materials configuration and techniques. Resistance thermometers, Thermistors, junction semiconductors, Sensors, Radiation methods, Optical pyrometers, Dynamic response of temperature sensors heat flux Sensors, Transducers for liquid level measurement, humidity, silicon and quartz sensors, fiber optic sensors. | 10 |
| **Unit – 5** | |

| | |
|---|---|
| **Smart sensors**: Introduction, primary sensors, converters, compensation. Recent trends in sensor technology – film sensors, semiconductor IC technology, MEMS, Nano-sensors | 8 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Use concepts in common methods for converting a physical parameter into an electrical quantity
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
4. Predict correctly the expected performance of various sensors knowledge outside the classroom through design of a real-life instrumentation system
5. Locate different type of sensors used in real life applications and paraphrase their importance

**Text Books:**

1. Sensors and Transducers Hardcover – Import, 5 December 2000by Ian Sinclai , newness publication.
2. Sensors and Transducers , Author, Department of Cybernetics, University of Reading, UK , M. J. Usher, 1985, Springer

**Reference Books**:

1. Doebelin, E.O., "Measurement systems – Application and Design", McGraw Hill.
2. D. Patranabis, "Sensors and Transducers", PHI, 2nd Edition.

**FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS**
(Open Elective)

| | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XE | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**
This course will enable students to

1. To Learn the architecture of microprocessor and microcontroller.
2. To know the programming of 8086
3. To understand the interfacing of the processors
4. To know Memory System and I/O Organization and its applications.
5. To develop Microcontroller programming for various applications

| **Unit -1** | **Hours** |
|---|---|
| 8085 PROCESSOR Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts, Interrupts. 8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration. | 10 |
| **Unit -2** | |
| 8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools. | 10 |
| **Unit -3** | |
| 8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers. | 10 |
| **Unit – 4** | |
| 8051 MICRO CONTROLLER Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts– Timing Diagram — Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085. | 10 |
| **Unit – 5** | |
| MICRO CONTROLLER PROGRAMMING & APPLICATIONS Simple programming exercises- key board and display interface –Control of servo motor stepper motor control- Application to automation systems. | 8 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Understand the architecture of microprocessor and their operation.
2. Demonstrate programming skills in assembly language for processors and controllers.
3. Analyze various interfacing techniques and apply them for the design of processor/Controller based systems.
4. Understand 8051 architecture.
5. Analyze Microcontroller programming & applications

**Text Books:**

1. R.S. Gaonkar, Microprocessor Architecture Programming and Application, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
2. A.K Ray, K.M. Bhurchandhi," Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
3. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition, 2011

**Reference Books**:

1. Douglas V Hall, SSSP Rao, Microprocessors and Interfacing – Programming and Hardware, Tata Mc Graw Hill Education Private Limited,3rdEdition,1994

| FUNDAMENTALS OF INTERNET OF THINGS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XF | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| | | | **Credits – 03** |

**Course Objectives:**

This course will enable students to

1. To introduce IoT Fundamentals
2. To know about the IoT Characteristics.
3. To give the understanding of IoT Architecture overview
4. To understand the concepts of IoT Reference Architecture.
5. To know different case studies of IoT.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to IoT:** Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models &APis. | 10 |
| **Unit -2** | |
| M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT. | 10 |
| **Unit -3** | |
| M2M vs loT An Architectural Overview-Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT. | 10 |
| **Unit – 4** | |
| IoT Reference Architecture-Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world-Introduction, Technical design Constraints. | 10 |
| **Unit – 5** | |
| Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi, Introduction to Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT. Case Studies: Home Automation, Smart Health care. | 8 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Understand general concepts of Internet of Things (IoT)
2. Understand general concepts of M2M
3. Know the design principals of IoT
4. Recognize the various architectural view IoT
5. Apply the different applications of IoT

**Text Books:**


1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-onApproach)", 1st Edition,VPT,2014
2. JanHoller, Vlasios Tsiatsis, Catherine Mulligan,StefanAvesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of intelligence",1stEdition,AcademicPress,2014.


**Reference Books**:


1. Francisda Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",1st Edition, A press Publications,2013
2. CunoPfister, Getting Started with the Internet of Things, O"ReillyMedia, 2011,ISBN:978-1-4493-9357-1

**FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING**
(Open Elective)

| | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XG | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |

**Credits – 03**

**Course Objectives:**
This course will enable students to
1. Know digital signal processing concepts
2. Find the DFT of the given Discrete Time Sequences
3. Impose FFT concept for solving the DFT of a sequence
4. Design Digital filters for the given specifications
5. Know the concepts on Digital Signal Processors
6.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction:** Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. | 10 |
| **Unit -2** | |
| **Discrete Fourier Transforms:** Introduction, Discrete Fourier transforms of standard signals, Properties of DFT, Linear filtering methods based on DFT. | 10 |
| **Unit -3** | |
| **Fast Fourier transforms (FFT)**: Introduction, Radix-2 decimation in time FFT Algorithm (DIT-FFT), Radix-2 decimation in frequency FFT Algorithm (DIF-FFT), Inverse FFT. | 10 |
| **Unit – 4** | |
| **Design of IIR Digital Filters:** Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations.<br><br>**Design of FIR Digital Filters:** Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Comparison of IIR & FIR filters | 10 |
| **Unit – 5** | |
| **DSP Processors:** Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multi-ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. | 8 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Interpret digital signal processing concepts and solve difference equations for analyzing Discrete Time Systems
2. Apply DFT for Discrete Time Sequences
3. Construct FFT algorithm for solving the DFT of a sequence
4. Construct Digital filters for the given specifications
5. Apply the signal processing concepts on Digital Signal Processors.

**Text Books:**


1. John G. Proakis, Dimitris G.Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications",Pearson Education / PHI, 2007.
2. A Anand Kumar, "Digital Signal Processing", 2nd Edition, PHI Publications
3. B.Venkataramani, M.Bhaskar, " Digital Signal Processors, Architecture, Programming and Applications", TATA McGraw Hill, 2002

1. Andreas Antoniou, **"**Digital Signal Processing", TATA McGraw Hill , 2006
2. Robert J. Schilling, Sandra L. Harris, "Fundamentals of Digital Signal Processing using Matlab",Thomson, 2007.

| SIGNALS AND SYSTEMS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXECOX0XH | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| | | | **Credits – 03** |

**Course Objectives:**

This course will enable students to

1. Learn various signals, systems both in continuous time and discrete time.
2. Know the Fourier analysis of continuous-time periodic signals and finite energy signals.
3. Perform signal conversion by applying sampling theorem.
4. Make use of applying various signal and system properties to LTI systems
5. Extend the transform analysis to discrete time sequences

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to Signals and Systems:** Definition of Signals and Systems, Singularity functions and related functions. Complex exponential and sinusoidal signals. Classification of Signals, Operations on signals. Classification of | 8 |
| **Unit -2** | |
| **Fourier Series:** Fourier series representation of continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series.<br>**Fourier Transform:** Fourier transform of arbitrary signal, Fourier transform of standard signals, properties of Fourier transforms. | 10 |
| **Unit -3** | |
| **Sampling Theorem**: Representation of a CT signal by its samples: The Sampling theorem, impulse sampling, Natural and Flat-top Sampling, Reconstruction of signal from its samples, effect of under sampling–Aliasing.<br>Review of Laplace Transforms, Properties, Inverse Laplace Transform, Relation between L.T and F.T of a signal. | 10 |
| **Unit – 4** | |
| **Analysis of Linear Systems:** Linear Time Invariant systems, impulse response, Response of a linear system, Transfer function of a LTI system, Concept of convolution and graphical representation of convolution. Cross-correlation and auto-correlation of signals, Relation between convolution and correlation. | 10 |
| **Unit – 5** | |
| **Z–Transforms:** Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence, constraints on ROC for various classes of signals, Properties of Z-transforms, Inverse Z-transform.<br>**Applications of signals and Systems:** Modulation for communication, Filtering of signals and Feedback control systems. | 10 |
| **Total** | **48** |

**Course outcomes:**

On completion of the course student will be able to

1. Understand various signals and systems and demonstrate their properties.
2. Develop Fourier analysis of continuous-time periodic signals and continuous-time finite energy signals.
3. Apply sampling theorem for signal conversion from continuous- time signals to discrete-time.
4. Illustrate various operations on LTI systems.
5. Apply z-transform to analyze discrete-time signals.

**Text Books:**


1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd Edition, PHI, 2009.
2. A Anand Kumar, " Signals and Systems", PHI Publications.


**Reference Books**


1. B.P. Lathi, "Signal Processing & Linear Systems", 1st Edition, Oxford University Press, 2006
2. Simon Haykin and Van Veen, "Signals & Systems", 2nd Edition, John Wiley India, 2011.

