



HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)
CHENNAI

DEPARTMENT OF CIVIL ENGINEERING
CURRICULUM AND SYLLABUS

Under CBCS

(Applicable for Students admitted from Academic Year 2018-19)

B. TECH. CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING
SCHOOL OF BUILDING SCIENCES

HITS, PADUR

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

VISION AND MISSION

MOTTO

“TO MAKE EVERY MAN A SUCCESS AND NO MAN A FAILURE.”

VISION

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

MISSION

- To create an ecosystem for learning and world class research.
- To nurture a sense of creativity and innovation.
- To instill highest ethical standards and values with a sense of professionalism.
- To take up activities for the development of Society.
- To develop national and international collaboration and strategic partnership with industry and institutes of excellence.
- To enable graduates to become future leaders and innovators.

VALUE STATEMENT

- Integrity, Innovation, Internationalization

DEPARTMENT OF CIVIL ENGINEERING

VISION AND MISSION

VISION:

To be a globally competent Premier Academic Centre for quality education and research in the diverse areas of Civil Engineering with social commitment.

MISSION

- M1. To inculcate comprehensive principles to produce highly competent and technologically capable professional engineers, academicians and entrepreneurs.
- M2. To impart quality education with strong emphasis on social commitment and sustainability, with ethical standards.
- M3. To provide a scholastic environment for state-of-the-art research.
- M4. To conduct Knowledge transfer programs to enhance technical knowledge.

Program Educational Objectives (PEOs)

- PEO 1:** The graduates will become experts in Planning, Designing and executing any infrastructural Development project.
- PEO 2:** The Graduates will be able to learn and adopt new technologies evolving in the field of Civil Engineering.
- PEO 3:** The Graduates will become globally competent Civil Engineering Professionals

Programme Outcomes Defined (POs)

- PO 1:** To apply the knowledge of Mathematics, Science and Engineering fundamentals to solve complex Civil Engineering Problems.
- PO 2:** Graduate will attain the ability to identify, formulate, analyze and find suitable solutions for complex Engineering problems using basic principles of Science and Engineering.
- PO 3:** Graduates will be able to design Civil Engineering System Components and Processes considering public health, safety and Environmental issues to meet the needs of the society.
- PO 4:** Graduates will be able to conduct investigations of complex problems in Civil Engineering using Research based knowledge and Research.
- PO 5:** Graduate will exhibit skills to use modern Engineering tools, software and equipment to analyze various problems in Civil Engineering Domain.
- PO 6:** To practice as an efficient Civil Engineer to assess and manage the societal needs
- PO 7:** Graduate will understand the impact of Engineering solutions based on the Sustainable Concepts.
- PO 8:** Graduate will be aware of their Professional and ethical responsibilities to the society.
- PO 9:** Graduate will be able to work individually or as a team member or leader in uniform and multidisciplinary settings

P10: Graduate will be able to communicate effectively in both verbal and written forms.

P011: Graduate will have an understanding of Engineering and Management Principles and apply this to one`s own work, as a member and a leader in a team, to manage projects.

P012 Graduate will develop confidence for self-education and ability for lifelong learning.

Program Specific Outcomes: (PSOs)

The Graduates will be able to

- PSO 1:** Apply mathematical and basic science knowledge to analyze, and interpret societal problems pertaining to civil engineering.
- PSO 2:** Exhibit ability to design a system, component or a process in various domains of civil engineering such as structural, environmental and transportation engineering.
- PSO 3:** Apply the construction management techniques such as planning, scheduling, quality control and cost control for various construction projects.

ACADEMIC REGULATIONS FOR

B. TECH. / B. TECH. (HONS.) DEGREE PROGRAMME

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I. PREAMBLE

As per the recommendations of UGC, the Hindustan Institute of Technology and Science (HITS) has introduced Choice Based Credit System (CBCS) from the academic year 2015-16. Choice Based Credit System (CBCS) is a proven, flexible mode of learning in higher education which facilitates a student to have guided freedom in selecting his/her own choices of courses in the curriculum for completing a degree program. This revision of regulations, curriculum and syllabi has been carried out further to make it more flexible and adaptive to the technology advancements happening in the world. CBCS offers a flexible system of learning.

The system permits a student to

- (i) Learn at their own pace through flexible registration process
- (ii) Choose electives from a wide range of courses offered within and outside their departments
- (iii) Undergo additional courses and acquire more than required number of credits to obtain B. Tech (Hons)
- (iv) Undergo additional courses in their special areas of interest and earn additional credits to obtain B. Tech with Minor Specialization
- (v) Adopt an interdisciplinary approach in learning
- (vi) Avail transfer of Credits
- (vii) Gain Non – CGPA credits to enhance skill/employability by taking up additional project work, entrepreneurship, co-curricular and vocational training.
- (viii) Make the best use of the expertise of available faculty.
- (ix) Learn and earn credits through MOOC and Project Based Learning
- (x) Enhance their Knowledge, Skill and Attitude through participation in innovative Curriculum Design, Delivery and Assessments.

The Curriculum is designed to take into the factors listed in the Choice Based Credit System (CBCS) with focus on Project Based Learning and Industrial Training so as to enable the students become eligible and fully equipped for employment in industries choose higher studies or entrepreneurship.

II. DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

1. “Programme” means Degree Programme like B.Tech. Degree Programme.
2. “Discipline” means specialization or branch of B.Tech. Degree Programme, (e.g. Civil Engineering).

3. “Course” means a theory or practical subject that is normally studied in a semester, (e.g., Mathematics, Physics, etc.).
4. “Vice – Chancellor of HITS” means the Head of the Institution.
5. “Registrar” is the Head of all Academic and General Administration of the Institute.
6. “Dean Academics” means the authority of the University who is responsible for all academic activities of various programmes and implementation of relevant rules of these Regulations pertaining to the Academic Programmes.
7. “Controller of Examinations” means the authority of the University who is responsible for all activities related to the University Examinations, publication of results, award of grade sheets and degrees.
8. “Dean – Student Affairs” is responsible for all student related activities including student discipline, extra and co – curricular activities, attendance and meetings with class representatives, Student Council and parent – teacher meet.
9. “HoD” means the Head of the Department concerned.
10. “Institute” means Hindustan Institute of Technology and Science (HITS), Chennai.
11. “TCH” means Total Contact Hours – refers to the teaching – learning periods.
12. “DEC” means Department Exam Committee.
13. “BoS” means Board of Studies.
14. “BoM” means Board of Management.
15. “ACM” means Academic Council meeting the highest authoritative body for approval for all Academic Policies.
16. “Class Teacher” is a faculty of the class who takes care of the attendance, academic performance and the general conduct of the students of that class.
17. “CIA” is Continuous Internal Assessment which is assessed for every student for every course during the semester.
18. “ESE” is End Semester Examination conducted by the Institute at the End of the Semester for all the courses of that semester.
19. “AICTE” means All India Council for Technical Education.
20. “UGC” means University Grants Commission.
21. “MHRD” means Ministry of Human Resource Development, Govt. of India.

ACADEMIC REGULATIONS FOR B. Tech. / B.Tech. (Hons.)**Under Choice Based Credit System (CBCS)****(Effective from Academic year 2018 - 19)****Vision, Mission and Objectives**

The Vision of the Institute is “To make every man a success and no man a failure”.

The Mission of the institute is

- To create an ecosystem that promotes learning and world class research.
- To nurture creativity and innovation.
- To instil highest ethical standards and values.
- To pursue activities for the development of the Society.
- To develop national and international collaborations with institutes and industries of eminence.
- To enable graduates to become future leaders and innovators.

Value Statement

Integrity, Innovation, Internationalization

Further, the Institute always strives

- To train our graduates with the latest and the best in the rapidly changing fields of Architecture, Engineering, Technology, Management studies, Science and Humanities and Liberal Arts.
- To develop graduates, with a global outlook, possessing Knowledge, Skills and Attitude and capable of taking up challenging responsibilities in the respective fields.
- To mould our graduates as citizens with moral, ethical and social values so as to fulfil their obligations to the nation and the society.
- To promote research in the field of Architecture, Engineering, Technology, Management studies, Science and Humanities and Liberal Arts and Allied disciplines.

Aims and Objectives of the Institute are focused on

- Providing state of the art education in Engineering, Technology, Applied Sciences and Management studies.
- Keeping pace with the ever – changing technological scenario and help the graduates to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and the nation.
- To inculcate a flair for Research, Development and Entrepreneurship.

2.0 Admission

The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, based on the guidelines issued by the UGC/ Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each of the B. Tech. degree programme will be decided by the Board of Management of the Institute as per the directives of AICTE/ UGC / MHRD, Government of India, taking into account, the market demands. Seats are also made available up to 20% of the sanctioned intake for Non – Resident Indians and foreign nationals, who satisfy the admission eligibility norms of the Institute.

2.1. Eligibility for Admission

(i) Regular Entry

Passed 10 + 2 examination with Physics and Mathematics as compulsory subjects along with one of the other subjects as Chemistry/ Biotechnology/ Biology/ Technical Vocational course.

The candidates should have obtained the minimum marks as per AICTE norms.

(ii) Lateral Entry

The candidates possessing a Diploma in Engineering/Technology in the relevant discipline of specialization with minimum 50% marks awarded by the State Boards of Technical Education, India or any other competent authority as accepted by the Board of Management of the Institute as equivalent thereto are eligible for admission to the 3rd Semester of the B. Tech degree programme.

2.2 The candidate has to fulfil all the prescribed admission requirements / norms of the Institute.

- In all matters relating to admission to the B. Tech degree programme, the decision of the Board of Management of the Institute shall be final.
- At any time after admission, if found that a candidate has not fulfilled one or many of the requirements stipulated by the Institute, or submitted forged certificates, the Institute has the right to revoke the admission and forfeit the fee paid. In addition, legal action may be taken against the candidate as decided by the Board of Management.

Student Discipline

Every student is required to observe utmost discipline and decorum both inside and outside the campus and not to indulge in any activity which may affect adversely the prestige reputation of the Institute.

Any act of indiscipline of a student reported to the Dean (Student affairs) and Head of the Department will be referred to a Discipline Committee constituted for the purpose. The Committee will enquire into the charges and decide on a suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Student Affairs) to recommend to the Vice-Chancellor for the implementation of the decision. The student concerned may appeal to the Vice-Chancellor, whose decision will be the final.

Ragging in any form is a criminal and non-bailable offence in our country. The current State and Central legislations provide stringent punishments including imprisonment. Once the involvement of a student(s) is established in ragging, offending fellow students/staff, harassment of any nature to the fellow students/staff etc. the student(s) will be liable to be dismissed from the Institute, as per the laid down procedures of the UGC / Govt. /Institute. Every senior student of the Institute, along with their parent, shall give an undertaking every year in this regard and the same should be submitted at the time of Registration.

Structure of the B. Tech Degree Programme

All B. Tech. degree Programmes will have the curriculum and syllabi (for 4 years) as approved by the respective Board of Studies and Academic Council of the Institute.

Credits are the weightages, assigned to the courses based on the following general pattern:

One Lecture / Tutorial period per week	--- 1 Credit Up
to Three periods of Practical per week	--- 1 Credit Up
to 4 periods of Practical per week	--- 2 Credits

The curriculum for B. Tech. programme is designed to have a minimum of **165 credits + 4 Non – CGPA credits** that are distributed across eight semesters of study for the award of degree.

Choice Based Credit System (CBCS) was introduced from the Academic year 2015-16 in the curriculum to provide the students, a balanced approach to their educational endeavor.

Under CBCS, the degree programme will consist of the following categories of courses:

- i) **General Core foundation (CF)** courses comprising of
 - Humanities courses;
 - Basic Sciences (BS) including Physics, Chemistry and Mathematics;
 - Engineering Sciences (ES), including Basic Engineering courses such as Material Science, Basic Workshop, Engineering Drawing, Engineering Graphics, Digital systems, etc.
- ii) **Compulsory Courses (CC) consist of the following.**
 - a. **Professional Core (PC)** courses: These courses expose the students to the foundation of Engineering topics related to the chosen programme of study comprising of theory and Practical/ field work/ Design project/ Project.
 - b. **Departmental Elective (DE)**: These courses enable the students to take up a group of courses of their interest in the area of specialization offered by the parent Department / School.
- iii) **Non –Departmental Electives (NE)**: These courses are offered by Engineering and Non-Engineering departments (across the disciplines) other than their parent Department. Two groups of Electives are available under NE namely, Engineering Electives, offered by the Engineering Departments and Open Electives, offered by the Non – Engineering departments.
- iv) **Indexed Journal / Conference Publications**: If a student publishes a research paper as main author in indexed Journal / Conference, the same can be considered as equivalent to two – credit course under NE.
- v) **Non-CGPA courses**: These courses are offered in certain semesters are compulsory, but are not used for calculation of GPA and CGPA. However, the credits will be mentioned in the grade sheet.

Non – CGPA courses

The student shall select any two courses /activity listed in **Table 1** during the course of study. The student has to make his / her own efforts for earning the credits. The grades given will be Pass / Fail (P/F). The respective class teachers have to encourage, monitor and record the relevant activities of the students, based on the rules issued from time to time by the Institute and submit the End semester report to the Head of the Department.

Table 1. Non – CGPA Courses

No.	Course / Activity	Credits
1.	Start ups	2
2.	Industrial Training	2
3.	Technical conference, seminar, competitions, Professional Societies	2
4.	Management courses	2
5.	Technical Certification Course	2
6.	Sports	2
7.	NCC	2
8.	NSS	2
9.	YRC	2
10.	Art and Cultural activities	2
11.	English Proficiency Certification	2
12.	Aptitude Proficiency Certification	2
13.	Foreign Languages Level II and above	2
14.	Publication in Conferences / Seminar	2

A student must earn compulsorily, the credits mentioned under each category shown in **Table 2** and also a minimum total of **169 credits - 165 credits (CGPA) + 4 credits (Non CGPA)** for the award of B. Tech. degree. For Lateral entry students, the 41 credits required for first and second semester of B. Tech shall be deemed to have been earned based on their curriculum in the diploma course. They have to earn a minimum of **128 credits (124 credits + 4 Non CGPA credits)** for the award of B. Tech. degree.

Students are eligible for award of **B.Tech.(Hons)** upon successful completion of **181 credits (165 regular credits + 12 Additional Credits+ 4 Non CGPA credits)** maintaining a CGPA of 8.0 during their period of study (4 years) and no history of arrears as detailed in clause 7.0.

Students are eligible for the award of **B.Tech. with Minor specialization** upon successful completion of 12 additional credits totalling **181 credits (165 regular credits + 12 Additional Credits+ 4 Non – CGPA credits)** as detailed in clause 8.0

Table 2. Distribution of Credits

No.	Category	Credits	Percentage
1	Basic Sciences (BS)	32	20
2	Humanities Courses (HS)	7	4
3	Professional Core (PC)	90	53
4	Department Elective (DE)	15	9
5	Non – Department Electives (NE)	10	6
6	Design Project	3	2
7	Internship	1	0.5
8	Project	8	5
9	Comprehension	1	0.5
	Total Credits	165	100
NON – CGPA			
10	Professional Development	4	---

The medium of instruction is English for all courses, examinations, seminar presentations and project reports.

Faculty Advisor

To help the students in planning their selection of courses and programme of study and for getting general advice on the academic programme, the concerned department will assign a certain number of students to a faculty member who will be called their Faculty Advisor. Such Faculty Advisor will continue to mentor the students assigned to him/her for the entire duration of the programme.

Class Committee

Every section / batch of the B. Tech. Degree programme will have a Class Committee consisting of Faculty and students.

The constitution of the Class Committee will be as follows:

- a. One Professor not associated with teaching the particular class shall be nominated by the Head of the Department to act as the Chairman of the Class Committee as approved by the Dean Academics.

- b. Course coordinator of each of the lecture – based courses (for common courses).
- c. Class teacher of the class.
- d. All Faculty handling the courses for that class in the semester.
- e. Workshop Superintendent (for first two semesters); as applicable.
- f. Four students from the respective class nominated by Head of the Department
- g. Faculty Advisors of the respective class.

Course committee

A course committee shall be constituted by the HOD for all the common courses, with the faculty who are teaching the courses and with a Professor of the core department as the Chairman. The Course committee shall meet periodically to ensure the quality of progression of the course in the semester.

The basic responsibilities of the Class Committee and Course committee are

- a. To review periodically the progress of the students.
- b. To discuss issues concerning curriculum and syllabi and the conduct of the classes.
- c. To inform the students about the method of assessment as recommended by the Department Exam Committee (“DEC”) at the beginning of the semester. Each class committee / course committee will communicate its recommendations and the minutes of the meetings to the Head of the Department, Dean (Academics) and the Dean (Student Affairs).
- d. To conduct meetings at least thrice in a semester as per the Academic Plan issued by the Dean – Academics.
- e. To review the academic performance of the students including attendance, internal assessment and other issues like discipline, maintenance etc.

Registration for courses in a Semester

A student will be eligible for registration of courses only if he/she satisfies the regulation clause 12.0 (progression), and clause 13.0 (maximum duration) and has cleared all dues to the Institute, Hostel and Library up to the end of the previous semester provided that student is not debarred from enrolment on disciplinary grounds.

The institute follows a flexible Choice Based Credit System and Slot based table. Accordingly, the students shall be given the option for selecting their courses, credits, teachers, slots and create their time table. The student is given the option of selecting the number of credits to undergo in a semester, subject to the curriculum requirements of minimum and maximum.

Except for the first-year courses, registration for a semester will be done during a specified week before the start of the semester as per the Academic Schedule.

Late registration /enrolment will be permitted by the Dean – Academics for genuine cases, on recommendation by the Head of the respective department, with a late fee as decided from time to time.

The student shall make the choice of course in consultation with the Faculty Advisor and as stipulated from time to time.

Students shall have to pay additional fee as prescribed, for registering in certain elective courses under Non - Departmental Electives courses offered by certain specific Departments and for higher level Foreign Languages, as decided from time to time.

B. Tech, (Honours) Programme

A new academic programme B.Tech. (Hons.) is introduced in order to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area. The features of the new programme, include:

- a. B.Tech. students in regular stream can opt for B.Tech. (Hons.), provided they have a CGPA of 8.0 up to the end of fourth semester without any history of arrears.
- b. The students opting for this program have to take four additional courses of their specialization of a minimum of 3 credits each from 5th to 8th semesters with not more than 2 additional courses in a semester.
- c. The list of such additional courses offered by the various Departments of the respective school will be announced in the beginning of the academic year to facilitate the registration process.
- d. The student can also opt for post graduate level courses
- e. The faculty advisor will suggest the additional courses to be taken by the students based on their choice and level of their academic competence.
- f. Students who have obtained “E” or “U” or “RC” / “RA” grade or “DE” category (vide clause 16.0 – Grading) in any course, including the additional credit courses, are not eligible for B.Tech. (Hons) degree.
- g. The students have to pay the requisite fee for the additional courses.

B. Tech with Minor specialization:

Students, who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering / Technology/ Arts/ Fashion/ Humanities/ Management/ Basic Sciences, may opt for additional courses in minor specialization groups offered by a department other than their parent department. Such students shall select the stream of courses offered with pre – requisites by the respective departments and earn a Minor Specialization.

- a. The number of credits to be earned for Minor specialization is 12 credits.

- b. The students are permitted to register for their minor specialization courses from the V semester onwards subject to a maximum of two additional courses per semester.
- c. The list of such additional courses offered by the various departments and the schedule will be announced in the beginning of the academic year to facilitate the registration process.
- d. The students have to pay the requisite fee for the additional courses.

Attendance

The faculty handling a course must finalize the attendance, 3 calendar days before the last instructional day of the course and submit to the HoD through the class teacher.

- a. A student with less than 75% attendance (Total Contact Hours - “TCH”) in any course, will **not** be permitted to appear for the end-semester examination in that particular course, irrespective of the reason for the shortfall of the attendance. The student is however permitted to avail **Academic Leave** up to 10% for attending academic related activities like, Industrial Visits, Seminars, Conferences, Competitions etc., with the prior approval of the HoD. After the event, the student should submit the relevant documents for proof to the HoD for approval of the Academic Leave.
- b. The remaining 25% allowance in attendance is given to account for activities under NCC / NSS / Cultural / Sports/ Minor Medical exigencies etc.
- c. A student with an attendance (“TCH” – Total Contact Hours) between 40% and 75% in any course will fall under the category “RC”, which means Repeat the Course during the Summer / Winter break. Students under “RC” category will **not** be permitted to attend the Regular End Semester Examinations for that course. During the Summer / Winter break, the regular courses of the respective semester will be offered as Summer/Winter Courses, to enable the students to get required attendance and internal assessment marks to appear in the Repeat examination.
- d. Students under “RC” category in any course shall attend, the immediately following Summer / Winter course as detailed in clause 11.1. The detailed schedule of the Summer / Winter courses offered in every semester will be announced during the end of that semester. The student who has obtained “RC” has to select their appropriate slots and courses, optimally to attend the courses.
- e. **The student, whose attendance falls below 40% for a course in any semester, will be categorized as “RA”, meaning detained in the particular course for want of attendance and they will not be permitted to write the End semester exam for that course. The procedure for repeating the course categorized as “RA” is mentioned in Clause 11.2.**

- Additional condonation may be considered in rare and genuine cases which includes, approved leave for attending select NCC / Sports Camps, cases requiring prolonged medical treatment and critical illness involving hospitalization.
- For such select NCC / Sports Camps prior permission for leave shall be obtained by the respective faculty coordinator / Director of sports from the designated authority, before deputing the students.
- For medical cases, submission of complete medical history and records with prior information from the parent / guardian to Dean (Student Affairs) is mandatory. The assessment of such cases will be done by the attendance sub – committee on the merit of the case and put-up recommendations to the Vice – Chancellor. Such condonation is permitted **only twice** for a student in the entire duration of the programme.
- The Vice-Chancellor, based on the recommendation of the attendance sub - committee may then give condonation of attendance, only if the Vice-Chancellor deems it fit and deserving. But in any case, the condonation cannot exceed 10%.

Assessment Procedure

Every course shall have two components of assessment namely,

- Continuous Internal Assessment “CIA”: This assessment will be carried out throughout the semester as per the Academic Schedule.
- End Semester Examination “ESE”: This assessment will be carried out at the end of the Semester as per the Academic Schedule.

Table 3 Weightage of the CIA and ESE for various categories of the courses

No.	Category of Courses	CIA weightage	CIA Minimum	ESE	ESE Minimum	Passing minimum (CIA+ESE)
1	Theory Course	50%	40%	50%	50%	45%
2	Practical Course	80%	50%	20%	50%	50%
3	Theory Course with Practical Components	60%	40%	40%	50%	45%
4	Department Elective (DE)/ Non – Department Elective (NE)	50%	40%	50%	50%	45%
5	Design Project	100%	50%	---	---	50%
6	Comprehension	100%	50%	---	---	50%
7	Internship	100%	50%	---	---	50%
8	Project and Viva Voce	50%	50%	50%	50%	50%

Theory Course / DE / NE Assessment weightages

The general guidelines for the assessment of Theory Courses, Department Electives “DE” and Non – Department Electives “NE” shall be done on a continuous basis is given in Table 4.

Table 4(a): Weightage for Assessment

No.		Assessment Theory, DE, NE courses	Weightage Theory, DE, NE courses	Duration
1.	CIA	First Periodical Assessment	5%	1 period
2.		Second Periodical Assessment	10%	1 Period
3.		Third Periodical Assessment	10%	1Period
4.		Seminar/Assignments/Project	15%	--
5.		Surprise Test / Quiz etc.,	10%	--
6.	ESE	End Semester Exam	50%	2 to 3 hours

Practical Course: For practical courses, the assessment will be done by the course teachers as below:

Weekly assignment/Observation / lab records and viva as approved by the Department Exam Committee “DEC”

- | | | |
|-----------------------------------|----|-----|
| a. Continuous Internal Assessment | -- | 80% |
| b. End Semester Examination | -- | 20% |

Theory courses with practical Component: For theory courses with practical component the assessment will be calculated as follows as approved by the “DEC”.

- | | | |
|-----------------------------------|----|-----|
| a. Continuous Internal Assessment | -- | 60% |
| b. End Semester Exam | -- | 40% |

Table 4(b): Weightage for Assessment

No.		Assessment Theory, DE, NE courses	Weightage Theory, DE, NE courses	Duration
1.	CIA	First Periodical Assessment	10%	1 period
2.		Second Periodical Assessment	10%	1 Period
3.		Third Periodical Assessment	10%	1Period
4.		Practical Assessment	30%	----
	ESE	End Semester Exam	40%	2to 3hours

Design Project – Assessment

The general guidelines for assessment of is given in Table 5.

Table 5: Assessment pattern for Design Project

No.	Review / Examination scheme	Broad Guidelines	Weightage
1.	First Review	Concept	20%
2.	Second Review	Design	30%
3.	Third Review	Experiment/Analysis	20%
4.	Project report and Viva – Voce	Results and Conclusion	30%

Comprehension – Assessment

The general guidelines for assessment of Comprehension is given in Table 6.

Table 6: Assessment pattern for Comprehension

No.	Review / Examination scheme	Broad Guidelines	Weightage
1.	First Periodical Assessment – MCQ	Basic Sciences	20%
2.	Second Periodical Assessment – MCQ	Core Engineering	50%
3.	Third Periodical Assessment – Presentation	Emerging Areas	30%

Internship

A student has to compulsorily attend Summer / Winter internship during 3rd year for a minimum period of one month.

In lieu of Summer / Winter internship, the student is permitted to register for undertaking case study / project work under an engineering faculty of the Institute and carry out the project for minimum period of one month.

In both the cases, the internship report in the prescribed format duly certified by the faculty in-charge shall be submitted to the HoD. The evaluation will be done through presentation and viva. The course will have a weightage of one credit or as defined in the respective curriculum.

For final year Project / Dissertation / Design Project/ Internship, the assessment will be done on a continuous basis as given in Table 7

Table 7: Assessment of Project work

No.	Review / Examination scheme	Weightage
1.	First Review	10%
2.	Second Review	20%
3.	Third Review	20%
4.	Project report and Viva – Voce	50%

For the final year project and Viva – Voce end semester examination, the student shall submit a Project Report in the prescribed format issued by the Institute. The first three reviews will be conducted by a committee constituted by the Head of the Department. The end – semester assessment will be based on the project report and a viva on the project conducted by a committee constituted by the Registrar / Controller of examination.

For Non – CGPA courses, the assessment will be graded “Satisfactory/Not Satisfactory” and grades as Pass/Fail will be awarded.

Flexibility in Assessment

The respective Departments under the approval of the Department Exam Committee (DEC) may decide the mode of assessment, based on the course requirements.

A student securing **less than the minimum** specified internal assessment marks in any course (clause 10.0, Table 3), will **not be permitted** to appear for the end-semester examination in that particular course and will be graded under “**RC**” category for that course. This will be denoted in the grade sheet as “RC”, till the course is successfully completed in the subsequent semester(s).

Procedures for Course Repetition / Repeat Examinations

Summer / Winter Course: - for “RC” Category

a. Students under RC category i.e.

- i. Attendance between 40% and 75% in any course(s) OR
- ii. CIA marks less than the prescribed minimum as specified in 10.0 Table 3 in any course(s) OR
- iii. Falls under both 1 and 2 above

are eligible for registering for the **Summer / Winter Course** which will be conducted during the Summer / Winter break, to improve their Attendance and/or CIA marks in the courses, by paying the **prescribed registration fee fixed from time to time**.

b. The Odd semester regular courses will be offered only in the Winter and the even semester

ACADEMIC

B. TECH – CIVIL

regular courses will be offered only in the Summer.

- c. **RC** students shall register by payment of prescribed fee and attend the classes during the summer / winter break and take assessments to earn minimum internal marks (clause 10.0, Table 3) and/or required attendance, to become eligible for writing the Repeat Examinations (Clause 11.3).
- d. The revised CIA marks shall not exceed 60% of the total internal weightage for any repeat course.

e. Re- Registration for ‘RC’ category

The students under “RC” category who **fail to improve** their attendance and/or CIA marks and **not** become eligible to write the Repeat Examination through the immediate summer/winter course are permitted to **re – register** for the Summer/ Winter course again under “RC” category whenever it is offered in the subsequent semester(s) during their period of study by **paying 50% of the prescribed registration fee** as mentioned in Clause 11.1 (a). It is the responsibility of the student to fix the appropriate slots in the Summer / Winter course time table. The student will not be able to register if he/she is unable to fix the slots in the time table. The course will remain in the “RC” category until he / she successfully completes that course.