# Open Elective Courses offered by ECT to other Departments

**Open Elective Courses offered by ECT Department**

| S.No | Subject Code | Name of the subject | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1 | 18XXETOXXXX | Signals and Systems | 3 | 0 | 0 | 3 |
| 2 | 18XXETOXXXX | Principles of Signal Processing | 3 | 0 | 0 | 3 |
| 3 | 18XXETOXXXX | Consumer Electronics | 3 | 0 | 0 | 3 |
| 4 | 18XXETOXXXX | Transducers and Sensors | 3 | 0 | 0 | 3 |
| 5 | 18XXETOXXXX | IOT and Applications | 3 | 0 | 0 | 3 |
| 6 | 18XXETOXXXX | IC Applications | 3 | 0 | 0 | 3 |
| 7 | 18XXETOXXXX | Principles of Communications | 3 | 0 | 0 | 3 |
| 8 | 18XXETOXXXX | Data Communications | 3 | 0 | 0 | 3 |
| 9 | 18XXETOXXXX | Digital Logic design | 3 | 0 | 0 | 3 |
| 10 | 18XXETOXXXX | Remote Sensing and GIS | 3 | 0 | 0 | 3 |

**SIGNALS AND SYSTEMS**
**(Open Elective)**

| | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | Engineering Mathematics | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand signals and systems classification
2. Explain convolution and representations of Systems
3. Understand frequency domain representation of systems

4.Explain the applications of Fourier representation

| **Unit -1** | **Hours** |
|---|---|
| **Introduction:** Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems | 10 |
| **Unit -2** | |
| **Time-domain representations for LTI systems:** Convolution, impulse response representation, Convolution Sum and Convolution Integral. Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations. | 10 |
| **Unit -3** | |
| **Frequency-domain representation for signals:** Introduction, Discrete-time and continuous time Fourier series (derivation of series excluded) and their properties. **Discrete-time and continuous-time** Fourier transforms (derivations of transforms are excluded) and their properties. | 10 |
| **Unit -4** | |
| **Applications of Fourier representations:** Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals. | 9 |
| **Unit -5** | |
| **LAPLACE & Z-TRANSFORMS:** Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Z-Transforms: Introduction, Z-transform, properties of ROC, properties of Z – transforms, inversion Z-transforms. Z-Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations | 9 |

**Course outcomes:** Students will be able to

1. Understand signal and its basic operations
2. Understand linear time invariant systems.
3. Apply the concepts of Fourier series representations to analyze continuous and discrete time periodic signals.
4. Understand and apply the continuous time Fourier transform, discrete time Fourier transform,

Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems

**Text Books:**


1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", Pearson, 2 nd Edn.G. Streetman and S. K. Banerjee, "Solid State Electronic Devices", 2nd edition, Pearson, 2014.
2. B. P. Lathi, "Linear Systems and Signals", Second Edition, Oxford University Press

3. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition.

**Reference Books**:

1. Michel J. Robert, “Fundamentals of Signals and Systems”, MGH International Edition, 2008.
Ramakrishna Rao,“Signals and Systems”, 2008, TM

| PRINCIPLES OF SIGNAL PROCESSING<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | Signals and Systems | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand discrete signals and systems, DIT algorithms
2. Explain the structures of IIR filters by bilinear transformation
3. Explain the structures of FIR filters by window techniques
4. Explain the concept of multirate signal processing and adaptive filters

| **Unit -1** | **Hours** |
|---|---|
| **Discrete Signals and Systems**- A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering. | 10 |
| **Unit -2** | |
| **Structures of IIR filters** – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation. | 10 |
| **Unit -3** | |
| **Structures of FIR filters** – Linear phase FIR filter – Filter design.<br>**Design using windowing techniques** (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques | 9 |
| **Unit – 4** | |
| **Multirate signal processing:** Basic building blocks of multirate DSP, Decimation, Interpolation, Sampling rate conversion by a rational factor, Multistage Sampling Rate Converters. | 10 |
| **Unit – 5** | |
| **Adaptive Filters:** Introduction, LMS and RLS Adaptation Algorithms, Applications of adaptive filtering to equalization, noise cancellation. | 9 |

**Course Outcomes:**

The student will be able to

1. Use the FFT algorithm for solving the DFT of a given signal
2. Design a Digital filter (FIR&IIR) from the given specifications
3. Realize the FIR and IIR structures from the designed digital filter.
4. Use the Multirate Processing concepts in various applications.
5. Apply the Adaptive signal processing concepts to various signal processing applications

**Text Books:**


1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PH


**Reference Books**:


1. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
2. Understanding Digital Signal Processing 2nd Edition by Richard G.Lyons


**CONSUMER ELECTRONICS**

| (Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | Analog Communications | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand the significance of audio systems
2. Explain the digital audio fundamentals and operation
3. Explain the operation of digital transmission and reception

4.Understand the need for different type of appliances

| **Unit -1** | **Hours** |
|---|---|
| **Audio Systems:** Microphones and Loudspeakers: Carbon, moving coil, cordless microphone, Direct radiating and horn loudspeaker, Multi-speaker system, Hi-Fi stereo and dolby system. Concept to fidelity, Noise and different types of distortion in audio system | 10 |
| **Unit -2** | |
| **Digital Audio Fundamentals:** Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion. | 9 |
| **Unit -3** | |
| **SCR and Thyristor:** Principles of operation and characteristics of SCR, Triggering of Television: Basics of Television: Elements of TV communication system, Scanning and its need, Need of synchronizing and blanking pulses, VSB, Composite Video Signal.<br>**Colour Television:** Primary, secondary colours, Concept of Mixing, Colour Triangle, Camera tube, PAL TV Receiver, NTSC, PAL, SECAM | 10 |
| **Unit -4** | |
| **Digital Transmission and Reception:** Digital satellite television, Direct-To-Home(DTH) satellite television, Introduction to :Video on demand, CCTV, High Definition(HD)-TV. Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram of LCD and LED Television and their comparison | 10 |
| **Unit -5** | |
| **Introduction to different type of domestic/commercial appliances:** Operation of Micro-wave oven, Food Processors, Digital Electronic Lock, Vacuum cleaner, Xerox Machine, scanner<br>. | 09 |

**Course Outcomes:**

Student will be able to

1. Understand the various type of microphones and loud speakers.
2. To identify the various digital and analog signal.
3. Describe the basis of television and composite video signal.
4. Describe the various kind of colour TV standards and system.
5. Compare the various types of digital TV system.
6. Understand the various type of consumer goods.

**Text Books :**

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company

**Reference Books**:

1. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

| TRANSDUCERS AND SENSORS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | EMI | Credits – 03 | |

**Course Objectives:**

This course will enable students to

- Understand measurements and instrumentation and its need.
- Explain the Characteristics of Transducers.

1. Explain the Characteristics of resistive, inductive and capacitive transducers

| **Unit -1** | **Hours** |
|---|---|
| **Measurements and Instrumentation of Transducers:** Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers. | 10 |
| **Unit -2** | |
| **Characteristics of Transducers:** Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs | 10 |
| **Unit -3** | |
| **Resistive Transducers:** Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications<br>**Torque measurement** – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer | 9 |
| **Unit – 4** | |
| **Inductive and Capacitive Transducer:** Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone. | |
| **Unit – 5** | |
| **Miscellaneous Transducers:** Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers | |

**Course Outcomes:**

At the end of the course, a student will be able to:

1. Use concepts in common methods for converting a physical parameter into an electrical quantity
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
4. Predict correctly the expected performance of various sensors
5. Locate different type of sensors used in real life applications and paraphrase their importance
6. Set up testing strategies to evaluate performance characteristics of different types of

sensors and transducers

7. develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system

**Text Books:**


1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, Dhanpat Rai & Company Private Limited, 2007.
2. Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.


**Reference Books**:


1. Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.
2. Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000
3. John. P, Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000.
4. Murthy. D. V. S, "Transducers and Instrumentation", Prentice Hall of India, 2001. 4. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
5. Instrument Transducers – An Introduction to their Performance and design – by Herman K. P. Neubrat, Oxford University Press

| IOT AND APPLICATIONS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | | Credits – 03 | |

**Course Objectives:**

This course will enable students to

2. Understand the IoT and its role in cloud computing.
3. Understand the elements and application development using IoT.
4. Explain the solution framework for IoT applications
5. Analyze the IoT Case Studies.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to IoT:** Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT. | 10 |
| **Unit -2** | |
| **Elements of IoT:** Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set. | 10 |
| **Unit -3** | |
| **IoT Application Development:** Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.<br>**Bluetooth Smart Connectivity** Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview. | 9 |
| **Unit – 4** | |
| **Solution framework for IoT applications:** Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices. | 10 |
| **Unit – 5** | |
| **IoT Case Studies:** IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation. Cloud Analytics for IoT Application :Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud. | 9 |

**Course Outcomes:**

The student will be able to:

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication modules.
3. Remotely monitor data and control devices.
4. Design real time IoT based applications.
5. Design the real case studies.

**Text Books:**


1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education,2017.
2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu,2011
3. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", UniversityPress,2015


**Reference Books**:


1. CypressSemiconductor/PSoC4BLE(BluetoothLowEnergy)ProductTrainingModules.
2. PethuruRajandAnupamaC.Raman,"TheInternetofThings:EnablingTechnologies,Platforms,andUse Cases",CRCPress,2017.

| IC APPLICATIONS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | Analog Circuits, DSD | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand the ideal op-amp and practical op-amp.
2. Understand 555 timer and IC565 VCO and its application.
3. Explain the DAC and ADC techniques and its specifications.
4. Explain the Use of TTL-74XX Series & CMOS 40XX Series ICs

| **Unit -1** | **Hours** |
|---|---|
| **Ideal and Practical Op-Amp**, Op-amp characteristics-DC and AC Characteristics, General Linear Applications of Op-Amp: Adder, Subtractor, Differentiators and Integrators, Active Filters and Oscillators, Nonlinear Applications of OPAMP: Comparators, Schmitt Trigger, Multivibrators | 10 |
| **Unit -2** | |
| **Introduction to 555 Timer**, Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger, PLL- Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO. | 10 |
| **Unit -3** | |
| **Introduction, Basic DAC Techniques** - Weighted Resistor Type. R-2R Ladder Type, inverted R-2R Type.<br>**Different types of ADCs** - Parallel Comparator Type. Counter Type. Successive Approximation Register Type and Dual Slope Type DAC and ADC Specifications. | 9 |
| **Unit – 4** | |
| **Use of TTL-74XX Series & CMOS 40XX Series ICs**, TTL ICs - Code Converters, Decoders, Demultiplexer, Encoders, Priority Encoders, multiplexers & their applications. Priority Generators, Arithmetic Circuit ICs-Parallel Binary Adder/Subtractor Using 2's Complement System, Magnitude Comparator Circuits. | 10 |
| **Unit – 5** | |
| **Commonly Available 74XX & CMOS 40XX Series ICs** - RS, JK. JK Master-Slave. D and T Type Flip-Flops & their Conversions, Synchronous and asynchronous counters. Decade counters. Shift Registers & applications | 09 |
| **Course Outcomes:**<br>The student will be able to<br>1. Analyze the Differential Amplifier with Discrete components<br>2. Describe the Op-Amp and internal Circuitry: 555 Timer, PLL<br>3. Discuss the Applications of Operational amplifier: 555 Timer, PLL<br>4. Design the digital application using digital ICs<br>5. Use the Op-Amp in A to D & D to A Converters | |

**Text Books:**


1. Linear Integrated Circuits -D. Roy Chowdhury, New Age International (p)Ltd, 3" Ed., 2008.
2. Digital Fundamentals - Floyd and Jain, Pearson Education,8th Edition, 2005.

**Reference Books**:


1. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987

| PRINCIPLES OF COMMUNICATION SYSTEMS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | Signals and Systems | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand modulation techniques in time and frequency domain
2. Explain angle modulation and signal sampling.
3. Analyze noise in analog modulation systems
4. Understand Transmission of Binary Data in Communication Systems

| **Unit -1** | **Hours** |
|---|---|
| **Amplitude modulation:** Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector. Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing. Single side–band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television | 10 |
| **Unit -2** | |
| **Angle modulation:** Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, | 9 |
| **Unit -3** | |
| **Signal Sampling and Analog Pulse Communication:** Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation. **Digital Communication Techniques:** Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Pulse Code Modulation, Delta Modulation. | 9 |
| **Unit – 4** | |
| **Noise in analog modulation:** Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM. | 10 |
| **Unit – 5** | |
| **Transmission of Binary Data in Communication Systems:** Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction | 10 |

**Course Outcomes**:

The student will be able to

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise
4. Characterize the influence of channel on analog modulated signals
5. Determine the performance of analog communication systems in terms of SNR
6. Analyze pulse amplitude modulation, pulse position modulation, pulse code

| |
|---|
| modulation and TDM systems |
| **Text Books:**<br>1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.<br>2. Communication Systems – B.P. Lathi, BS Publication,2006. |
| **Reference Books**:<br>1. Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.<br>2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.<br>3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007. |

| DATA COMMUNICATIONS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | Communication | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand the concept of data communications and network connection.
2. Explain the operation of data link layer and network layer.
3. Understand the operation of transport layer and IP.
4. Explain the application layer and Principles of Networking Applications.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to Data Communications:** Components, Data Representation, Data Flow, Networks Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture, | 10 |
| **Unit -2** | |
| **Data Link Layer:** Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame. | 10 |
| **Unit -3** | |
| **The Network Layer**: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane.<br>**The Internet Protocol(IP):** Forwarding and Addressing in the Internet Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6 | 9 |
| **Unit – 4** | |
| **Transport Layer:** Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP - UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented **Transport:** TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP | 10 |

| | |
|---|---|
| Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control | |
| **Unit – 5** | |
| **Application Layer:** Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages. | 9 |

**Course Outcomes:**

1. Know the Categories and functions of various Data Communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms

**Text Books:**


1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017.
2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.


**Reference Books**:


1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education, 2003.
3. Understanding Communications and Networks, 3 rd Edition, W.A.Shay, Cengage Learning, 2003.

| DIGITAL LOGIC DESIGN<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand the number system and codes.
2. Explain the minimization techniques with four variables and single function.
3. Understand the logic circuits design using MSI and LSI
4. Explain the operation of sequential and combinational circuit design.

| **Unit -1** | **Hours** |
|---|---|
| **REVIEW OF NUMBER SYSTEMS & CODES:** Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code. BOOLEAN **THEOREMS AND LOGIC OPERATIONS:** Boolean theorems, principle of complementation & duality, De-Morgan theorems, Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486. | 9 |
| **Unit -2** | |
| **MINIMIZATION TECHNIQUES:** Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables)and tabular method(Quine-mccluskey method) with only four variables and single function. COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams. | 10 |
| **Unit -3** | |
| **COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :** Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers, Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.<br>**INTRODUCTION OF PLD's :** PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table. | 10 |
| **Unit – 4** | |
| **SEQUENTIAL CIRCUITS I**: Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop, Design of 5ripple counters, design of synchronous counters, | 10 |

| | |
|---|---|
| Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register, Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121. | |
| **Unit – 5** | |
| **SEQUENTIAL CIRCUITS II :** Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa, Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping) | 9 |

**Course Outcomes**:

The student will be able to

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters
5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines
6. Produce innovative designs by modifying the traditional design techniques

**Text Books:**


1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K. Jha 3rdEdition, Cambridge UniversityPress,2009
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHIpublication,2008
3. Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.


**Reference Books**:


1. Fundamentals of Logic Design by Charles H.RothJr,JaicoPublishers,2006
2. Digital electronics by R S Sedha.S.Chand&companylimited,2010
3. Switching Theory and Logic Design by A.Anand Kumar,PHILearningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough,Cengagelearning,2006.
5. TTL74-Seriesdatabook.

| REMOTE SENSING AND GIS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXETOXXXX | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Pre-requisite | | Credits – 03 | |

**Course Objectives:**

This course will enable students to

1. Understand the concept of photogrammetry and its significance.
2. Explain the basic concept of remote sensing and limitations.
3. Understand the vector data model and topology rules.
4. Explain the raster data model , elements and importance of source map and data editing

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to Photogrammetry:** Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line. | 09 |
| **Unit -2** | |
| **Remote Sensing:** Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques. | 10 |
| **Unit -3** | |
| **Remote Sensing:** Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process.<br>**Electromagnetic Spectrum**, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques. | 10 |
| **Unit – 4** | |
| **Vector Data Model:** Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules | 10 |
| **Unit – 5** | |
| **Raster Data Model:** Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data. Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing | 09 |

**Course Outcomes:**

The student will be able to

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems
6. Create GIS and cartographic outputs for presentation

**Text Books:**

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

**Reference Books**:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications. 2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications

# Open Elective Courses offered by EEE to other Departments

**Open Electives offered by EEE department**

| S. No | Subject Code | Subject title |
|---|---|---|
| 1 | 18XXEEOM0XA | Control system design |
| 2 | 18XXEEOM0XB | Optimization techniques |
| 3 | 18XXEEOM0XC | Electrical Energy Conservation And Auditing |
| 4 | 18XXEEOM0XD | Electrical and Hybrid Vehicles |
| 5 | 18XXEEOM0XE | Intelligent control & its applications |
| 6 | 18XXEEOM0XF | Electrical materials |
| 7 | 18XXEEOM0XG | Industrial Electrical Systems |
| 8 | 18XXEEOM0XH | Advanced Control Systems |

| CONTROL SYSTEM DESIGN<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XA | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits – 03 | | | |

**Course Objectives:**

This course will enable student to

1. Explain the concepts of design problem and various design specifications.
2. Discuss the design of compensator for both time and frequencydomain specifications.
3. Explain the design of various controllers.
4. Understand the concept on feed-forward control.
5. Apply the knowledge of design using statespace
6. Understand the methods of solving Non-linear system of equations.

| **Unit 1: Design Specifications** | **Hours** |
|---|---|
| Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response. | **10** |
| **Unit 2: Design of Classical Control System in the time domain and Frequency domain** | |
| Introduction to compensator. Design of Feedback and Feed forward compensators, Feedback compensation. Realization of compensators.<br>Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using Bode diagram. | **10** |
| **Unit 3: Design of PID controllers** | |
| Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control. | **09** |
| **Unit 4: Control System Design in state space** | |
| Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Full order, Reduced order observer. Separation Principle. | **10** |
| **Unit 5: Design of control for Non LinearSystems** | |
| Introduction, Methods of solving Non-linear systems of equations. Pseudo-composition, weight function procedure, Technique for extending scalar methods to the multidimensional case in a nontrivial way | **09** |

**Course outcomes:**

On completion of the course student will be able to:

1. Elaborate the concepts of various designing fundamentals.
2. Apply the basic design in both time and frequency domain
3. Understand the concepts of PID controllers
4. Apply the knowledge of design using state space
5. Illustrate the basic concepts of nonlinearities and their performance
6. Discuss the concepts of singular points and performance of system

**Text Books:**


1. N.Nise,“ControlsystemEngineering”,JohnWiley,2000.
2. I.J.NagrathandM.Gopal,“Controlsystemengineering”,Wiley,2000.
3. M.Gopal,“DigitalControlEngineering”,WileyEastern,1988.
4. K.Ogata,“ModernControlEngineering”,PrenticeHall,2010.