Course – Repetition - “RA” Category

- a. Students who secure attendance less than **40%** in any course(s) in a semester will be categorized under “RA” - meaning **Repeat the course(s)** for want of minimum attendance. The CIA marks obtained by the students placed under RA category will become null and void.
- b. “RA” category students shall re-register for the same course once again whenever it is offered in the subsequent regular semesters and has to secure required minimum attendance and minimum internal assessment marks to become eligible to appear in the end semester examination for that course, by paying the requisite fee.
- c. It is the responsibility of the student to schedule their time table to include the “RA” courses without affecting the attendance of the regular courses of the current semester.
- d. Normally, a student will be permitted to register for not more than 3 “RA” courses in a semester. However, the students who wish to register for more than 3 “RA” courses are permitted to register only if the student finds suitable slots for doing the course within the framework of the time table for the regular semester. Request for registrations of additional RA courses over and above 3 in a semester shall be got approved by the respective HoD’s.
- e. The student has the option to drop their regular courses proportionally in their regular semester during the course registration process without affecting the minimum credit requirement specified. Such dropped courses will be categorized as “RA”. However, the student has to complete the dropped courses in the subsequent semesters.

- f. It is the responsibility of the student to fix the slots for “RA” courses within the framework of the time table and slot availability without affecting his/her regular courses.

g. Detention

A student who secure RC or RA or both in all the theory courses prescribed in a semester shall repeat the semester by registering for the semester in the next academic year. However, he/she is permitted to appear for arrear examination as per eligibility.

Repeat Examinations

- a) Normally, the results of the End Semester Examinations for Regular Theory courses are announced within a period of 10 days after the last regular examination.
- b) During the even semester, the Repeat Examinations will be conducted for even semester courses and during the odd semester the Repeat Examinations will be conducted for odd semester courses.
- c) The schedule for the Repeat Examinations will be notified through the Academic Calendar which will be published at the beginning of every academic year.
- d) The students under “RC” category, who have secured the requisite attendance and internal assessment marks as applicable, by successfully completing the Summer/ Winter course, are eligible to register for the Repeat Examinations.
- e) The students who fail to secure a pass or being absent for genuine reasons in their End Semester Examination for the regular courses are permitted to appear for the Repeat Exams by paying the prescribed fee.
- f) For the **Supplementary examinations (refer: Clause 15.2)**, the students with “U” grade in any course (refer clause 10.0 Table 3 and Clause 16.1) shall register by paying requisite fee and appear in the Repeat Examinations.
- g) The students who wish to apply for the revaluation of their answer scripts (Regular/ Supplementary / Repeat Examinations) should apply immediately after the announcement of results.

B.Tech.– Regular: Student has to satisfy the following conditions as laid down in Table 8 for progression from one academic year to next.

Table 8. Minimum Eligibility for progression B.Tech.- Regular

To enroll for semester	Minimum no. of credits to be earned for progression
3	NIL
5	15 credits* in Theory courses in 1 st , 2 nd and 3 rd Semesters
7	30 credits* in Theory courses up to 5 th Semester

** Credit calculation is applicable for Theory / Theory integrated lab only*

If a student fails to satisfy the above clause 12.1 in an academic year, the student has to take a break in study until they become eligible for progression

B.Tech.- Lateral Entry

Student has to satisfy the following conditions as laid down in Table 9 for progression from one academic year to next.

Table 9. Minimum Eligibility for progression B.Tech.- Lateral Entry

To enroll for semester	Minimum no. of credits to be earned
5	NIL
7	15 credits* in Theory courses in 3 rd , 4 th and 5 th Semesters

**Credit calculation is applicable for Theory / Theory integrated lab only*

If a student fails to satisfy the above clause 12.2 in an academic year, the student has to take a break in study until they become eligible for progression

If a student is in **RC** category (due to lack of minimum CIA marks **as specified in clause no. 10. Table 3**) or **RA** category (due to lack of minimum attendance as specified in clause 9.0 e) **in all theory courses prescribed in a semester**, he/she will be detained and will not be allowed to proceed to the next semester. He/she has to re-register for all the courses in the following academic year only.

13.0 Maximum Duration of the Programme

A student may complete the programme at a slower pace than the regular pace, but in any case, in not more than 6 years for B. Tech, and not more than 5 years for lateral entry students excluding the semesters withdrawn as per clause 14.0.

A student completing the B.Tech. programme during the extended period will not be eligible for Institute ranking.

Temporary Withdrawal from the Programme

A student is permitted to take a break, up to a maximum of 2 semesters, during the entire programme to clear the backlog of arrears.

A student may be permitted by the Vice- Chancellor to withdraw from the entire programme for a maximum of two semesters for reasons of ill health, start – up venture or other valid reasons as recommended by a committee consisting of Head of Department, Dean (Academic) and Dean (Student Affairs).

Declaration of results

A student shall secure the minimum marks as prescribed in Clause 10.1 (Table 3) in all categories of courses in all the semesters to secure a pass in that course.

Supplementary Examinations: If a candidate fails to secure a pass in a course and gets a “U” grade as per clause 16.1 he/she shall register and pay the requisite fee for re-appearing in the End Semester Examination during the following semester(s). Such examinations are called Supplementary Examinations and will be conducted along with the Regular /Repeat Examinations. The Supplementary Exams for the Odd semester courses will be conducted during the odd semester and supplementary exams for the even semester courses will be conducted during the even semester only. The student need not attend any contact course. The Internal Assessment marks secured by the candidate will be retained for all such attempts.

A candidate can apply for the revaluation of his/her end semester examination answer script in a theory course, after the declaration of the results, on payment of a prescribed fee.

If a candidate fails to secure a pass in Practical/Theory with Practical component / Design Project / Internship / Comprehension courses, due to not satisfying the minimum passing requirement (“U” grade) – as per clause 16.1 he/she shall register for the courses by paying the prescribed fee in the subsequent semester when offered by the departments.

Revaluation is **not** permitted for Practical/Theory with Practical component/Design Project / Internship / Comprehension courses. However, only for genuine grievances as decided by the Exam Grievance Committee a student may be permitted to apply for revaluation.

After 5 years, i.e., completion of one year (2 semesters) from the normal duration of the programme, the internal assessment marks obtained by the candidate will not be considered in calculating the passing requirement. A candidate who secures 50% in the end semester examination will be declared to have passed the course and earned the specified credits for the course irrespective of the score in internal assessment marks earned in that course.

Candidate who earns required credits for the award of degree after 5 years for B.Tech. programme (on expiry of extended period of 2 semesters over and above normal duration of course) he/she will be awarded only second class irrespective of his/her CGPA. However, the period approved under temporary withdrawal, if any, from the programme (13.0) will be excluded from the maximum duration as mentioned above.

Semester Abroad Programme: Students who are allowed to undergo internship or Training in Industries in India or abroad during their course work or attend any National/ International Institute under semester abroad programme (SAP) up to a maximum of 2 semesters will be granted credit transfer for the Course Work/project work done by them in the Industry /Foreign Institute as per the recommendations of the credit transfer committee. The leave period of the students for international internships / Semester Abroad programme etc., will be accounted for attendance.

A grading system as shown in Table 10 will be followed.

Table 10: Grading system

Range of Marks	Letter Grade	Grade Points	Remarks
90 – 100	S	10	Outstanding
80-89	A	09	Excellent
70-79	B	08	Very Good
60-69	C	07	Good
50-59	D	06	Average
45 – 49	E	05	Pass
<45	U	00	To Reappear for end-semester examination
--	RC	00	Repeat Course (Summer / Winter) due to Attendance deficiency (between 40% and 75%) and/or I. Lack of minimum CIA marks as specified in clause 10.0 Table 3
--	RA	00	Repeat the course due to (i) Lack of minimum attendance (Below 40%) in regular course
	--	00	DETAINED “RC” or “RA” or both in all registered theory courses of a semester. The student is detained and has to repeat the entire semester. Clause 12.3

GPA and CGPA

GPA is the ratio of the sum of the product of the number of credits C_i of course “i” and the grade points P_i earned for that course taken over all courses “i” registered and successfully completed by the student to the sum of C_i for all “i”. That is,

$$\text{GPA} = \frac{\sum C_i P_i}{\sum C_i}$$

CGPA will be calculated in a similar manner, in any semester, considering all the courses enrolled from the first semester onwards.

- The Grade card will not include the computation of GPA and CGPA for courses with letter grade **RA**, **RC** and **U** until those grades are converted to the regular grades.
- A course successfully completed cannot be repeated.

Grade Sheet

Letter grade

Based on the performance, each student is awarded a final letter grade at the end of the semester in each course. The letter grades and corresponding grade points are given in Table 10.

A student is considered to have completed a course successfully and earned credits if he/she secures a letter grade other than **U**, **RC**, **RA** in that course.

After results are declared, grade sheet will be issued to each student which will contain the following details:

- Program and discipline for which the student has enrolled.
- Semester of registration.
- The course code, name of the course, category of course and the credits for each course registered in that semester
- The letter grade obtained in each course
- Semester Grade Point Average (GPA)
- The total number of credits earned by the student up to the end of that semester in each of the course categories.
- The Cumulative Grade Point Average (CGPA) of all the courses taken from the first semester.
- Credits earned under Non CGPA courses.
- Additional credits earned for B. Tech (Hons.) and B. Tech with Minor specialization.

Class/Division

Classification is based on CGPA and is as follows:

CGPA \geq 8.0: First **Class with distinction**

$6.5 \leq$ CGPA < 8.0 : **First Class**

$5.0 \leq$ CGPA < 6.5 : **Second Class.**

- (i) Further, the award of '**First class with distinction**' is subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses in his/her first appearance with effect from II semester, within the minimum duration of the programme.
- (ii) The award of '**First Class**' is further subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses **within 5 years for B. Tech programmes**
- (iii) The period of authorized break of the programme (vide clause 14.0) will not be counted for the purpose of the above classification.
- (iv) To be eligible for award of **B. Tech (Hons.)** the student must have earned additional 12 credits in the relevant Engineering courses offered by the Departments of the respective Schools, thereby a total of **181 credits (165 regular credits + 12 additional credits + 4 Non CGPA credits)** and **should have 8.0 CGPA without any history of arrears and should not have secured E, RC, RA, U, in any course during the entire programme.**
- (v) To be eligible for award of **B. Tech with Minor Specialization**, the student must have earned additional 12 credits in the relevant courses offered by other than the parent department and has successfully earned **181 credits (165 regular credits + 12 Additional credits + 4 Non CGPA Credits)**

19.0 Transfer of credits

- 19.1.** Within the broad framework of these regulations, the Academic Council, based on the recommendation of the Credit Transfer Committee so constituted may permit students to transfer part of the credit earned in other approved Universities of repute & status in the India or abroad.

The Academic Council may also approve admission of students who have completed a portion of course work in another approved Institute of repute under lateral entry based on the recommendation of the credit transfer committee on a case-to-case basis.

Admission norms for working Professional:

Separate admission guidelines are available for working / experienced professionals for candidates with the industrial / research experience who desire to upgrade their qualification as per recommendation of Credit Transfer Committee.

Eligibility for Award of the B.Tech. /B. Tech (Hons)/ B. Tech with Minor Specialization Degree

A student shall be declared to be eligible for award of B. Tech. /B. Tech (Hons) / B. Tech degree with Minor specialization if he/she has satisfied the clauses 4.6 /7.0 /8.0 respectively within the stipulated time (clause 13, 14).

- a. Earned the specified credits in all the categories of courses (video c l a u s e 4.6) as specified in the curriculum corresponding to the discipline of his/ her study ;
- b. No dues to the Institute, Hostels, Libraries etc.; and
- c. No disciplinary action is pending against him / her.

The award of the degree shall be recommended by the Academic Council and approved by the Board of Management of the Institute.

Change of Discipline

If the number of students in any discipline of B.Tech. programme as on the last instructional day of the First Semester is less than the sanctioned strength, then the vacancies in the said disciplines can be filled by transferring students from other disciplines subject to eligibility. All such transfers will be allowed on the basis of merit of the students. The decision of the Vice-Chancellor shall be final while considering such requests.

All students who have successfully completed the first semester of the course will be eligible for consideration for change of discipline subject to the availability of vacancies and as per norms.

22.0 Power to modify

Notwithstanding all that has been stated above, the Academic Council is vested with powers to modify any or all of the above regulations from time to time, if required, subject to the approval by the Board of Management.