**Reference Books:**


1. B. C. Kuo, “ Automatic Control system”, PrenticeHall,1995.
2. J. J. D’Azzo and C. H. Houpis, “ Linear control system analysis anddesign (conventional and modern)” , McGrawHill,1995.
3. R. T. Stefani and G. H. Hostettler, “Design of feedback Control Systems”, Saunders CollegePub,1994.

| OPTIMIZATION TECHNIQUES<br>Open Elective | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XB | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits -3 | | | |

**Course Objectives:**

This course will enable student to:

1. Explain the objective and constraint functions in terms of design variables, and then state the optimization problem.
2. Solve single variable and multi variable optimization problems with and without constraints.
3. Explain linear programming technique to an optimization problem, slack and surplus variables, by using Simplex method.
4. Explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.
5. Discuss evolutionary programming techniques.

| **Unit 1: Introduction** | **Hours** |
|---|---|
| Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems. | **09** |
| **Unit 2: Classical Optimization Techniques**<br>Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers,<br>multivariableOptimizationwithinequalityconstraints,Kuhn,Tuckerconditions. | **10** |
| **Unit 3: Linear Programming**<br>Standard form of a linear programming problem , geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method. | **09** |
| **Unit 4: Nonlinear Programming**<br>Unconstrained cases, One, dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method.<br>Constrained cases, Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem. | **10** |
| **Unit 5: Introduction to Evolutionary Methods**<br>Evolutionary programming methods, Introduction to Genetic Algorithms (GA)– Control parameters, Number of generation, population size, selection, reproduction, crossover and mutation, Operator selection criteria , Simple mapping of objective function to fitness function, constraints, Genetic algorithm steps,<br>Stopping criteria –Simple examples. | **10** |

**Course outcomes:**

On completion of the course student will be able to:

1. State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
2. Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
3. Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
4. Apply gradient and non-gradient methods to nonlinear optimization problems.
5. Apply interior or exterior penalty functions for the constraints to derive the optimal solutions.
6. Able to apply Genetic algorithms for simple electrical problems.

**Text Books:**


1. "Engineering optimization: Theory and practice"-by S. S.Rao, NewAge International (P) Limited, 3rd edition,1998.
2. Soft Computing with Matlab Programming by N.P.Padhy&S.P.Simson,Oxford University Press –2015


**Reference Books:**


1. "Optimization methods in operations Research and Systems Analysis" by K.V.Mitaland C.Mohan, New Age International (P) Limited, Publishers, 3rd edition,1996.
2. Genetic Algorithms in search, optimization, and Machine Learning by DaviE.Goldberg, ISBN:978-81-7758-829-3, Pearsonby Dorling Kindersley (India) PvtLtd.
3. "Operations Research: An Introduction" by H.A.Taha, PHI Pvt. Ltd., 6thedition.
4. Linear Programming byG.Hadley.

| ELECTRICAL ENERGY CONSERVATION AND AUDITING<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XC | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits-03 | | | |

**Course Objectives:**

This course enable student to:

1. Explain energy efficiency, scope, conservation and technologies.
2. Discuss energy efficient lighting systems.
3. Calculate power factor of systems and propose suitable compensation techniques.
4. Explain the working of energy instruments.
5. Discuss energy conservation in HVAC systems.
6. Calculate life cycle costing analysis and return on investment on energy efficient technologies.

| **Unit 1: Basic Principles of Energy Audit and International Acts on Energy** | **Hours** |
|---|---|
| Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts –Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Indian energy scenario and consumption, energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, National action plan on climate change Energy and environment, air pollution, climate change United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties | **10** |
| **Unit 2: Energy conservation opportunities in lighting** | |
| Modification of existing systems – Replacement of existing systems – Priorities Definition of terms and units – Luminous efficiency –Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers –Energy conservation measures, lighting energy audit,case studies. | **10** |
| **Unit 3: Power Factor and energy instruments** | |
| Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems Energy Instruments – Watt–hour meter – Data loggers –Thermocouples– Pyrometers – Lux meters – Tong testers – Power analyzer. | **09** |
| **Unit 4: HVAC Systems and ECBC** | |
| Heating, ventilation, air conditioning (HVAC), fenestrations Energy Conservation Building Codes (ECBC), building envelope, insulation, lighting, water pumping, inverter and energy storage/captive generation, elevators and escalators, star labeling for existing buildings, Energy Service Companies based case studies. | **09** |
| **Unit 5: Energy Efficient Motors and Financial Aspects of Conservation Technologies** | |
| Energy Efficient motors Design, construction, Gorilla fan case study(Additional practical topic) Understanding energy cost, Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis — Economics of energy efficient motors and systems. Need of investment, appraisal and criteria, Calculation of simple | **10** |

| | |
|---|---|
| payback period–Return on investment – Net present value – Internal rate of return – numerical examples Applications of life cycle costing analysis – Return on investment –Numerical examples. | |

**Course outcomes:**

On completion of the course student will be able to:

1. Explain energy efficiency, conservation and various technologies
2. Design energy efficient lighting system
3. Calculate power factor of systems and propose suitable compensation techniques
4. Explain the working of Energy Instruments.
5. Explain energy conservation techniques in HVAC Systems
6. Calculate life cycle costing analysis and return on investment on energy efficiency technologies.

**Text Books:**

1. Hand Book of Energy Audit by Sonal Desai- Tata McGrawhill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc. Ltd–2nd edition, 1995

**Reference Books:**


1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications.2012
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. NewDelhi.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management hand book by W.C.Turner, John wileyandsons.
5. Energy management and conservation –k v Sharma and pvenkataseshaiah-I K International Publishing Housepvt.ltd,2011.
6. http://www.energymanagertraining.com/download/Gazette_of_IndiaPartIISecI-37_25-08-2010.pdf

| ELECTRICAL AND HYBRID VEHICLES<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XD | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits-03 | | | |

**Course Objectives:**

This course will enable student to:

1. Explain working of hybrid and electric vehicles, its performance and characteristics.
2. Discuss hybrid vehicle configuration and its components.
3. Explain electric vehicle drive systems.
4. Discuss the properties of energy storage systems.
5. Compare different Energy management strategies

| **Unit 1: Introduction** | **Hours** |
|---|---|
| Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.<br>Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles. | **10** |
| **Unit 2: Hybrid Electric Drive Trains** | |
| Architecture of Hybrid Electric Vehicles (HEV), analysis of drive trains, energy use in conventional vehicles, energy saving potential of hybrid drive trains, various HEV configurations and their operation model.<br>Power flow in HEV: Power flow control in series, parallel, series-parallel hybrid system. Torque and Speed coupling. | **10** |
| **Unit 3: Electric Drive Trains** | |
| Architecture of electric drive train, electric vehicle configuration, electric drive trains, EV power source configurations.<br>Single and Multi-Motor drives, In wheel drives, requirements of different electric motors used in EVs, Power-Torque-Speed characteristics, electric propulsion systems. | **09** |
| **Unit 4: Energy Storage** | |
| Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. | **09** |
| **Unit 5: Energy Management Strategies** | |
| Introduction to energy management strategies used in hybrid and electric vehicles, classification, comparison of different energy management strategies, implementation issues of energy management strategies. Functions of control system in HEVs & EVs, Elementary control theory, Electronic control unit, control area network, control variables, classifications of Hybrid electronic control unit, fuzzy logic based control system | **10** |

**Course outcomes:**

On completion of the course student will be able to:

1. Illustrate the working of hybrid and electric vehicles, its performance and characteristics.
2. Analyze hybrid vehicle configuration and its components.
3. Discuss electric vehicle drive systems.
4. Illustrate electric propulsion systems.
5. Infer the properties of energy storage systems.
6. Distinguish different energy management strategies.

**Question paper pattern:**

The question paper will have 10questions.

1. Each full question carries 14marks.
2. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

**Text Books:**


1. C. Mi, M. A. Masrur and D. W. Gao, " Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons,2011.
2. S. Onori, L. Serrao and G. Rizzoni, " Hybrid Electric Vehicles: Energy Management Strategies" , Springer,2015.