B. TECH – CIVIL ENGINEERING									
(165 CREDIT STRUCTURE)									
SEMESTER – I									
SL NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MEA4101/ ELA4101	Engineering Graphics and Computer Aided Design / Professional English and soft skills	1	1	2	3	1	4
2	BS	MAA4101	Matrices and Calculus	3	0	2	4	1	5
3	BS	PHA4101/ CYA4101	Engineering Physics / Engineering Materials	3	0	0	3	1	3
4	PC	CSA4101 GEA4102	Problem Solving Using C / Sustainable Engineering Systems	2	0	2	3/2	1	4/3
5	PC	EEB4101/ CEB4101	Introduction to Digital Systems / Engineering and Design	3	0	0	3	1	3
Practical									
6	BS	GEA4131	Engineering Immersion Lab	0	0	2	0.5	2	2
7	BS	PHA4131/ CYA4131	Engineering Physics Lab/ Materials Chemistry Lab	0	0	2	1	0	2
Total				12	1	10	17.5/ 16.5	7	23/22
L - Lecture; T - Tutorial; P - Practical; C- Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – II									
SL NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4117	Analytical Mathematics	3	0	2	4	0	5
2	BS	PHA4101/ CYA4101	Engineering Physics / Engineering Materials	3	0	0	3	1	3
3	BS	ELA4101/ MEA4101	Professional English and soft skills / Engineering Graphics and Computer Aided Design	1	1	2	3	1	4
4	PC	CSA4101/ GEA4102	Problem Solving Using C / Sustainable Engineering Systems	2	0	2	3/2	1	4/3
5	PC	EEB4101/ CEB4101	Introduction to Digital Systems / Engineering and Design	3	0	0	3	1	3
6	PC	CEB4117	Mechanics of Structures - I	3	1	0	4	1	4
7	PC	CEB4118	Surveying & Geomatics	3	0	0	3	1	3

CURRICULUM AND SYLLABUS**B. TECH – CIVIL**

Practical									
8	PC	CEB4141	Surveying Lab	0	0	3	1	1	2
9	BS	GEA4131	Engineering Immersion Lab	0	0	2	0.5	2	2
10	BS	PHA4131/ CYA4131	Engineering Physics Lab/ Materials Chemistry Lab	0	0	2	1	0	2
Total				18	2	13	24.5/ 25.5	9	32/31
L - Lecture; T - Tutorial; P - Practical; C- Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – III

SL NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4201	Partial Differential Equations and Transforms	3	1	0	4	0	5
2	PC	CEB4201	Construction Materials	3	0	0	3	1	3
3	PC	CEB4202	Mechanics of Structures II	3	1	0	4	0	4
4	PC	CEB4203	Mechanics of Fluids	3	1	0	3	1	4
5	DE	CEC42**	Department Elective I	3	0	0	3	0	3
6	NE	CED42**	Non-Department Elective I	2	0	0	2	0	2
Practical									
7	PC	CEB4231	Construction Materials Lab	0	0	3	1	0	3
8	PC	CEB4232	Mechanics of Fluids Lab	0	0	3	1	0	3
9	PC	CEB4233	Computer Aided Building Drawing	0	0	3	1	0	3
9	PC	CEB4234	Design Project I	0	0	2	1	0	2
Total				17	3	1 1	23	2	32
L - Lecture; T - Tutorial; P - Practical; C- Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – IV

SL NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4216	Probability and Statistics	3	1	0	4	0	5
2	PC	CEB4216	Structural Analysis I	3	1	0	4	0	4
3	PC	CEB4217	Construction Techniques, Equipment and Practices	3	0	0	3	1	3
4	PC	CEB4218	Environmental Engineering	3	0	0	3	1	3

CURRICULUM AND SYLLABUS**B. TECH – CIVIL**

5	DE	CEC42**	Department Elective II	3	0	0	3	0	3
6	NE	CED42**	Non-Department Elective II	2	0	0	2	0	2
Practical									
7	PC	CEB4241	Strength of Materials Lab	0	0	3	1	0	3
8	PC	CEB4242	Environmental Engineering Lab	0	0	3	1	0	3
9	PC	CEB4243	Design Project II	0	0	2	1	0	2
Total				17	0	8	22	2	28
1	M	CEM4276	Fundamentals of GIS	4	0	0	4	0	4
L - Lecture; T - Tutorial; P - Practical; C- Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – V

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CEB4301	Design of Concrete Structures	3	1	0	4	1	4
2	PC	CEB4302	Structural Analysis II	3	1	0	4	1	4
3	PC	CEB4303	Geotechnical Engineering	3	0	0	3	1	3
4	PC	CEB4304	Transportation Engineering – I	3	0	0	3	1	3
5	PC	CEB4305	Construction Management	3	0	0	3	1	3
6	DE	CEC43**	Department Elective III	3	0	0	3	0	3
7	NE	CED43**	Non-Department Elective III	2	0	0	2	0	2
Practical									
8	PC	CEB4331	Transportation Engineering Lab	0	0	3	1	0	3
9	PC	CEB4332	Geotechnical Engineering Lab	0	0	3	1	0	3
10	PC	CEB4333	Design Project III	0	0	2	1	0	2
Total				20	2	8	25	5	30
1	H	CEH4361	Construction Planning & Cost Estimation	3	0	0	3	0	3
2	M	CEM4361	GIS Data Acquisition, Automation, and Applications	3	0	0	3	0	3
L - Lecture; T - Tutorial; P - Practical; C- Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER –VI

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4301	Optimization Techniques	3	1	0	4	0	4
2	PC	CEB4316	Design of Steel Structures	3	1	0	4	1	4

CURRICULUM AND SYLLABUS

B. TECH – CIVIL

COURSE CODE AND CREDIT				COURSE CREDIT					
3	PC	CEB4317	Hydraulic Engineering	3	1	0	4	1	4
4	BS	GEA4316	Professional Ethics & Life Skills	2	0	0	2	1	2
5	DE	CEC43**	Department Elective IV	3	0	0	3	0	3
6	NE	CED43**	Non- Department Elective IV	2	0	0	2	0	2
Practical									
7	PC	CEB4341	Hydraulic Engineering Lab	0	0	3	1	0	3
8	PC	CEB4342	Computer Aided Structural Analysis Lab	0	0	3	1	2	2
9	PC	CEB4343	Design Project IV	0	0	2	1	0	2
Total				16	3	8	22	5	26
2	H	CEH4376	Project Management & Scheduling	3	0	0	3	0	3
3	H	CEH4377	Infrastructure Project Management	3	0	0	3	0	3
3	M	CEM4376	Remote Sensing and GIS	3	0	0	3	0	3
L - Lecture; T - Tutorial; P - Practical; C- Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER –VII

[illegible]

SEMESTER – VIII									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	PC	CEB4441	Project & Viva - voce	0	0	24	8	0	24
Total				0	0	24	8	0	24

LIST OF DEPARTMENT ELECTIVES OFFERED BY DEPARTMENT OF CIVIL ENGINEERING									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
SEMESTER – III									
1	DE	CEC4251	Engineering Geology	3	0	0	3	0	3
2	DE	CEC4252	Irrigation Engineering	3	0	0	3	0	3
3	DE	CEC4253	Renewable Energy	3	0	0	3	0	3
4	DE	CEC4254	Housing Planning and Management	3	0	0	3	0	3
5	DE	CEC4255	Modern Construction Materials	3	0	0	3	0	3
SEMESTER – IV									
1	DE	CEC4266	Applied Hydrology	3	0	0	3	0	3
2	DE	CEC4267	Remote Sensing Techniques and Applications	3	0	0	3	0	3
3	DE	CEC4268	Air Pollution Management	3	0	0	3	0	3
4	DE	CEC4269	Concrete Technology	3	0	0	3	0	3
5	DE	CEC4270	Water Resources Engineering	3	0	0	3	0	3
6	DE	CEC4271	Building Services	3	0	0	3	0	3
SEMESTER – V									
1	DE	CEC4351	Concepts in Environment Impact Assessment	3	0	0	3	0	3
2	DE	CEC4352	Geo Environmental Engineering	3	0	0	3	0	3
3	DE	CEC4353	Ground Improvement Techniques	3	0	0	3	0	3
4	DE	CEC4354	Earthquake Engineering	3	0	0	3	0	3
5	DE	CEC4355	Wind Engineering	3	0	0	3	0	3
6	DE	CEC4356	Industrial Waste Management	3	0	0	3	0	3
SEMESTER – VI									
1	DE	CEC4366	Green and Smart Buildings	3	0	0	3	0	3
2	DE	CEC4367	Pre-stressed Concrete	3	0	0	3	0	3
3	DE	CEC4368	Design of Steel Concrete Composite Structures	3	0	0	3	0	3
4	DE	CEC4369	Repair and Rehabilitation of Structures	3	0	0	3	0	3
5	DE	CEC4370	Health and Safety Practices in Construction Industry	3	0	0	3	0	3
6	DE	CEC4371	Pavement Design and Engineering	3	0	0	3	0	3
SEMESTER – VII									
1	DE	CEC4451	Traffic Engineering and Management	3	0	0	3	0	3
2	DE	CEC4452	Municipal Solid Waste management	3	0	0	3	0	3
3	DE	CEC4453	Bridge Structures	3	0	0	3	0	3
4	DE	CEC4454	Storage Structures	3	0	0	3	0	3
5	DE	CEC4455	Tall Structures	3	0	0	3	0	3
6	DE	CEC4456	Industrial Structures	3	0	0	3	0	3
7	DE	CEC4457	Prefabricated Structures	3	0	0	3	0	3
8	DE	CEC4458	Basics of Dynamics and Aseismic Design	3	0	0	3	0	3

LIST OF NON-DEPARTMENT ELECTIVES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
SEMESTER – III									
1	NE	CED4281	Solid waste Management	2	0	0	2	0	2
SEMESTER – IV									
2	NE	CED4291	Air and Noise Pollution Control	2	0	0	2	0	2
SEMESTER – V									
1	NE	CED4381	Sustainable Engineering Practices	2	0	0	2	0	2
2	NE	CED4382	Environmental Impact Assessment for Engineering Projects	2	0	0	2	0	2
SEMESTER – VI									
1	NE	CED4391	Project Safety Management	2	0	0	2	0	2
2	NE	CED4392	Introduction to Oceanography	2	0	0	2	0	2
SEMESTER – VII									
1	NE	CED4481	Intelligent Transportation systems.	2	0	0	2	0	2
2	NE	CED4482	Introduction to Road Safety and Management.	2	0	0	2	0	2
3	NE	CED4483	Standards and Practices in Civil Engineering.	2	0	0	2	0	2

SEMESTER – I

[illegible]

CO-2	-	-	2	-	3	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-
CO-5	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: BASICS OF ENGINEERING GRAPHICS AND PLANE CURVES (6L+6P=12)															
Importance of graphics - BIS conventions and specifications - drawing sheet sizes - Lettering – Dimensioning - Scales. Drafting methods - introduction to Computer Aided Drafting – Computer Hardware – Workstation – Printer and Plotter – Introduction to software for Computer Aided Design and Drafting – Exposure to Solid Modelling software – Geometrical Construction-Coordinate Systems/Basic Entities – 3D printer. Practical component: AutoCAD – Solid modelling tool - Basics. Suggested Readings: Basics of drafting and dimensioning														CO-1 BTL-2	
MODULE 2: VISUALIZATION, ORTHOGRAPHIC PROJECTIONS AND FREE HAND SKETCHING(6L+6P=12)															
Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three-Dimensional objects — Pictorial Projection methods - Layout of views- Free hand sketching of multiple views from pictorial views of objects. Drafting of simple Geometric Objects/Editing General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Conversion to orthographic views from given pictorial views of objects, including dimensioning – Drafting of Orthographic views from Pictorial views. Practical component: 2D drafting, Orthographic projections Suggested Readings: AutoCAD tool – Commands for sketching, Projections														CO-2 BTL-2	
MODULE 3: GEOMETRICAL MODELLING, ISOMETRIC AND DEVELOPMENT OF SURFACES(6L+6P=12)															
Principles of isometric projection and solid modelling. Isometric drawing – IsoPlanes and 3D Modelling commands. Projections of Principal Views from 3-D Models. Solid Modeling – Types of modelling - Wire frame model, Surface Model and Solid Model – Introduction to graphic software for solid modelling. Development of Surfaces Practical component: 3D modelling and surface development Suggested Readings: Surface modelling and solid modelling														CO-3 BTL-3	
MODULE 4: COMPUTER AIDED DESIGN AND DRAFTING (6L+6P=12)															

<p>Preparation of solid models of machine components like slide block, solid bearing block, bushed bearing, gland, wall bracket, guide bracket, shaft bracket, jig plate, shaft support (open type), vertical shaft support etc using appropriate modelling software. 2D views and sectional view, computer aided drafting and dimensioning. Generate 2D drawing from the 3D models – generate and develop the lateral surfaces of the objects. Presentation Techniques of Engineering Drawings – Title Blocks – Printing/Plotting the 2D/3D drawing using printer and printing solid object using 3D printer.</p> <p>Practical component: 2D to 3D transformation, plotting of drawings</p> <p>Suggested Readings: 3D modelling – view generations and commands</p>	<p>CO-4 BTL-2</p>
<p>MODULE 5: SIMPLE DESIGN PROJECTS – COMPUTER AIDED DESIGN (6L+6P=12)</p>	
<p>Creation of engineering models and their presentation in standard 2D form, 3D Wire-Frame and shaded solids, meshed topologies for engineering analysis, tool-path generation for component manufacture, geometric dimensioning and tolerancing. Use of solid-modelling software for creating associative models at the components and assembly levels in their respective branch of engineering like building floor plans that include: windows, doors, fixtures such as WC, Sink, shower, slide block, etc. Applying color coding according to drawing practice.</p> <p>Practical component: 3D solid meshed topology, geometrical dimensioning, simple components</p> <p>Suggested Readings: AutoCAD dimensioning, assembly of solid components</p>	<p>CO-5 BTL-3</p>
<p>TEXT BOOKS</p>	
<p>1.</p>	<p>Jeyapoovan, T. (2016). <i>Engineering Drawing and Graphics Using AutoCAD</i>, 7th Edition, Vikas Publishing House Pvt Ltd., New Delhi.</p>
<p>REFERENCE BOOKS</p>	
<p>1.</p>	<p>Warren J. Luzadder and Jon. M. Duff. (2016). <i>Fundamentals of Engineering Drawing</i>, Prentice Hall of India Pvt. Ltd., Eleventh Edition.</p>
<p>2.</p>	<p>Jensen, J.D. Helsel, D.R. Short. (2012). <i>Engineering Drawing and Design</i>, McGraw-Hill, Sixth Edition.</p>
<p>E BOOKS</p>	
<p>1.</p>	<p>http://keralatechnologicaluniversity.blogspot.com/2015/06/engineering-graphics-j-benjamin-pentex-freebook-pdf-download.html</p>
<p>2.</p>	<p>http://keralatechnologicaluniversity.blogspot.com/2015/07/engineering-graphics-p-i-varghese.html</p>
<p>MOOC</p>	
<p>1.</p>	<p>http://nptel.ac.in/courses/112103019/</p>
<p>2.</p>	<p>http://nptel.ac.in/courses/105104148/</p>

COURSE TITLE		MATRICES AND CALCULUS								CREDITS			4		
COURSE CODE		MAA4101		COURSE CATEGORY			BS			L-T-P-S			3-0-2-1		
Version		1.0		Approval Details			24 ACM 30 th May 2018			LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Practical component						ESE				
15%		15%			20%						50%				
Course Description		To make the student understand the basic concepts of matrices and calculus using MATLAB													
Course Objective		The course should enable the student to, 1. Know how to perform some simple operations on matrices 2. Understand effectively the basic concepts of differentiation and partial differentiation and their applications. 3. Perform integration and other operations for certain types of functions and carry out the computation fluently. 4. Classify ordinary differential equations.													
Course Outcome		Upon completion of this course, the students will be able to, 1. Understand the concept of matrices and Eigen Values. 2. Understand the concept of features in Differential Calculus 3. Understand the concept of Integral Calculus 4. Understand the concept of ordinary differential equation													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
CO-1	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO-3	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO-4	2	1	-	-	1	1	1	-	-	-	-	-	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE1: MATRICES (13L+2P=15)															

Characteristic equation – Eigen values and Eigenvectors – Properties – Cayley Hamilton theorem (Statement only) – Verification and inverse of the matrix using Cayley Hamilton theorem- Diagonalization of matrices using similarity transformation. Practical Component: <ul style="list-style-type: none">• Lab1: Eigen values and Eigenvectors, Verification and inverse using Cayley Hamilton theorem- Diagonalization Suggested Reading: Basics of Matrices		CO-1 BTL-3
MODULE 2: DIFFERENTIAL CALCULUS (13L+2P=15)		
Methods of differentiation of functions – Product and Quotient rules – Inverse trigonometric functions – Implicit function – parametric form. Partial differentiation – Total differentiation- Taylor’s series – Maxima and minima of functions of two variables Practical Component: <ul style="list-style-type: none">• Lab2: Taylor’s series – Maxima and minima of functions of two variables Suggested Reading: Basics of Differentiation		CO-2 BTL-3
MODULE 3: INTEGRAL CALCULUS (13L+2P=15)		
Integration – Methods of integration – Substitution method – Integration by parts – Integration using partial fraction – Bernoulli’s formula. Applications of Integral Calculus: Area, Surface and Volume. Practical Component: Practical Component: Lab3: Applications of Integral Calculus: Area, Surface area and Volume. Suggested Reading: Basics of Integrations		CO-3 BTL-3
MODULE 4: ORDINARY DIFFERENTIAL EQUATIONS (13L+2P=15)		
Second order differential equations with constant coefficients – Particular integrals – e^{ax} , $\sin ax$, $\cos ax$, x^m , $e^{ax} \cos bx$, $e^{ax} \sin bx$. Solutions of homogeneous differential equations with variable coefficients – Variation of parameters. Practical Component: Lab 4: Solution of Second order differential equations. Suggested Reading: Basics of Differential Equations.		CO-4 BTL-3
TEXT BOOKS		
1.	Grewal B.S. (2014). <i>Higher Engineering Mathematics</i> , Khanna Publishers, New Delhi, 43rd Edition.	
2.	Bali N. P and Manish Goyal. (2011). <i>A Text book of Engineering Mathematics</i> , Eighth Edition, Laxmi Publications Pvt Ltd.	
3.	Chandrasekaran A. (2010). <i>A Text book of Engineering Mathematics I</i> , Dhanam Publications, Chennai.	
REFERENCE BOOKS		
1.	Srimantha Pal and Bhunia, S.C. (2015). <i>Engineering Mathematics</i> , Oxford University Press.	
2.	Weir, M.D and Joel Hass. (2015). <i>Thomas’ Calculus</i> , 12th Edition, Pearson India.	
3.	Dean G. Duffy. (2011). <i>Advanced Engineering Mathematics with Matlab</i> , Third Edition, by CRC Press.	
E BOOKS		
1.	http://nptel.ac.in/courses/111105035/	
2.	https://www.edx.org/.../introduction-engineering-mathematics-utarlingtonx-engr3	
MOOC		
1.	https://www.mooc-list.com/tags/engineering-mathematics	

COURSE TITLE	ENGINEERING PHYSICS				CREDITS	3
COURSE CODE	PHA4101	COURSE CATEGORY	BS	L-T-P-S	3-0-0-0	
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL	BTL-3	

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with fundamental principles of physics, using mathematical derivations, for first year B. Tech students; the principles and applications of elasticity, acoustics, ultrasonics, quantum physics, crystal physics, lasers and fiber optics are dealt in this course. Intended for Aeronautical, Automobile, Bio tech., Chemical, Civil and Mechanical branches.
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Course Objective	<p>The course should enable the student to,</p> <ol style="list-style-type: none"> 1. Explain stress, strain and elastic moduli and apply the concepts to solve basic problems 2. Apply principles of acoustics to solve basic problems and use ultrasonics as an engineering tool 3. Explain particle nature of radiation, compute Schrodinger's wave equation and apply it to infinite potential well 4. Identify crystal structures and crystal planes, describe different magnetic materials and hysteresis based on concept of ferromagnetic domains. 5. Discuss the principles, working and applications of lasers and fiber optics
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Solve the basic problems in elasticity and explain the properties of matter 2. Apply the knowledge of acoustics in designing acoustical buildings and employing ultrasonic as an engineering tool. 3. Use mathematical derivations to solve quantum problems. 4. Identify the crystal lattice planes, distinguish different magnetic materials, and explain the ferromagnetic domain. 5. Familiarize with the principles, working and applications of lasers and fiber optics.
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Prerequisites: Knowledge in fundamentals of Physics at higher secondary level

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO- 3	PO -4	PO- 5	PO -6	PO -7	PO -8	PO -9	PO- 10	PO -11	PO- 12	PSO -1	PSO -2	PSO -3
CO-1	3	2	0	0	0	0	0	0	0	0	0	3	-	-	-
CO-2	3	2	0	0	3	0	0	0	0	0	0	3	-	-	-

[illegible]

1.	P.Mani. (2011). <i>Engineering Physics</i> , VolI& II, Dhanam Publications, Chennai.
REFERENCE BOOKS	
1.	Gaur R.K. and Gupta S.L. (2010). <i>Engineering Physics</i> , 8 th edition, DhanpatRai publications (P) Ltd., New Delhi.
2.	P. Charles, Poople and Frank J. Owens. (2007). <i>Introduction to Nanotechnology</i> , Wiley India.
3.	Arthur Beiser. (2007). <i>Concepts of Modern Physics</i> , Tata McGraw – Hill Publications.
4.	Rajendran V. Marikani A. (2003). <i>Applied Physics for engineers</i> , 3rd edition, Tata McGraw –Hill publishing company Ltd., New Delhi.
E BOOKS	
1.	https://books.google.co.in/books?id=w4crDAAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2.	https://www.goodreads.com/book/show/789047.Physics_for_Scientists_and_Engineers
MOOC	
1.	https://www.coursera.org/learn/how-things-work
2.	https://www.coursera.org/learn/quantum-physics
3.	https://onlinecourses.nptel.ac.in/noc21_ph21
4.	https://onlinecourses.swayam2.ac.in/aic20_sp64

COURSE TITLE				ENGINEERING MATERIALS (Common to ALL Branches of Engineering)						CREDITS		3			
COURSE CODE				CYA4101		COURSE CATEGORY			BS		L-T-P-S		3-0-0-0		
Version				1.0		Approval Details			24 th ACM - 30.5.2018		LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment				Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance		ESE		
15%				15%		10%			5%		5%		50%		
Course Description				To make the students understand the basic concepts of Engineering Materials and their applications.											
Course Objective				<div>1. To make the students understand the basics of crystal structure and phase rule.</div> <div>2. To provide an exposure on the fundamentals of powder metallurgy and applications of inorganic materials and composites.</div> <div>3. To give a strong foundation on the basic concepts of nanomaterials, the general synthetic methods with emphasis on their applications.</div> <div>4. To illustrate the applications of conducting polymers and liquid-crystals, with a good exposure on their basic terminologies.</div> <div>5. To provide a knowledge on the theoretical basis of the chemical composition, properties and applications of lubricants, adhesives and explosives.</div>											
Course Outcome				<div>Upon completion of this course, the students will be able to</div> <div>1. Propose and justify suitable metals/materials for alloying.</div> <div>2. State and select a suitable high-temperature material for industrial applications.</div> <div>3. Suggest an appropriate technique for nanomaterial synthesis and also select a property-guided molecular material for a given application.</div> <div>4. Identify the materials which can be employed as organic conductors and liquid- crystals in electronic devices.</div> <div>5. Distinguish and select a suitable organic / inorganic material as lubricant / adhesive / explosive based on its applications.</div>											
Prerequisites: Knowledge in fundamentals of chemistry at higher secondary level.															
CO, PO AND PSO MAPPING															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	1	-	-	-	1	-	-	-	-	1	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-

B.TECH – CIVIL ENGINEERING

[illegible]

2.	P. M. Ajayan, L. S. Schadler, P. V. Braun. (2003). <i>Nanocomposite Science and Technology</i> , Wiley-VCH Verlag GmbH Co. KGaA, Weinheim.
3.	V.V. Vasiliev and E.V. Morozov. (2001). <i>Mechanics and Analysis of Composite Materials</i> . Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK.
E BOOKS	
1.	http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html
2.	https://abmpk.files.wordpress.com/2014/02/book_material-science-callister.pdf/
MOOC	
1.	https://www.edx.org/course/materials-science-engineering-misix-mse1x
2.	https://www.mooc-list.com/tags/materials-science

COURSE TITLE	PROFESSIONAL ENGLISH AND SOFT SKILLS			CREDITS	3
COURSE CODE	ELA4 101	COURSE CATEGORY	HS	L-T-P-S	2-0-2-1
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL	BTL-4
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendanc e	ESE
15%	15%	10%	5%	5%	50%
Course Description	This course has been designed to meet students' current and future language and communication needs. It attempts to develop their proficiency in the four language skills and knowledge of grammar and vocabulary. This course teaches students how to communicate accurately, appropriately and fluently in professional and social situations.				
Course Objective	<ol style="list-style-type: none"> 1. To acquire self-confidence by which the learner can improve upon their informative listening skills by an enhanced acquisition of the English language. 2. To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate. 3. To equip the students to Read, comprehend and answer questions based on literary, scientific and technological texts. 4. To enhance the writing skills of the students via training in instructions, recommendations, checklists, process-description, letter-writing and report writing. 5. To equip the learners in analyzing and applying creative thinking skills and participate in brainstorming, mind-mapping, audiovisual activities and excel in employability skills 				
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Demonstrate the ability to construct sentences with accuracy with focus on syntax. 2. Enrich vocabulary, use of phrases, expressions, idioms, and proverbs. Derive the contextual meaning through reading and listening from general and academic situations, Identify specific details and general ideas. Learn to give instructions and make suggestions. 3. Analyse and transcode data, construct different types of written essays, read complex passages and summarize ideas, create personal profiles in the form of a resume. 4. Organize and articulate ideas, concepts, and perceptions in a comprehensive manner in written business correspondence, and speaking in formal and informal situations. 				

5. Apply critical thinking skills and participate in brainstorming sessions on general topics, and transact information with an audience. Prepare students for interview questions, presentation skills. Produce complex written documents such as reports, business/scientific documents, and project proposals.

Prerequisites: Plus, Two English-Intermediate Level

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO-2	-	-	-	-	-	-	-	2	2	3	-	-	-	-	-
CO-3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO-4	-	-	-	-	-	-	2	-	-	3	2	-	-	-	-
CO-5	-	-	-	-	-	-	-	-	2	3	2	3	-	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FUNCTIONAL GRAMMAR AND VOCABULARY

(6L+6P=12)

Introduction to communication skills –Self Introduction - Basic grammar (tenses, subject verb agreement) - Basic vocabulary (prefixes, suffixes, roots, phrasal verbs and idioms)- Topic sentences, paragraph writing

Suggested Activities:

Short conversations-Situational Communication-Dialogue Writing - Writing short paragraph based on environment protection, societal issues, health, cultural contexts etc., identifying topic sentences, linking pairs of sentences.

Suggested Reading:

1. An Introduction to Professional English and Soft Skills with audio CD by Dr. Bikram K. Das et al. Published by Cambridge University Press. 2009
2. Professional Speaking Skills by ArunaKoneru, Oxford Press, 2015
3. Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.
4. English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition

**CO-1
BTL-2**

MODULE 2 – LISTENING AND SPEAKING SKILLS

(6L+6P=12)

Academic listening (listening to lectures different topics, audio excerpts and answering question) - General listening (conversations, speeches: formal and informal) - Giving instructions and suggestions- Active and Passive Voice

Suggested activities:

Listen and repeat, listening to audio excerpts-Listening to native speakers - TED Talks, short prepared speeches, Table topics – Speaking in different situations- MCQ's - Cloze exercises- Complete the Dialogue

Suggested sources:

(Listening and Speaking Modules) – Language Lab Professional Speaking Skills by ArunaKoneru, Oxford Press

**CO-2
BTL-3**

English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition		
MODULE – 3: FUNCTIONAL READING AND WRITING(6L+6P=12)		
Reading comprehension (academic texts and general texts)-Reading and Interpreting visual data, charts, tables and graphs-- Report writing- accident, industrial, survey, general reports – Direct and Indirect speech Suggested Activities: Identify the errors in sentences, grammar exercise, reading passage for identifying the contextual meaning, interpreting charts, tables and graphs, choose the right meaning of the word given Assignment on suggested reading activity – Book review Suggested sources: Essential English Grammar by Raymond Murphy, Cambridge University Press, 2016 edition Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.		CO-3 BTL-3
MODULE – 4 : BUSINESS CORRESPONDENCE		(6L+6P=12)
Memo-Notice - Agenda – Minutes of the Meeting-Action Taken report- Report Writing- Connectives - Cause and effect Suggested activities: Drafting agenda, notice, memo, minutes of the meeting- ATR- Cause and effect exercises - Presentation in the language lab (Technical or Non-technical topic) Suggested sources: Cambridge Advanced English, Newspapers, library books, IELTS , IELTS Academic Writing 1, New Insights into IELTS, CUP		CO-4 BTL-3
MODULE 5 – PRESENTATION SKILLS AND INTERVIEW SKILLS		(6L+6P=12)
Presentation Skills - Reading and Interpreting Advertisements—Job Application- Covering Letter -Curriculum Vitae –E-mail - Project proposal –Interview skills (HR questions) – Group Discussion Suggested Activities: Presentation in the language lab (Technical or Non-technical topic) Group Discussion (Tutorial Classes) Suggested Sources: English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition Soft Skills and Employability Skills by Sabina Pillai and Agna Fernandez, Cambridge University Press, 2018. Education and personality development by K. Manoharan, APH Publishing Home, 2016		CO-5 BTL-3
TEXT BOOKS		
1.	Dr. Bikram K. Das et al. (2009). <i>An Introduction to Professional English and Soft Skills</i> , Cambridge University Press.	
2	Dolly John. (2014). <i>English for Life and the Workplace Through LSRW&T skills</i> , Pearson Publications.	
REFERENCE BOOKS		