**Reference Books:**


1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric,HybridElectric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge,2016.

| INTELLIGENT CONTROL & ITS APPLICATIONS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XE | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits – 03 | | | |

**Course Objectives:**

This course will enable student to:

1. Explain the basic intelligent controller concepts
2. Understand concepts of feed forward neural networks and learning and understanding of feedback neural networks.
3. Discuss the concept of genetic algorithm.
4. Understand the basic knowledge of fuzzy logic control.
5. Apply the knowledge of fuzzy logic control, genetic algorithm and neural network to the real problems.

| **Unit 1: Introduction to Intelligent Control** | **Hours** |
|---|---|
| Introduction and motivation. Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation, Expert systems. | **09** |
| **Unit 2: Artificial Neural Networks** | **10** |
| Concept of Artificial Neural Networks, its basic mathematical model, McCulloch- Pitts neuron model, simple perception, Adeline and Madeline, Feed-forward Multilayer Perception. Learning and Training the neural network. Introduction, derivation, algorithm, flowchart, limitation-Error Back propagation, Hopfield, Radial bases function | |
| **Unit 3: Genetic Algorithm** | **10** |
| Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like tab search and ant-colony search techniques for solving optimization problems | |
| **Unit 4: Fuzzy Logic System** | **10** |
| Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems. Fuzzy logic control for nonlinear time- delay system. Implementation of fuzzy logic controller. | |
| **Unit 5: Applications** | **09** |
| Aerospace and data mining applications of Genetic Algorithm - Neural Network and Fuzzy Logic Control applications in Smart grid, Electric drives and Distributed generation. | |

**Course outcomes:**

On completion of the course student will be able to :

1. Infer representations applied to artificial intelligence techniques
2. Illustrate the use of artificial neuron in perceptron models and back propagation algorithm to multilayer feed forward networks
3. Develop rule based and decision making with the use of classical and fuzzylogic systems
4. Analyze the concept of geneticalgorithm.
5. Analyze the fuzzy logic controller using MATLAB.
6. Discover various applications of neural and fuzzy logic systems inelectrical Engineering

**Text Books:**


1. Simon Haykins, Neural Networks: A comprehensive Foundation, Pearson Edition,2003.
2. T.J. Ross, Fuzzy logic with Fuzzy Applications, McGraw Hill Inc,1997.
3. David E Goldberg, Genetic Algorithms. Wesley PublishingCompany,1989
4. John Yen and Reza Langari, Fuzzy logic Intelligence, Control, and Information, Pearson Education, Indian Edition,2003.
5. Neural Network, Fuzzy Logic and Genetic Algorithm : Synthesis and Applications. Rajasekaran and G. A. VijayalakshmiPai (Prentice Hall India, 2010)


**Reference Books:**


1. M.T. Hagan, H. B. Demuth and M. Beale, Neural Network Design, Indian reprint,2008.
2. Fredric M. Ham and IvicaKostanic, Principles of Neuro computing for science and Engineering, McGraw Hill,2001.
3. N. K. Bose and P. Liang, Neural Network Fundamentals with Graphs, Algorithms, and Applications, Mc. Graw Hill, Inc.1996.
4. Yung C. Shin and ChengyingXu, Intelligent System, Modeling, Optimization and Control, CRC Press,2009.
5. N. K. Sinha and Madan M Gupta, Soft computing & Intelligent Systems, Theory &Applications, Indian Edition, Elsevier,2007.
6. WitoldPedrycz, Fuzzy Control and Fuzzy Systems, Overseas Press, Indian Edition,2008.

| ELECTRICAL MATERIALS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XF | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 45 | Exam Hours | 03 |
| Credits – 03 | | | |

**Course Objectives:**

This course will enable student to:

1. Describe the formation and properties of conducting material.
2. Explain the formation and properties of Semiconductor Materials.
3. Infer the formation and properties of Dielectric Materials.
4. Explain the formation and properties of Magnetic Materials.
5. Describe the formation and properties of Special Purpose Materials.

| **Unit 1: Conducting Materials** | **Hours** |
|---|---|
| Review of metallic conduction on the basis of free electron theory. Fermi-Dirac distribution – variation of conductivity with temperature and composition, materials for electric resistors- general electric properties; material for brushes of electrical machines, lamp filaments, fuses and solder. | **10** |
| **Unit 2: Semiconductor Materials** | **09** |
| Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors. | |
| **Unit 3: Dielectric Materials** | **10** |
| Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyro electric materials. | |
| **Unit 4: Magnetic Materials** | **10** |
| Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis | |
| **Unit 5: Materials for Electrical Applications & Special Purpose Materials** | **10** |
| Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation. Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer | |

| | |
|---|---|
| oil as per ISI | |

**Course outcomes:**

On completion of the course student will be able to:

1. Understand various types of conducting, their properties in various conditions.
2. Evaluate semiconductor materials and technologies
3. Understand various types of dielectric materials, their properties in various conditions.
4. Evaluate magnetic materials and their behavior.
5. Acquire Knowledge on Materials used in electrical engineering and applications.
6. Able to test Transformer oil as per standard.

**Text Books:**


1. R K Rajput", " A course in Electrical Engineering Materials", Laxmi Publications, 2009
2. "T K Basak", " A course in Electrical Engineering Materials", New Age Science Publications 2009


**Reference Books:**


1. TTTI Madras, "Electrical Engineering Materials", McGraw Hill Education, 2004.
2. "AdrianusJ.Dekker", Electrical Engineering Materials, PHI Publication, 2006.
3. S. P. Seth, P. V. Gupta "A course in Electrical Engineering Materials", DhanpatRai& Sons, 2011.

| INDUSTRIAL ELECTRICAL SYSTEMS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XG | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits – 03 | | | |

**Course Objectives:**

This course will enable student to:

1. Explain Tariff structure and protection components.
2. Compare various types wiring systems and IE rules.
3. Describe the Illumination technology.
4. Compare various types of cables.
5. Discuss on PLC applications.
6. Explain the implementation of SCADA for various applications.

| **Unit 1: Electrical System Components** | **Hours** |
|---|---|
| LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and<br>Electrical safety practices | **10** |
| **Unit 2: Residential and Commercial Electrical Systems** | |
| Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components. | **10** |
| **Unit 3: Illumination Systems** | |
| Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting. | **10** |
| **Unit 4: Industrial Electrical Systems** | |
| HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components. DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks. | **10** |
| **Unit 5: Industrial Electrical System Automation** | |

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

**Course outcomes:**

On completion of the course student will be able to:

1. Illustrate Tariff structure and protection components.
2. Discuss various types wiring systems and IE rules.
3. Explain the Illumination technology.
4. Distinguish various types of cables.
5. Discover PLC applications.
6. Choose various applications to implement SCADA.

**Text Books:**


1. S. L. Uppal and G. C. Garg, " Electrical Wiring, Estimating & Costing", Khannapublishers,2008.
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International,2007.
3. S. Singh and R. D. Singh, "Electrical estimating and costing",DhanpatRai and Co.,1997.


**Reference Books:**


1. Web site for IS Standards.
2. H. Joshi, "Residential Commercial and Industrial Systems", McGrawHill Education,2008.

| ADVANCED CONTROL SYSTEMS<br>(Open Elective) | | | |
|---|---|---|---|
| Subject Code | 18XXEEOM0XH | IA Marks | 30 |
| Number of Lecture Hours/week | 03 | Exam Marks | 70 |
| Total Number of Lecture Hours | 48 | Exam Hours | 03 |
| Credits -03 | | | |

**Course Objectives:**

The objectives of this course is to acquire knowledge on

1. formulation of different models using state space analysis
2. analysis of state feedback control through pole placement technique.
3. analysis of a nonlinear system using Lypanov's method of stability
4. formulation of Euler Lagrange equation to optimize typical functional and solutions.
5. optimal controller design using LQG framework

| **Unit 1: State Space Analysis** | **Hours** |
|---|---|
| State Space Representation –Solution of state equation –State transition matrix, –Canonical forms –Controllable canonical form –Observable canonical form, Jordan Canonical Form. | **09** |
| **Unit 2: Controllability, Observability and Design of Pole Placement** | **10** |
| Tests for controllability and observability for continuous time systems –Time varying case –Minimum energy control –Time invariant case –Principle of duality –Controllability and observability form Jordan canonical form and other canonical forms –Effect of state feedback on controllability and observability –Design of state feedback control through pole placement. | |
| **Unit 3: Describing Function and Stability Analysis** | **10** |
| Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase–plane analysis. Stability in the sense of Lyapunov –Lyapunov's stability and Lypanov's instability theorems –Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems. | |
| **Unit 4: Calculus of variations** | **09** |
| Minimization of functional of single function –Constrained minimization –Minimum principle –Control variable inequality constraints –Control and state variable inequality constraints –Euler lagrangine equation | |
| **Unit 5: Optimal Control Design** | **10** |
| Linear Quadratic Optimal Regulator (LQR) problem formulation –Optimal regulator Design by parameter adjustment (Lyapunov method) –Optimal regulator Design by Continuous Time Algebraic Riccatti equation (CARE) - | |

| | |
|---|---|
| Optimal controller Design using LQG framework. | |

**Course outcomes:**

1. Able to design the state space model of control system and formulate different state models
2. Able to design of control system using the pole placement technique
3. Able to analyse of nonlinear system using the describing function technique and phase plane analysis.
4. Able to analysis the stability analysis using lypnov method.
5. Able to minimize the function using calculus of variation studied.
6. Able to design optimal controller using LQG framework.