1.	Sabina Pillai and Agna Fernandez. (2018). <i>Soft Skills & Employability Skills</i> , Cambridge University
2.	Steve Hart et al. (2016). <i>English for Undergraduates</i> , Cambridge University Press.
3.	Collins. (2012). <i>Skills for the TOEFL IBT Test</i> , HarperCollins Publisher.
4.	Jeff Butterfield. (2010). <i>Soft Skills for Everyone</i> , Cengage Learning.
5.	ArunaKoneru. (2015). <i>Professional Speaking Skills</i> , Oxford Publications.
E BOOKS	
1.	https://www.britishcouncil.in/english/courses-business
2.	http://www.bbc.co.uk/learningenglish/english/features/pronunciation
3.	http://www.bbc.co.uk/learningenglish/english/
4.	http://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/
5.	https://oneshopenglish.com/
6.	https://breakingnews.com/
MOOC	
1.	https://www.mooc-list.com/tags/english
2.	https://www.mooc-list.com/course/adventures-writing-stanford-online
3.	http://www.cambridgeenglish.org/learning-english/free-resources/mooc/

COURSE TITLE		PROBLEM SOLVING USING C								CREDITS			3		
COURSE CODE		CSA4101			COURSE CATEGORY			PC		L-T-P-S			2-0-2-1		
Version		1.0			Approval Details			24 ACM 30 th May 2018		LEARNING LEVEL			BTL-4		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Practical Component						ESE				
15%		15%			20%						50%				
Course Description		To introduce computers and programming in C and also explore the power of computational techniques that are currently used by engineers and scientists and to develop programming skills with reasonable complexity.													
Course Objective		The course should enable the student to, 1. To acquire the basic knowledge in computer hardware, programming languages and Problem-solving techniques. 2. Learn the fundamentals of C programming. 3. Gain knowledge in Functions, arrays and strings in C programming. 4. Understand the pointers, Structures and Union in C programming 5. Gain Knowledge on Embedded Programming													
Course Outcome		Upon completion of this course, the students will be able to, 1. Describe the basics of digital computer and programming languages. 2. Demonstrate problem solving techniques using flowchart, algorithm/pseudo code to solve the given problem. 3. Design and Implement C program using Control Statements and Functions. 4. Design and Implement C program using Pointers and File operations. 5. Identify the need for embedded C in real-time applications.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	P O-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS O-1	PS O-2	PS O-3
CO-1	2	2	2	-	-	2	-	2	-	-	1	2	2	-	-
CO-2	3	3	3	2	2	1	-	2	2	1	-	1	2	3	-
CO-3	3	3	3	2	2	2	-	1	3	3	2	1	2	3	-
CO-4	3	3	3	2	-	-	-	-	-	-	1	-	1	2	-
CO-5	1	1	1	-	1	2	-	1	-	-	-	2	1	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: COMPUTER FUNDAMENTALS (6L+6P=12)															

<p>Introduction – Fundamentals of digital computers - Programming languages - Programming Paradigms – Types of Programming Languages – Language Translators</p> <p>– Problem Solving Techniques: Algorithm – Flow Chart - Pseudo code.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Drawing Flowcharts using E- Chart & Writing pseudo code for the following problems • Greatest of three numbers • Sum of N numbers • Computation of nCr 	<p>CO-1 BTL-1</p>
MODULE 2: PROBLEM SOLVING TECHNIQUES AND LANGUAGES (6L+6P=12)	
<p>Evolution of C -Why C language - Applications of C language - Data Types in C – Operators and Expressions – Input and Output statements in C – Decision Statements – Loop Control Statements.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Program to illustrate arithmetic and logical operators • Program to read and print data of different types • Program to calculate area and volume of various geometrical shapes • Program to compute biggest of three numbers • Program to print multiplication table • Program to convert days to years, months and days • Program to find sum of the digits of an integer 	<p>CO-2 BTL-3</p>
MODULE 3: FUNDAMENTALS OF C (6L+6P=12)	
<p>Functions – Storage Class – Arrays – Strings and standard functions - Pre-processor Statements.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Program to compute Factorial, Fibonacci series and sum of n numbers using recursion • Program to compute sum and average of N Numbers stored in an array • Program to sort the given n numbers stored in an array • Program to search for the given element in an array • Program to do word count • Program to insert a substring in a string • Program to concatenate and compare two strings • Program using pre-processor statements 	<p>CO-3 BTL-4</p>
MODULE 4: FUNCTIONS, ARRAYS AND STRINGS (6L+6P=12)	
<p>Pointers – Dynamic Memory allocation – Structure and Union – Files.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Program to compute sum of integers stored in a 1-D array using pointers and dynamic memory allocation • Program to read and print records of a student/payroll database using structures • Program to simulate file copy • Program to illustrate sequential access file • Program to illustrate random access file 	<p>CO-4 BTL-3</p>
MODULE 5: POINTERS, STRUCTURES AND UNION (6L+6P=12)	
<p>Structure of embedded C program - Data Types - Operators - Statements - Functions - Keil C Compiler.</p> <p>Practical component:</p>	<p>CO-5 BTL-2</p>

Simple programs using embedded C	
TEXT BOOKS	
1.	Jeyapoovan T. (2015). <i>Fundamentals of Computing and Programming in C</i> , Vikas Publishing house
2.	Mark Siegesmund. (2014). <i>Embedded C Programming</i> , first edition, Elsevier publications.
REFERENCE BOOKS	
1.	Ashok Kamthane. (2017). <i>Computer Programming</i> , Pearson Education, 7 th Edition, Inc 2017.
2.	Yashavant Kanetkar. (2016). <i>Let us C</i> , 15th edition, BPP publication.
3.	S. Sathyalakshmi, S. Dinakar. (2013). <i>Computer Programming Practical's – Computer Lab Manual</i> , Dhanam Publication, First Edition.
E BOOKS	
1.	https://en.wikibooks.org/wiki/C_Programming
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc18-cs10/preview
2.	http://nptel.ac.in/courses/106105085/2
3.	https://www.udemy.com/c-programming-for-beginners/
4.	https://www.coursera.org/specializations/c-programming

COURSE TITLE	INTRODUCTION TO DIGITAL SYSTEMS			CREDITS	3
COURSE CODE	MHB4102	COURSE CATEGORY	DE	L-T-P-S	2-0-2-1
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical component	ESE
15%	15%	10%	50%

Course Description	Introduction to digital system is concerned with the design, selection, analysis of digital circuits as well as the various electronics components to be used in a mechatronics system
Course Objective	<p>The course should enable the student to,</p> <ol style="list-style-type: none"> 1. Practice the different number systems, Logic gates, Minimization Techniques 2. Design of adders, subtractors and other combinational circuits. 3. Apply the underlying principle and applications of various sequential circuits 4. Design of asynchronous circuits and the various issues in it. Real time interfacing concepts and its application. 5. Understand the principle of various electronic devices 6. Synergetic combination of above in the design of mechatronic systems.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Simplify mathematical expressions using Boolean functions 2. Design combinational circuits 3. Design sequential circuits and Asynchronous circuits for simple problems 4. Select appropriate electronic devices for mechatronic systems

Prerequisites:**CO, PO AND PSO MAPPING**

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
CO-1	3	2	-	-	-	-	-	2	-	-	-	2	2	-	-
CO-2	3	2	2	2	2	-	-	2	-	-	-	2	2	-	-
CO-3	3	2	-	-	-	-	-	2	-	-	-	2	2	-	-
CO-4	3	2	-	-	-	-	-	2	-	-	-	2	2	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO DIGITAL SYSTEMS	(6L+6P=12)
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<p>Introduction to Digital systems – Number systems - Binary, Hexadecimal – Boolean theorems – Basic Logic Gates, Minimization – Minterm, Maxterm, Karnaugh Map, K map up to 4 variables. Simplification of logic functions with K-map, tabular minimization procedures</p> <p>Practical component: (<i>To be done in Simulation environment</i>)</p> <p>1. Implementation of Boolean Expressions using Basic Logic Gates</p> <p>Suggested Readings: Basics of number systems.</p>	<p>CO-1 BTL-2</p>
MODULE 2: COMBINATIONAL CIRCUITS (6L+6P=12)	
<p>Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, De-multiplexer, Magnitude Comparator, Decoder, Encoder.</p> <p>Practical component: (<i>To be done in Simulation environment</i>)</p> <p>1. Implementation of Boolean Relations using Digital Comparators</p> <p>2. Implementation of Arithmetic Expressions using Adders / Subtractors</p> <p>3. Implementation of BCD-TO-7-segment Decoder / Driver and Operation of 7-segment LED Display</p> <p>Suggested Readings: Priority Encoder.</p>	<p>CO-2 BTL-2</p>
MODULE 3: SEQUENTIAL CIRCUITS (6L+6P=12)	
<p>Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers.</p> <p>Practical component: - (<i>To be done in Simulation environment</i>)</p> <p>1. Implementation of Sequential Circuits using Basic Flip-Flops</p> <p>2. Implementation of Multi-bit Sequential Circuits using Shift Registers</p> <p>Suggested Readings: Best practices for Cyber security standards</p>	<p>CO-3 BTL-3</p>
MODULE 4: ASYNCHRONOUS SEQUENTIAL CIRCUITS (6L+6P=12)	
<p>Asynchronous sequential circuits- fundamental mode pulse mode sequential circuits. cycles and races, Race free assignments, hazards</p> <p>Practical component: - (<i>To be done in Simulation environment</i>)</p> <p>1. Implementation of Logic Functions using Multiplexers</p> <p>2. Implementation of Logic Functions using Decoders</p> <p>Suggested Readings: ASM chart</p>	<p>CO-3 BTL-2</p>
MODULE 5: BASIC ELECTRONIC DEVICES (6L+6P=12)	
<p>Voltage – Current – Ohms Law – introduction to electronic devices – PN Junction Diode, V-I characteristics, Transistors, Rectifiers.</p> <p>Practical component: V-I characteristics of PN junction diode, transistors</p> <p>Suggested Readings:</p>	<p>CO-4 BTL-2</p>

Inverters, Converters and Voltage regulators	
TEXT BOOKS	
1.	Thomas I. Floyd. (2014). <i>Digital Fundamentals</i> , 11th edition, Pearson.
REFERENCE BOOKS	
1	M. Morris Mano. (2016). <i>Digital Logic and Computer Design</i> , Prentice-Hall
2.	W.H.Gothmann. (1992). <i>Digital Electronics-Introduction Theory and Practice</i> , PH
3.	S. Salivahanan and S. Arivazhagan. (2006). <i>Digital Circuits and Design</i> , 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi
E BOOKS	
1.	http://nptel.ac.in/courses/106108099/Digital%20Systems.pdf
2.	https://onlinecourses.nptel.ac.in/noc18_ee33/preview
MOOC	
1	http://nptel.ac.in/courses/106108099/Digital%20System

COURSE TITLE		SUSTAINABLE ENGINEERING SYSTEMS						CREDITS			2			
COURSE CODE		GEA4102		COURSE CATEGORY		PC		L-T-P-S			2-0-0-1			
Version		1.0		Approval Details		24 th ACM, 30.5.2018		LEARNING LEVEL			BTL-3			
ASSESSMENT SCHEME														
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance			ESE			
15%		15%		10%		5%		5%			50%			
Course Description		This course will provide an insight about the principles of Sustainability.												
Course Objectives		1. To explain the principles of sustainability with case studies. 2. To compare assessing technologies for ensuring sustainability. 3. To apply the concepts of green engineering. 4. To analyze the need of waste, reuse and redistribution management. 5. To study water cycle and role of human beings for ensuring sustainability.												
Course Outcomes		Upon completion of this course, the students will be able to 1. Explain the principles of sustainability with case studies. 2. Compare assessing technologies for ensuring sustainability. 3. Apply the concepts of green engineering. 4. Analyze the need of waste, reuse and redistribution management. 5. Study water cycle and role of human beings for ensuring sustainability.												
Prerequisites: Nil														
CO, PO AND PSO MAPPING														
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO- 1	3	1	3	-	1	3	3	2	2	2	2	3	1	2
CO- 2	2	2	2	-	1	3	3	2	2	2	2	3	3	3
CO- 3	2	1	1	-	1	3	3	2	2	2	2	3	2	1
CO- 4	1	2	2	-	1	3	3	2	2	2	2	3	2	3