**Text Books:**


1. Modern Control Engineering by K. Ogata, Prentice Hall of India, 3rd edition, 1998.
2. Automatic Control Systems by B.C. Kuo, Prentice Hall Publication


**Reference Books:**


1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996.
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal, Tata McGraw–Hill Companies, 1997

# Open Elective Courses offered by ME to other Departments

## Open Elective Courses Offered by Mechanical Engineering to other Departments

| S. No. | Subject Code | Name of the subject | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1. | 18XXMEOX0XA | Operations Research | 3 | 0 | 0 | 3 |
| 2. | 18XXMEOX0XB | Fundamentals of Mechanical Engineering | 3 | 0 | 0 | 3 |
| 3. | 18XXMEOX0XC | Industrial Robotics | 3 | 0 | 0 | 3 |
| 4. | 18XXMEOX0XD | Engineering Materials | 3 | 0 | 0 | 3 |
| 5. | 18XXMEOX0XE | Introduction to Material Handling | 3 | 0 | 0 | 3 |
| 6. | 18XXMEOX0XF | Production Planning and Control | 3 | 0 | 0 | 3 |
| 7. | 18XXMEOX0XG | Non-Conventional Sources of Energy | 3 | 0 | 0 | 3 |
| 8. | 18XXMEOX0XH | Fluid Mechanics and Fluid Machinery | 3 | 0 | 0 | 3 |

| Operations Research<br>SEMESTER - XX | | | |
|---|---|---|---|
| **Subject Code** | 18XXMEOX0XA | **Internal Marks** | 30 |
| **Number of Lecture Hours/Week** | 3(L) | **External Marks** | 70 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

Enable the students to

1. Understand the definition, scope, objectives, phases, models and limitations of operations research and developing the ability to formulate the linear programming problems for minimizing the project cost and maximizing its profit.
2. Solve linear programming problems using various techniques based on the constraints
3. Understand about different application areas of operations research like transportation problem, assignment model, sequencing models.
4. Suggest optimal sequence and replacement policy and economic order quantities to be maintained for better and economic growth of the industry.
5. Suggest optimal game strategies and estimation of waiting times in waiting line problems in the competitive business world.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction to Operations Research:** Definition, Features, types of OR models, Methodology, Tools, Limitations and applications of Linear Programming.<br>**Linear Programming-I:** Introduction, Formulation of Linear Programming Problem (LPP), Assumptions for solving LPP, Applications of LPP, Graphical method of solving LPP. | **10** |
| **Unit -2** | |
| **Linear Programming-II:** Introduction, steps in solving problems using simplex method, Principle of simplex method- Maximization and minimization problems, solution by simplex method, limitations of LPP simplex method.<br>**Linear Programming-III:** Introduction, Concept of primal, dual relationship, formulation of the dual of the primal problem, solution of LP problems using dual simplex method. | **10** |
| **Unit – 3** | |
| **Transportation Problem:** Basics, Solution of Transportation problem with several methods, performing optimality test, degeneracy in transportation problem.<br>**Assignment model:** Definition, Formulation, Different methods of solutions, Hungarian assignment method, unbalanced assignment problems, travelling salesman problems.<br>**Sequencing problems:** introduction, basics, types of sequencing problems, priority sequencing, sequencing n-jobs through two machines, n-jobs and m-machines, two jobs 3-machines case. | **10** |
| **Unit – 4** | |
| **Replacement:** Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement. | **10** |

| | |
|---|---|
| **Inventory Control:** Introduction, Types of Inventories, Costs associated with inventories, the concept of EOQ, Deterministic inventory problems with no shortages, with shortage. | |
| **Unit – 5** | |
| **Queuing Theory**: Introduction, Queuing system, elements of Queuing system Operating characteristics of a Queuing system, Classification of queuing models: Model-I [M/M/1:∞ / FIFO], Model-III [M/M/1: N/FIFO].<br>**Game Theory**: Introduction, Two Person Zero sum games, Maximin - Minimax principle, Games without saddle points- mixed strategies, Graphical solution of 2Xn, mX2 games, and Dominance property, P-system, S-system, Q-system and Ss-system | **10** |

**Course outcomes:**

1. Formulate and solve mathematical model (linear programming problem) for real situations like production and distribution of goods using basic linear programming techniques li graphical methods
2. Apply the concepts of linear programming for decision making like simplex and dual simplex algorithms in production industries.
3. Calculate the optimal values of cost, job distribution and placement using transportation, assignment and sequencing methods
4. Select the best optimal inventory and replacement time for the goods produced in an industry for its better and economic growth using inventory and replacement techniques.
5. Select the best optimal time and strategy to be followed by any organization to identify the waiting times and strategies to be implemented using waiting lines and game theory techniques for a continuous and successful growth of an industry.

**TEXT BOOKS:**

1. Operation Research /Premkumar Gupta, D.S.Hira / S.Chand
2. Operations Research / S.D.Sharma-KedarnathRamnath(JNTU)

**REFERENCES:**

1. Operations Research / R. Pannerselvam / PHI Publications.
2. Operation Research /J.K.Sharma/MacMilan.
3. Operation Research An Introduction / Taha / Pearson
4. Operations Research / A.M.Natarajan, P. Balasubramani, A. Tamilarasi / Pearson Education.

**Question paper pattern:**

1. Question paper contains 10 Questions, 2 from each course outcome. The student must answer 5 full questions by selecting one question from each course outcome (Internal Choice)
2. All questions carries 14 marks each
3. Each full question will have sub question covering all topics under a course outcome

| Fundamentals of Mechanical Engineering<br>SEMESTER - XX | | | |
|---|---|---|---|
| **Subject Code** | 18XXMEOX0XB | **Internal Marks** | 30 |
| **Number of Lecture Hours/Week** | 3(L) | **External Marks** | 70 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

Enable the students to

1. Understand the concepts of fluid properties like specific gravity, viscosity, density, surface tension
2. To study the classification of turbines and work done and efficiency of the different turbines and also study about draft tube theory and to determine the function efficiency.
3. To study about specific speed and performance characteristics of different types of turbines.
4. To study automobile engine working, valve timing and associated systems such as lubricating system, cooling system, fuel feed system, ignition system etc., their necessity, requirements, construction details, different types and their working
6. To study the construction, working principles and advantages of belt and rope drives, selection of belt drive- types of belt drives, V-belts, types of coupling.

| **Unit -1** | **Hours** |
|---|---|
| **Fluid Mechanics:** Dimensions and units: physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, and vapor pressure. Atmospheric gauge and vacuum pressure – Measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. | **10** |
| **Unit -2** | |
| **Impact of jets:** hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes. | **10** |
| **Unit – 3** | |
| **Hydraulic Turbines and Governing systems:** Classification of turbines; Working principle, Efficiency calculation and Design principles for Pelton Wheel, Francis and for Kaplan turbines; Governing of turbines; Performance and characteristic curves.. | **10** |
| **Unit – 4** | |
| **I. C. Engines**: Classification, working principles – valve and port timing diagrams – air standard cycles –fuel injection system, carburetion, ignition, cooling and lubrication – Engine performance evaluation.<br>**Spark Ignition and Combustion Ignition engines** – Classification, working principles, Types of engines. | **10** |
| **Unit – 5** | |
| **Belt drives:** Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt,<br>**Coupling:** Brief introduction of coupling, Rigid couplings - muff, split muff and | **10** |

| | |
|---|---|
| flange couplings, flexible couplings - flange coupling | |

**Course outcomes:**

1. Understand the concepts of fluid properties like specific gravity, viscosity, density, surface tension.
2. To study the classification of turbines and work done and efficiency of the different turbines and also study about draft tube theory and to determine the function efficiency.
3. This study is also used for the estimation of efficiency and performance of the turbine with the study of characteristics curves.
4. To study automobile engine working, valve timing and associated systems such as lubricating system, cooling system, fuel feed system, ignition system etc., their necessity, requirements, construction details, different types and their working
5. To study the construction, working principles and advantages of belt and rope drives, selection of belt drive- types of belt drives, V-belts, types of coupling.

**TEXT BOOKS:**

1. Basic Mechanical Engineering / Pravin Kumar/ Pearson
2. Thermal Engineering-R.S Khurmi/JS Gupta/S.Chand.
3. Introduction to Engineering Materials / B.K. Agrawal/ McGraw Hill

**REFERENCES:**

1. Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI
2. Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria

**Question paper pattern:**

1. Question paper contains 10 Questions, 2 from each course outcome. The student must answer 5 full questions by selecting one question from each course outcome (Internal Choice)
2. All questions carries 14 marks each
3. Each full question will have sub question covering all topics under a course outcome

| Industrial Robotics | | | |
|---|---|---|---|
| **Subject Code** | 18XXMEOX0XC | **Internal Marks** | 30 |
| **Number of Lecture Hours/Week** | 3(L) | **External Marks** | 70 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |

**Credits – 03**

**Course Objectives:**

Enable the students to

1. Understand various applications of robotics and classification of coordinate system and control systems
2. Build the concepts of components of industrial robotics.
3. Determine kinematic analysis with D-H notation, forward and inverse kinematics
4. Model trajectory planning for a manipulator by avoiding obstacles
5. Understand different types of actuators and importance of application of robots in manufacturing

| **Unit -1** | **Hours** |
|---|---|
| **Introduction:** Automation and Robotics, CAD/CAM and Robotics – An overview of Robotics –present and future applications – classification by coordinate system and control system. | 10 |
| **Unit -2** | |
| **Components of the Industrial Robotics:** Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices. | 10 |
| **Unit – 3** | |
| **Motion Analysis:** Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems. | 10 |
| **Unit – 4** | |
| **Trajectory Planning:** General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language. | 10 |
| **Unit – 5** | |

| | |
|---|---|
| **Robot Actuators and Feed Back Components:** Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors– potentiometers, resolvers, encoders – Velocity sensors.<br>Robot Applications in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection. | 10 |

**Course outcomes:**

1. Understand various applications of robotics and classification of coordinate system and control systems
2. Build the concepts of components of industrial robotics.
3. Apply kinematic analysis with D-H notation, forward and inverse kinematics
4. Model trajectory planning for a manipulator by avoiding obstacles.
5. Understand different types of actuators and various applications of robots in manufacturing

**TEXT BOOKS:**

1.Industrial Robotics / Groover M P /Mc Graw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

**REFERENCES:**

1. Introduction to Robotics/ Saeed B Niku / Wiely Publications.

**Question paper pattern:**

1. Question paper contains 10 Questions, 2 from each course outcome. The student must answer 5 full questions by selecting one question from each course outcome (Internal Choice)
2. All questions carries 14 marks each
3. Each full question will have sub question covering all topics under a course outcome

| ENGINEERING MATERIALS<br>SEMESTER XX | | | |
|---|---|---|---|
| Subject Code | 18XXMEOX0XD | Internal Marks | 30 |
| Number of Lecture Hours/Week | 03 | External Marks | 70 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**Credits - 03**

**Course objectives:**

This course will enable students to:

1. Classify different bonds in solids and understand crystallization of the metals, for the formation of the solid solutions and compounds.
2. Understand different phase diagrams .
3. Recorgnize the property requirements of a given application and suggest a suitable ferrous and non ferrous metal and their alloys.
4. Illustrate the property requirements of a given application and suggest appropriate heat treatment
5. Identify the property requirements of a given application and suggest a suitable ceramics, composite materials
6. Identify the relationships between structure, composition and properties of different engineering materials.

| **Unit -1** | **Hours** |
|---|---|
| **Structure of Metals and Constitution of alloys:** Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rothery's rules, intermediate alloy phases, and electron compounds. Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery. | **10** |
| **Unit -2** | |
| **Equilibrium Diagrams:** Experimental methods of construction of equilibrium diagrams, Isomorpous alloy systems, equilibrium cooling and heating of alloys, lever rule, coring, miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. | **8** |
| **Unit - 3** | |
| **Ferrous & non-ferrous metals and their alloys** Structure and properties of white cast iron, malleable cast iron, grey cast iron, spheroid graphite cast iron, alloy cast irons. Classification of steels, structure and properties of plain carbon steels, low alloy steels, Hadfield manganese steels, tool and die steels. Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys | **12** |
| **Unit – 4** | |
| **Heat treatment of Alloys:** Annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface-hardening methods (carburizing, carbo-nitriding, cyaniding, induction hardening and flame hardening), age hardening treatment, and cryogenic treatment of alloys. vacuum and plasma hardening | **8** |

**Unit-5**

| | |
|---|---|
| **Ceramic and composite materials:** Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterial's – definition, properties and applications of the above. Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites. | **12** |

**Course outcomes:**

On completion of the course, student will be able to

1. Classify different bonds in solids and understand crystallization of the metals, for the formation of the solid solutions and compounds.
2. Different phase diagrams and study of binary phase diagrams
3. Recorgnize the property requirements of a given application and suggest suitable ferrous & non ferrous alloys
4. Analyze the property requirements of a given application and suggest appropriate heat treatment
5. Identified the property requirements of a given application and suggest a suitable ceramics, composite materials
6. Understand the relationships between structure, composition and properties of different engineering materials

**Text Books:**

1. Introduction to Physical Metallurgy - Sidney H. Avener - McGrawHill
2. Essential of Materials science and engineering - Donald R.Askeland –Thomson

**Reference Books:**

1. Material Science and Metallurgy – V.D.Kodgire and S.V.Kodgire
2. Materials Science and engineering - Callister & Baalasubrahmanyam
3. Material Science for Engineering students – Fischer – Elsevier Publishers.
4. Material science and Engineering - V. Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press.
6. Material Science and Metallurgy – A V K Suryanarayana – B S Publications.
7. Material Science and Metallurgy – U. C. Jindal – Pearson Publication

**Web Source References:**

1. https://www.iitm.ac.in/mmresearch
2. http://nptel.ac.in/courses/113106032/3
3. https://en.wikipedia.org/wiki/Materials_science

**Question paper pattern:**

1. Question paper contains 10 Questions, 2 from each course outcome. The student must answer 5 full questions by selecting one question from each course outcome (Internal Choice)
2. All questions carries 14 marks each
3. Each full question will have sub question covering all topics under a course outcome

| INTRODUCTION TO MATERIAL HANDLING<br>SEMESTER - XX | | | |
|---|---|---|---|
| **Subject Code** | 18XXMEOX0XE | **Internal Marks** | 30 |
| **Number of Lecture Hours/Week** | 3(L) | **External Marks** | 70 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |
| **Credits – 03** | | | |

**COURSE OBJECTIVES:**

Students should be able

1. To understand the classification of material handling equipment
2. To explain the usage of different material handling equipment in industry
3. To know how to connect loading stations to the different discharge conditions.
4. To explain the usage of cranes at industries
5. To explain the usage of hoists and monorails at industries

| **Unit -1** | **Hours** |
|---|---|
| Introduction to materials handling, examples of materials equipment, examples of materials handling equipment, continuous conveying, intermittent conveying, examples, lifting, hoisting, handling of bulk goods and piece goods, cranes and conveyors, principles of calculation of conveying equipment, cycle time, bulk materials and bulk density, angle of repose, example for a belt conveyor and a simple hoist. | **10** |
| **Unit -2** | |
| Belt conveyors, constructional details, toughing angle, idlers, belt specifications, chutes, skirt boards, ploughs, belt conveyor layouts, belt trippers and typical examples, roller conveyors, overhead conveyors, apron conveyors, component parts and operational details and applications with typical layouts. | **10** |
| **Unit – 3** | |
| **Unit materials handling and storage**: Unit load concept (platform sheet industrial hand trucks, self contained unit load, palletless handling, introduction only), industrial hand trucks, powered industrial trucks, automated guided vehicles, basic storage and equipment system, Automated storage and retrieval systems (AS/RS), carosel storage system and its applications. | **10** |
| **Unit – 4** | |
| **Cranes** Jib cranes like wall mounted and travelling type, stability criteria, wheel loads, wheel trucks and bogeys, number of mechanisms in jib cranes, jib construction. Harbour cranes, luffing and level luffing cranes, shipyard gantry cranes, | **10** |
| **Unit – 5** | |
| **Hoists and monorails** Portal frames and slewing rings and bearings typical stability, calculations of portal cranes, types of hoists | **10** |

**Course outcomes:**

1. Classify the material handling equipment
2. Explain the usage of different material handling equipment in industry
3. Discuss how to connect loading stations to the different discharge conditions
4. Associate the usage of cranes at industries
5. Associate the usage of hoists and monorails at industries

**TEXT BOOKS**

1. Material handling handbook, 2nd edition, ASME, 1985
2. Automation production systems and computer integrated manufacturing, Mikell P Groover, Prentice Hall of India, 2002.