CURRICULUM AND SYLLABUS

B.TECH – CIVIL ENGINEERING

CO-5	3	2	2	-	1	3	3	2	2	2	2	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related														
MODULE 1 – PRINCIPLES OF SUSTAINABLE SYSTEMS (6L)														
Sustainability Definitions - Principles of Sustainable Design, Sustainable Engineering - Frameworks for Applying Sustainability Principles . Summary & Activities.													CO-1 BTL-2	
MODULE 2 – TECHNOLOGY DEVELOPMENT AND LIFECYCLE ASSESSMENT (6L)														
Technology as a part of anthropogenic environment - Technology readiness levels (TRL) – technical metrics - Emerging, converging, disruptive technologies - Life Cycle Assessment (LCA) methodology - Summary & Activities.													CO-2 BTL-3	
MODULE 3 - GREEN ENGINEERING(6L)														
Principles of Green Engineering - Frameworks for assessment of alternatives - Green Engineering examples - Multifunctional Materials and Their Impact on Sustainability - Summary & Activities.													CO-3 BTL-3	
MODULE 4 - RESOURCE MANAGEMENT TECHNOLOGIES (6L)														
Waste management purpose and strategies - Recycling: open-loop versus closed-loop thinking - Recycling efficiency - Management of food waste and composting technologies - E-waste stream management - Reuse and redistribution programs - LCA approach to waste management systems - Summary and Activities.													CO-4 BTL-3	
MODULE 5 - SUSTAINABLE WATER AND WASTEWATER SYSTEMS (6L)														
Water cycle - Water conservation and protection technologies - Water treatment systemsMetrics for assessment of water management technologies-Summary & Activities.Collaborative Decision Making - Role of Community and Social Networking - Human Factor in Sustainability Paradigm - Summary & Activities.													CO-5 BTL-3	
TEXT BOOKS														
1.	Vanek F.M. and L.D. Albright. (2018). <i>Energy Systems Engineering. Evaluation and Implementation</i> , McGraw Hill.													
2	C.U. Becker. (2012). <i>Sustainability Ethics and Sustainability Research</i> , Springer													
REFERENCES														
1.	J.B. Guinee et al. (2015). <i>Life Cycle Assessment: Past, Present, and Future</i> , Environ. Sci. Technology, pp.90-96.													
2	Anastas P. T and Zimmerman J. B. (2016). <i>Innovations in Green Chemistry and Green Engineering</i> , Springer.													
3.	Christensen T. (2016). <i>Solid Waste Technology & Management</i> , Volume 1 & 2, Wiley and Sons.													
4.	Michael P. Weinstein R and Eugene Turner. (2015). <i>Sustainability Science: The Emerging Paradigm</i> , Springer Science, Business Media.													
E BOOKS														

1.	https://www.oreilly.com/library/view/sustainable-engineering-concepts/9780132756563/
2.	https://www.abebooks.com/book-search/title/engineering-sustainability-practical-guide-sustainable/author/jonker-gerald-harmsen-jan/
MOOC	
1.	https://www.coursera.org/learn/sustainability
2	https://www.academiccourses.com/Certificate/Sustainability-Studies/India/
3.	https://onlinecourses.nptel.ac.in/noc18_ce08/preview
4.	https://www.coursera.org/learn/ecosystem-services

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO AUTOMOBILE ENGINEERING DESIGN (7L + 2P =9)	
<p>Design and its objectives; Design constraints, Design functions, Design means and Design from; Role of Science, Engineering and Technology in design; Engineering as a business proposition; Functional and Strength Designs. Design form, function and strength; How to initiate creative designs? Initiating the thinking process for designing a product of daily use. Need identification; Problem Statement; Market survey-customer requirements; Design attributes and objectives; Ideation; Brainstorming approaches; arriving at solutions; Closing on to the Design needs.</p> <p>Project: An Exercise in the process of design initiation. A simple problem is to be taken up to examine different solutions- Vehicle, Group Presentation and discussion.</p>	CO-1 BTL-4
MODULE 2: PROCESSES IN DESIGN FOR AUTOMOTIVE SYSTEM (7L+2P=9)	
<p>Design process- Different stages in design and their significance; Defining the design space; Analogies and “thinking outside of the box”; Quality function deployment-meeting what the customer wants; Evaluation and choosing of a design. Design Communication; Realization of the concept into a configuration, drawing and model. Concept of “Complex is Simple”. Design for function and strength.</p> <p>Design detailing- Material selection, Design visualization- Solid modelling; Detailed 2D pa drawings; Tolerance; Use of standard items in design; Research needs in design; Energy need of the design, both in its realization and in the applications</p> <p>Project: An exercise in the detailed design of any two automobile components</p>	CO-2 BTL-4
MODULE 3: PROTOTYPING OF AUTOMOBILE COMPONENTS (7L+2P =9)	
<p>Prototyping- rapid prototyping; testing and evaluation of design; Design modifications; Freezing the design; Cost analysis.</p> <p>Engineering the design – From prototype to product. Planning; Scheduling; Supply chains; inventory; handling; manufacturing/construction operations; storage; packaging; shipping; marketing; feed-back on design</p> <p>Project: List out the standards organizations. Prepare a list of standard items used in automobile original equipment manufacturers. Develop any design with over 50% standard items as parts.</p>	CO-3 BTL-4
MODULE 4: QUALITY ASPECTS IN AUTOMOBILE ENGINEERING (7L+2P =9)	
<p>Design for “X”; covering quality, reliability, safety, manufacturing/construction, assembly, maintenance, logistics, handling; disassembly; recycling; re-engineering etc.</p> <p>Project: List out the design requirements(x) for designing a car.</p>	CO-4 BTL-4
Module 5: USER CENTRED DESIGNS IN AUTOMOBILE ENGINEERING (7L+2P =9)	
<p>Product centered and user centered design. Product centered attributes and user centered attributes. Bringing the two closers. Example: Motorcycle and Car, Aesthetics and ergonomics. Value engineering, Concurrent engineering, Reverse engineering in design; Culture based design; Architectural designs; Motifs and cultural background; Tradition and design; Study the evolution of Wheels; Printed motifs; Role of colours in design. Make sharp corners and change them to smooth curves-check the acceptance. Design as a marketing tool; Intellectual Property rights – Trade secret; patent; copy-right; trademarks; product liability. Group presentation of any such products covering all aspects that could make or mar it.</p>	CO-5 BTL-4

Project: Examine the possibility of value addition for an existing product.	
TEXT BOOKS	
1.	Balmer R. T, Keat W. D, Wise G and Kosky P. (2012). <i>Exploring Engineering: An Introduction to Engineering and Design</i> , Third Edition, Elsevier Publisher.
2	Dym C L, Little P and Orwin E J. (2013). <i>Engineering Design - A Project based introduction</i> , Wiley.
REFERENCES	
1.	Eastman, C. M. (Ed.). (1996). <i>Design for X Concurrent engineering imperatives</i> , Springer.
2.	Haik, Y and Shahin M. T. (2011). <i>Engineering Design Process</i> , Cengage Learning.
3.	Pahl G, Beitz W, Feldhusen J and Grote K H. (2007). <i>Engineering Design: A Systematic approach</i> , 3rd edition, Springer.
4.	Voland, G. (1999). <i>Engineering by Design</i> , Pearson India

CO-4	1	3	2	1	2	-	-	-	-	-	-	-	2	1
CO-5	3	3	3	2	3	-	-	-	-	-	-	-	1	-
1: Weakly related, 2: Moderately related and 3: Strongly related														
MODULE 1 – Introduction to Digital Systems													(9L)	
Analog& Digital signals - Need for digital instruments – Elements of digital instruments – Number systems: - Binary, Hexadecimal - Logic gates - Boolean algebra (Identities and Properties) - Digital controllers (ON-OFF). Practical Component: Lab: - (<i>To be done in Simulation environment</i>) 1. Logic gates simulation 2. Boolean Identities and Property verification 3. Digital controller design Suggested Reading: Basics of number systems, All digital systems in consumer and industrial electronics.													CO-1 BTL-3	
MODULE 2 –Sensors and Displays													(12L)	
Sensors and Transducers –Classification, Potentiometer, Strain Gauge, Piezoelectric Sensor, Linear Variable Differential Transformer, Resistance temperature detectors (RTD), Thermocouples, Tactile transducers - Displays: - Light Emitting Diode (including OLED) displays. Practical Component: - (To be done in Simulation environment) 1. Simulation of Sensor characteristics- potentiometer 2. Simulation of Sensor Characteristics-Strain Gauge 3. Simulation of Sensor characteristics-LVDT 4. Simulation of Sensor characteristics-RTD 5. Simulation of Sensor Characteristics-Thermocouple Suggested Reading: Primary sensing elements, introduction to displays.													CO-2 BTL-4	
MODULE – 3 : Signal Conditioning Circuits													(9L)	
D.C. Bridge- Unbalanced, Push-Pull configuration, Operational amplifiers- Inverting, Non-Inverting, Instrumentation Amplifier, Active filters: - Low pass, High pass - Analog to Digital Converter – Successive Approximation, Digital to Analog Converter - Weighted Resistor. Practical Component: - (<i>To be done in Simulation environment</i>) 1. Simulation of DC bridges 2. Operational amplifier applications 3. Active filter simulation 4. ADC- DAC simulation. Suggested Reading: Basic network theorems.													CO-3 BTL-4	
MODULE – 4: Introduction to Micro controllers													(9L)	
Introduction: Memory types, peripheral devices- Microcontroller (8 bit), Architecture, Graphics Processing Unit (GPU) - Applications: -Interfacing of Digital Input/Output, Analogue Input/Output, Display. Introduction to Programmable Logic Controller (PLC) and PID (Proportional + Integral + Derivative) Controller. Practical Component: - (<i>To be done in Simulation environment</i>) 1. PLC Ladder logic simulation. 2. Proportional controller simulation.													CO-4 BTL-3	

3. Proportional + Integral controller simulation.		
4. Proportional + Derivative controller simulation.		
5. Proportional +Integral + Derivative controller simulation.		
Suggested Reading: Hobby electronics with Microcontroller interface.		
MODULE 5 – Consumer Electronics and Communication System (6L)		
Consumer Electronics: Television, Mobile Phones, Air conditioners, Refrigerators, Washing Machine. (Block diagram approach only.) Communication System: Satellite communication, Global Positioning Systems, Global System for Mobile. (Block diagram approach only.) Suggested Reading: Consumer Electronics User Manuals.		CO-5 BTL-3
TEXT BOOKS		
1.	Thomas I. Floyd. (2018). <i>Digital Fundamentals</i> , Pearson,11th edition.	
2.	Ramakant A. Gayakwad. (2017). <i>Op-amps and Linear Integrated Circuits</i> , Prentice Hall,4 th edition.	
3.	David A. Bell. (2018). <i>Electronic Instrumentation and Measurements</i> , Oxford University Press.	
4.	SepehrNaimi, SarmadNaimi and Muhammad Ali Mazidi. (2017). <i>The 8051 Microcontroller And Embedded Systems Using Assembly and C</i> , Pearson,Second edition.	
5.	Frank D. Petruzella. (2016). <i>Programmable Logic Controllers</i> , McGraw-Hill Education.	
REFERENCE BOOKS		
1.	M. Morris Mano. (2016). <i>Digital Logic and Computer Design</i> , Prentice-Hall.	
2.	Roy Choudhury. (2018). <i>Linear Integrated Circuits</i> , New Age International Publishers, 4th edition.	
3.	Thomas W. Schultz. (2018), <i>C and 8051</i> , Schultz Publishers, 4 th edition.	
4.	S.P Bali. (2008). <i>Consumer Electronics</i> , Pearson Education Asia Pvt., Ltd.,	
E BOOKS		
1.	http://www.ee.iitm.ac.in/~giri/pdfs/EE4140/textbook.pdf	
2.	https://electronics.howstuffworks.com/home-audio-video-channel.htm	
MOOC		
1.	http://nptel.ac.in/courses/106108099/Digital%20Systems.pdf	
2.	http://nptel.ac.in/courses/112103174/pdf/mod2.pdf	
3.	http://www.nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/pdf/Teacher_Slides/mod3/M3L6.pdf	
4.	http://nptel.ac.in/courses/108105063/pdf/L-09(SS)(IA&C)%20((EE)NPTEL).pdf	

COURSE TITLE		ENGINEERING IMMERSION LAB						CREDIT		0.5					
COURSE CODE		GEA4131		COURSE CATEGORY			BS		L-T-P-S		0-0-2-2				
VERSION		1.0		APPROVAL DETAILS			24 th ACM - 30.5.2018		LEARNING LEVEL		BTL-3				
ASSESSMENT SCHEME															
CIA										ESE					
80%										20%					
Course Description		To provide the students with hands on experience on various basic engineering practices													
Course Objective		The course should enable the students to 1. Relate theory and practice of basic Civil and Mechanical Engineering 2. Learn basic concepts in Aeronautical and Automobile Engineering 3. Learn basic concepts in Electrical, Electronics, mechatronics and Computer Science													
Course Outcome		Upon completion of this course, the students will be able to 1. Identify and use of tools, Types of joints used in welding, carpentry and plumbing operations. 2. Have hands on experience on basic fabrication techniques such as carpentry and plumbing practices. 3. Have hands on experience on basic fabrication techniques of different types of welding and basic machining practices.													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS O-1	PS O-2	PSO-3
CO-1	3	2	-	2	-	1	-	-	2	-	-	-	-	-	-
CO-2	3	2	-	2	-	1	-	-	2	-	-	-	-	-	-
CO-3	3	2	-	2	-	1	-	-	2	-	-	-	-	-	-
SLOT X -LIST OF EXPERIMENTS															
I. MECHANICAL ENGINEERING WORKSHOP 1. Welding: Arc welding: Butt joints 2. Lap joints. 3. Machining: Facing 4. Turning															
II. AUTOMOBILE ENGINEERING 1. Dismantling and studying of two stroke gasoline engines. 2. Assembling of two stroke gasoline engines. 3. Dismantling and studying of four stroke gasoline engines 4. Assembling of four stroke gasoline engines.															
III. AERONAUTICAL ENGINEERING															

1. Study of Flow Pattern around Various Objects.
2. Force measurement on Aircraft Model
3. Determination of Young's Modulus for Aluminum Cantilever Beam
4. Binary Addition & Subtraction using Microprocessor

IV. CIVIL ENGINEERING

1. Plumbing- Basic Pipe Connection using valves, couplings and elbows.
2. Carpentry – Sowing, Planning and making common Joints.
3. Bar Bending
4. Construction of a 50 cm height brick wall without mortar using English Bond.

SLOT Y -LIST OF EXPERIMENTS**V. ELECTRICAL ENGINEERING**

1. Study of tools and accessories.
2. Study of cables.
3. Staircase wiring, Tube light and Fan connection.
4. Measurement of energy using single phase energy meter.

VI. ELECTRONICS ENGINEERING

1. Study of Active and Passive Components.
2. Study of Logic Circuits.
3. Making simple circuit using Electronic Components.
4. Measuring of parameters for signal using CRO.

VII. COMPUTER SCIENCE

1. Troubleshooting different parts of the computer peripherals, Monitor, Keyboard & CPU.
2. Installation of various operating systems, their capabilities, Windows, Unix, Linux.
3. Installation of commonly used software like MS Office
4. Assembling digital computer.