**REFERENCE BOOK**

1. R.O. Bailey, "Bulk material handling by conveyor belt I and II" M.A. Al
2. Frutchbaum, " Bulk solids handling

**Question paper pattern:**

1. Question paper contains 12 Questions, 2 from each course outcome. The student must answer 6 full questions by selecting one question from each course outcome (Internal Choice)
2. CO1- CO5 questions carries 12 marks each
3. Each full question will have sub question covering all topics under a course outcome

| PRODUCTION PLANNING AND CONTROL<br>SEMESTER - XX | | | |
|---|---|---|---|
| **Subject Code** | 118XXMEOX0XF | **Internal Marks** | 30 |
| **Number of Lecture Hours/Week** | 3(L) | **External Marks** | 70 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |
| **Credits – 03** | | | |

**Course Objectives:**

Enable the students to

1. Understand the concepts of production design concepts for production and service systems
2. Apply forecasting techniques for various firms, namely qualitative & quantitative methods to optimize/make best use of resources in achieving their objectives.
3. Identify different strategies employed in manufacturing and service industries to plan inventory
4. Apply different scheduling policies in planning and control and make best use of resources.
5. Measure the effectiveness, identify likely areas for improvement, develop and implement improved planning and control methods for production systems.

| **Unit -1** | **Hours** |
|---|---|
| **Introduction**: Definition – objectives and functions of production planning and control – elements of production control – types of production – organization of production planning and control department – internal organization of department. | **10** |
| **Unit -2** | |
| **Forecasting** – importance of forecasting – types of forecasting, their uses – general principles of forecasting – forecasting techniques – qualitative methods and quantitative methods. | **10** |
| **Unit – 3** | |
| **Inventory management** – functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ models – Inventory control systems – P– Systems and Q-Systems<br>**Material Management Techniques:**<br>Introduction to MRP I, MRP II, ERP, LOB (Line of Balance), JIT and KANBAN system. | **12** |
| **Unit – 4** | |
| **Routing & Scheduling**– definition – routing procedure –route sheets – bill of material – factors affecting routing procedure, schedule –definition – difference with loading, Scheduling policies – techniques, standard scheduling methods, line balancing, aggregate planning | **10** |
| **Unit – 5** | |
| **Dispatching**– activities of dispatcher – dispatching procedure – follow up– definition – reason for existence of functions – types of follow up, expediting, controlling aspects. Applications of computer in production planning and control. | **8** |

**Course outcomes:**

On completion of this course, students will be be able to:

1. **Choose** the acceptable production planning and control system for designing and

development of a product.
2. **Examine** the forecasts made in the manufacturing and service sectors by using selected quantitative and qualitative techniques.
3. **Categorize** the production systems based on the inventory principles and techniques to optimize/make best use of resources.
4. **Select and use** an appropriate principles/methods/ techniques/ modern concept with reference to given application/situation in the preparation of route sheets with scheduling and loading in manufacturing systems
5. **Illustrate** the role of a dispatching and follow-up necessary at various stages of manufacturing in an industry.

1.

**Text Books:**

1. Elements of Production Planning and Control / Samuel Eilon.
2. Manufacturing, Planning and Control, Partik Jonsson Stig-Arne Mattsson, Tata Mc Graw Hill.
3. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran, GK Vijaya Raghavan & MS Balasundaram/WILEY India Edition

**Reference Books:**

1. Production Planning and Control, Mukhopadyay, PHI.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller/Prentice-Hall
3. Production Control A Quantitative Approach / John E. Biegel/Prentice-Hall

**Question paper pattern:**

1. Question paper contains 10 Questions, 2 from each course outcome. The student must answer 5 full questions by selecting one question from each course outcome (Internal Choice)
2. CO1- CO5 questions carries 14 marks each.
3. Each full question will have a sub question covering all topics under a course outcome.

| NON-CONVENTIONAL SOURCES OF ENERGY<br>SEMESTER-XX | | | |
|---|---|---|---|
| **Subject code** | 18XXMEOX0XG | **Internal marks** | 30 |
| **Number of lecture hours/Week** | 3(L) | **External marks** | 70 |
| **Total No Of lecture hours** | 50 | **Exam hours** | 03 |
| **Credits-03** | | | |

**Course Objectives:**

Enable the students to:

1. Understand the principles and working of solar and solar energy collection.
2. Apply the principles of solar energy storage, applications in generation of electric power.
3. Apply the knowledge of Wind energy and Biomass, in generation of electric power production.
4. Apply the Principles and working of Geothermal energy power plant, OTEC plants, tidal, wave energy and Mini hydel power plants in generation of the electric power
5. Apply the principles of direct energy conversion systems like Thermoelectric generators, MHD generators and fuel cells, in generation of electric power production

| **Unit-1** | **Hours** |
|---|---|
| **Principles of Solar Radiation:** Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - the solar constant, extra-terrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.<br>**Solar Energy Collection:** Flat plate and concentrating collectors, classification of concentrating collectors, advanced collectors.. | **8** |
| **Unit-2** | |
| **Solar Energy Storage and Applications:** Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, photovoltaic energy conversion. | **6** |
| **Unit-3** | |
| **Wind Energy:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria<br>**Bio-Mass:** Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of biogas, utilization for cooking, I.C. Engine operation, and economic aspects. | **10** |
| **Unit-4** | |
| **Geothermal Energy:** Resources, types of wells, methods of harnessing the energy, potential in India. Ocean Energy – OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles.<br>**Tidal and Wave energy:** Potential and conversion techniques, mini-hydel power plants, their economics. | **10** |
| **Unit-5** | |
| **Direct Energy Conversion:** Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermoelectric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD | **16** |

| | |
|---|---|
| accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions. | |

**Course outcomes:**

1. The student understands the principles and working of solar and solar energy collection.
2. The students apply the principles of solar energy storage, applications in power generation.
3. The students Apply the knowledge of Wind energy and Biomass, in generation of power
4. The students Apply the Principles and working of Geothermal energy power plant, OTEC plants, tidal, wave energy and Mini hydel power plants in generation of the electric power.
5. Apply the principles of direct energy conversion systems like Thermoelectric generators, MHD generators and fuel cells, in generation of electric power.

**Text books:**

1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai/ Khanna Publishers
3. Biological Energy Resources/ Malcolm Fleischer & Chris Lawis/ E&FN Spon

**Reference books:**

1. Renewable Energy Sources / Twidell& Weir
2. Solar Power Engineering / B.S. Magal Frank Kreith& J.F. Kreith
3. Principles of Solar Energy / Frank Krieth& John F Kreider
4. Non-Conventional Energy / Ashok V Desai / Wiley Eastern

**Question paper pattern:**

1. Question paper contains 10 questions,2 from each course outcomes, the student must answer 5 full questions by selecting one question from each course outcome (Internal choice)
2. All question carries 14 marks each
3. Each full question will have sub question covering all topics under a course outcome

| FLUID MECHANICS AND FLUID MACHINERY<br>SEMESTER -XX | | | |
|---|---|---|---|
| **Subject Code** | 18XXMEOX0XH | **Internal Marks** | 30 |
| **Number of Lecture Hours/Week** | 3(L) | **External Marks** | 70 |
| **Total Number of Lecture Hours** | 50 | **Exam Hours** | 03 |

**Credits – 03**

1. Understand the fundamental properties of fluid and calculate fluid pressure using the manometer.
2. Apply the differential conservation equations of mass, momentum, and energy to fluid flow problems.
3. Evaluate major and minor losses in pipes and also discuss boundary layer concepts.
4. Solve problems on the turbo machines like turbines using analytical method and velocity triangles.
5. Discuss the Classification and working principles of pumps and evaluate the performance of hydraulic machines.

| **Unit -1** | **Hours** |
|---|---|
| **Fluids:** Definition of fluid, Fluid properties, Atmospheric gauge and vacuum pressure – measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law. Buoyancy, forces on submerged bodies, stability of floating bodies. | **10** |
| **Unit -2** | |
| **Fluid Kinematics:** Introduction, flow types. Equation of continuity for one dimensional flow. Stream line, path line and streak lines and stream tube. Stream function and velocity potential function.<br>**Fluid Dynamics:** surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend. | **10** |
| **Unit – 3** | |
| **Closed Conduit Flow:** Reynold's experiment- Darcy Weisbach equation, Minor losses in pipes- pipes in series and pipes in parallel- total energy line hydraulic gradient line.<br>**Basics of Turbo Machinery:** Hydrodynamic force of jets on stationery and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes. | **10** |
| **Unit – 4** | |
| **Turbines:** Hydraulic Turbines: classification of turbines, Working and efficiencies of Pelton wheel, Francis and Kaplan turbines. Importance of Draft | **10** |

| | |
|---|---|
| Tube.<br>**Hydraulic Quantities:** Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. | |
| **Unit – 5** | |
| **Pumps: Centrifugal Pumps:** Classification, working, work done – manometric head losses and efficiencies- specific speed- pumps in series and parallel performance characteristic curves, cavitation & NPSH.<br>Reciprocating Pumps: Working, Discharge, slip, indicator diagrams. | **10** |

**Course outcomes:**

1.Demonstrate various properties of fluids, pressure measurement devices and their applications.

2.Identify the kinematics and dynamics properties of fluids flowing in different conditions and its effects on the bodies.

3.Estimate the effect of various losses in fluids due to flowing and obstructions and understand using the concepts of pipe losses and Boundary layer theory.

4. Analyze the performance of hydraulic turbines, units and specific quantities based on the design by applying the knowledge of turbomachinery using analytical methods and velocity triangles.

5. Analyze the performance of various hydraulic pumps based on workings and design.

**TEXT BOOKS**

1. Hydraulics, fluid mechanics and Hydraulic machinery Modi and Seth
2. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd.

**REFERENCE BOOKS**

**1.** Fluid Mechanics and Hydraulic Machines by Rajput
2. Fluid Mechanics & Turbo machinery by Dixon, 7th Edn, Elesvier
3. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International
4. Fluid Mechanics- Fundementals and Applications by Y.A. Cengel, J.M.Cimbala, 6th Edn, McGrawHill
5. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria& Sons.

**Question paper pattern:**

1. Question paper contains 10 Questions, 2 from each course outcome. The student must answer 5 full
   questions by selecting one question from each course outcome (Internal Choice)
2. All questions carries 14 marks each
3. Each full question will have sub question covering all topics under a course outcome