VIII. MECHATRONICS ENGINEERING

1. Study of Key Elements of Mechatronics Systems
2. Sensors – Load Cell, Thermocouple
3. Actuators – Linear & Rotary Actuators
4. Interfacing & Measurements – Virtual Instrumentation

REFERENCE

1	Jeyapoovan T and Saravanapandian M. (2015). <i>Engineering practices lab manual</i> , Vikas publishing House, New Delhi, 4th Edition.
2	Hajra Choudhury S.K, Hajra Choudhury A.K. and Nirjhar Roy S.K. (2008). <i>Elements of Workshop Technology</i> , Media promoters and publishers private limited, Mumbai.
3	Ibrahim Zeid. (2011). <i>CAD/CAM Theory and Practice</i> , Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4	Robert Quesada, Jeyapoovan T. (2006). <i>Computer Numerical Control Machining and Turning Centers</i> , Pearson Education, New Delhi.

METHOD OF ALLOCATION FOR ENGINEERING IMMERSION LAB**SLOT X : MECH, AERO, AUTO, CIVIL EXPERIMENTS****SLOT Y : EEE, ELECTRONICS, CSE, MECHATRONICS EXPERIMENTS**

➤ EVERY CLASS OF

- GROUP A (AERO, AUTO, MECH, MCT, CHEM, BIO, CIVIL)
- GROUP B (CSE, IT, ECE, EEE, AEROSPACE)

GETS DIVIDED INTO 4 SUB - GROUPS NAMELY a, b, c, d -- EACH CONSISTING OF 15 TO 20 STUDENTS MAX.

- FOR EXAMPLE: **GROUP A STUDENTS WILL OCCUPY SLOT X**
 - WEEK 1 : SLOT X ---
a – MECH; b – AUTO; c – AERO ; d – CIVIL
 - WEEK 2 : SLOT X ---
b – MECH; c – AUTO; d – AERO ; a – CIVIL
- THE ABOVE SCHEDULE WILL BE ON ROTATION EVERY MONTH (ONE CYLCE PER MONTH)
- **GROUP B STUDENTS WILL OCCUPY SLOT Y**
 - WEEK 1 : SLOT Y ---
a – EEE; b – ECE; c – CSE ; d – MCT
 - WEEK 2 : SLOT Y ---
b – EEE; c – ECE; d – CSE ; a – MCT
- THE ABOVE SCHEDULE WILL BE ON ROTATION EVERY MONTH (ONE CYLCE PER MONTH)

(9P)

1. Torsional Pendulum – Determination of rigidity modulus of the material of a wire.	CO-1 BTL-3
2. Non-Uniform Bending – Determination of Young’s Modulus.	
3. Uniform Bending – Determination of Young’s Modulus.	
MODULE 2: PROPERTIES OF MATTER- LIQUID (3P)	
4. Viscosity – Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow.	CO-2 BTL-3
MODULE 3: THERMAL CONDUCTIVITY (3P)	
5. Lee’s Disc – Determination of thermal conductivity of a bad conductor. Preparation of urea-formaldehyde resin.	CO-3 BTL-3
MODULE 4: OPTICS (6P)	
6. Air – Wedge – Determination of thickness of a thin wire	CO-4 BTL-3
7. Spectrometer – refractive index of a prism	
MODULE 5: ESTIMATION METAL ION CONTENTS IN THE SAMPLE (6P)	
8. Semiconductor laser – Determination of wavelength of laser using grating	CO-5 BTL-3
9. Semiconductor diode – VI characteristics	
TEXT BOOKS	
1. P. Mani. (2005). <i>Engineering Physics Practical</i> , Dhanam Publications, Chennai	
REFERENCE BOOKS	
1. Glenn V. Lo, Jesus Urrechaga Aituna. (2005). <i>Introductory Physics Laboratory Manual, Part-I</i> , Fall.	
2. P. Kulkarni. (2015). <i>Experiments in Engineering Physics Bachelor of Engineering and Technology</i> .	
E BOOKS	
1. http://www.aurora.ac.in/images/pdf/departments/humanities-and-sciences/engg-phy-lab-manual.pdf	
MOOC	
1. https://www.coursetalk.com/providers/coursera/courses/introduction-to-chemistry-1	

COURSE TITLE			MATERIALS CHEMISTRY LABORATORY (Common to ALL branches of Engineering)							CREDITS			1		
COURSE CODE			CYA4131			COURSE CATEGORY		BS		L-T-P-S			0-0-2-0		
Version			1.0			Approval Details		24 th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
Experimental			Calculation			Result		Viva		Record			ESE		
30%			10%			10%		20%		10%			20%		
Course Description			This course imparts practical exposure on basic techniques employed for the analyses of lubricants, refractories & other engineering materials and spectrophotometric analyses for metal ions.												
Course Objectives			1. To train the students in characterization of lubricants by viscosity measurement. 2. To give a practical exposure for the construction of phase diagram, for partially-miscible liquids (phenol-water system) 3. To provide the students practical knowledge in preparation of polymers (urea-formaldehyde resin) 4. To impart hands-on training in characterization of refractories. 5. To equip the students with practical skill in estimation of metal ions by spectrophotometry.												
Course Outcomes			Upon completion of this course, the students will be able to 1. grade the lubricants based on viscosity 2. analyze the phase diagram and interpret the critical solution temperature. 3. apply the practical knowledge gained on the preparation of polymers, for the preparation of other similar macromolecules. 4. analyze the strength of refractories. 5. apply the spectrophotometric method for the determination of metal ions in different environment.												
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS O-1	PS O-2	PS O 3
CO-1	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-2	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-3	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-4	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-5	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: PROPERTIES OF LUBRICANTS (6 L)															

1. Determination of viscosity of polymer using Ostwald Viscometer. 2. Determination of Viscosity Index of lubricants. 3. Determination of viscosity of oil using Red-Wood Viscometer.	CO-1 BTL-3
MODULE 2: PHASE DIAGRAM IN LIQUID SYSTEM (6 L)	
4. Construction of phenol-water phase diagram. 5. Determination of adsorption isotherm for acetic acid on activated charcoal.	CO-2 BTL-3
MODULE 3: PREPARATION POLYMER RESIN. (6 L)	
6. Preparation of urea-formaldehyde resin.	CO-3 BTL-3
MODULE 4: BASIC PROPERTIES OF REFRACTORIES(6 L)	
7. Determination of porosity of a refractory. 8. Determination of apparent density of porous solids.	CO-4 BTL-3
MODULE 5: ESTIMATION METAL ION CONTENTS IN THE SAMPLE (6 L)	
9. Estimation of dye content in the effluent by UV-Visible spectrophotometry. 10. Determination of copper / iron content in the alloy by colorimetry. 11. Estimation of sodium and potassium ions by flame photometry. 12. Verification of Beer-Lambert's law using gold nanoparticles.	CO-5 BTL-3
TEXT BOOKS	
1. P.S. Raghavan. (2018). Materials Chemicals Laboratory Manual, Dhanam Publications.	
REFERENCE BOOKS	
1. J. Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas Vogel's. (2009). <i>Textbook of Quantitative Chemical Analysis</i> , Pearson Education, 6 th Edition.	
E BOOKS	
1. http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html	
MOOC	
1. https://www.coursetalk.com/providers/coursera/courses/introduction-to-chemistry-1	

SEMESTER II

COURSE TITLE	ANALYTICAL MATHEMATICS			CREDITS	4
COURSE CODE	MAA 4117	COURSE CATEGORY	BS	L-T-P-S	3-0-2-1
Version	1.0	Approval Details	24 th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical component	ESE
15%	15%	20%	50%

Course Description	To make the student understand the basic analytical mathematical skills that is imperative for effective understanding of engineering subject using MATLAB.
Course Objective	The course should enable the students to <ol style="list-style-type: none"> 1. Demonstrate the fundamental understanding of integrals 2. Apply problem solving skills vectors 3. Understand the concepts of Laplace Transforms 4. Understand the concept of Fourier series 5. Understand the concepts of complex variables
Course Outcome	Upon completion of this course, the students will be able to <ol style="list-style-type: none"> 1. Competent to evaluate surface and volume integrals. 2. Perform vector operations and interpret the results geometrically 3. Solve the system of ordinary differential equations using Laplace Transform 4. Proficient to know that any periodic function satisfying Dirichlet's conditions can be expressed as a Fourier series 5. Understand complex variable theory, applications of analytic function and harmonic conjugate.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
CO-1	1	2	-	-	-	-	2	-	-	-	-	-	-	-	-
CO-2	2	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO-3	2	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO-4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	2	1	-	-	-	-	2	-	-	-	-	-	-	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: MULTIPLE INTEGRALS (10L+2P=12)	
<p>Double integration – Cartesian and polar co-ordinates – Change of order of integration. Area as a double integral – Triple integration in Cartesian coordinates – Volume as a triple integral – Change of variables between Cartesian and polar coordinates.</p> <p>Suggested Reading: Line Integrals</p> <p>Lab: Area and Volume using double and triple integration.</p>	<p>CO-1 BTL- 1,2,3,4</p>
MODULE 2: VECTOR CALCULUS (10L+2P=12)	
<p>Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle between surfaces–Solenoidal and Irrotational vector fields, Green's theorem - Gauss divergence theorem and Stoke's theorem (without proof) – Verification and evaluation of the above theorems - Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds.</p> <p>Suggested Reading: Basics of Vectors</p> <p>Lab: Area using Green's theorem and Volume using Gauss divergence theorem.</p>	<p>CO-2 BTL-3</p>
MODULE 3: LAPLACE TRANSFORMS (10L+2P=12)	
<p>Laplace transform – Conditions of existence – Transform of elementary functions – properties– Transforms of derivatives– Initial and final value theorems – Transform of periodic functions. Inverse Laplace transforms using partial fraction and convolution theorem. Solution of linear ODE of second order with constant coefficients.</p> <p>Suggested Reading: Basics of Transform</p> <p>Lab: Finding Laplace and Inverse Laplace Transform of Elementary Functions, Solutions of Ordinary differential equations using Laplace transform</p>	<p>CO-3 BTL-3</p>
MODULE 4: FOURIER SERIES (10L+2P=12)	
<p>Dirichlet's Conditions – General Fourier Series – Odd and even functions – Half range sine and cosine series –Harmonic Analysis.</p> <p>Suggested Reading: Basics of series</p> <p>Lab: Fourier series Expansion of simple functions, Harmonic Analysis</p>	<p>CO-4 BTL-3</p>
MODULE 5: COMPLEX VARIABLES (10L+2P=12)	
<p>Functions of a complex variable – Analytic function – Cauchy - Riemann equations (Statement only) – Properties of analytic function (Statement only) – Construction of Analytic functions by Milne – Thomson method.</p> <p>Suggested Reading: Complex Numbers</p> <p>Lab: Complex Numbers</p>	<p>CO-5 BTL-3</p>
TEXT BOOKS	
1.	Kreyszig Erwin. (2016). <i>Advanced Engineering Mathematics</i> , John Wiley and Sons, 10th Edition.
2	A. P. Santhakumaran and P.Titus. (2012). <i>Engineering Mathematics II</i> , NiMeric Publications, Nagercoil.
3.	Chandrasekaran A. (2014). <i>Engineering Mathematics- II</i> , Dhanam Publication
4.	Raj Kumar Bansal, Ashok Kumar Goel and Manoj Kumar Sharma. (2016). <i>MATLAB and its Applications in Engineering</i> , Pearson Publication, Second Edition

REFERENCE BOOKS	
1.	Sastry S. S. (2014). <i>Engineering Mathematics</i> , Vol. I & II, PHI Learning Pvt. Ltd, 4 th Edition.
2.	Wylie R.C. and Barrett L.C. (2012). <i>Advanced Engineering Mathematics</i> , Tata McGraw Hill Education Pvt. Ltd, 6th Edition.
3.	Dean G. Duffy. (2013). <i>Advanced Engineering Mathematics with MATLAB</i> , CRC Press, Third Edition.
E BOOKS	
1	https://nptel.ac.in/courses/122/104/122104017/
2	https://www.khanacademy.org/.../double-integrals.../double-integral .
3	https://nptel.ac.in/courses/115101005/downloads/lectures-doc/Lecture-1.pdf
4	https://nptel.ac.in/syllabus/122104017/
5	https://nptel.ac.in/courses/111105035/22%20nptel.ac.in/syllabus/111103070/
MOOC	
1.	https://www.edx.org/course/introduction-engineering-mathematics-utarlingtonx-engr3-0x

COURSE TITLE		ENGINEERING MATERIALS (Common to ALL Branches of Engineering)										CREDITS		3			
COURSE CODE		CYA4101		COURSE CATEGORY				BS				L-T-P-S		3-0-0-1			
Version		1.0		Approval Details				24 ACM 30 th May 2018				LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME																	
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project				Surprise Test / Quiz				Attendance		ESE	
15%		15%				10%				5%				5%		50%	
Course Description		To make the students understand the basic concepts of Engineering Materials and their applications.															
Course Objective		1. To make the students understand the basics of crystal structure and phase rule. 2. To provide an exposure on the fundamentals of powder metallurgy and applications of inorganic materials and composites. 3. To give a strong foundation on the basic concepts of nanomaterials, the general synthetic methods with emphasis on their applications. 4. To illustrate the applications of conducting polymers and liquid- crystals, with a good exposure on their basic terminologies. 1. To provide a knowledge on the theoretical basis of the chemical composition, properties and applications of lubricants, adhesives and explosives.															
Course Outcome		Upon completion of this course, the students will be able to 1. Propose and justify suitable metals/materials for alloying. 2. State and select a suitable high-temperature material for industrial applications. 3. Suggest an appropriate technique for nanomaterial synthesis and also select a property-guided molecular material for a given application. 4. Identify the materials which can be employed as organic conductors and liquid- crystals in electronic devices. 5. Distinguish and select a suitable organic / inorganic material as lubricant / adhesive / explosive based on its applications.															
Prerequisites: Nil																	
CO, PO AND PSO MAPPING																	
CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO- 12	PSO -1	PSO- 2	PSO- 3		
CO-1	3	1	1	-	-	-	1	-	-	-	-	1	1	-	-		
CO-2	3	2	1	1	-	-	2	-	-	-	-	2	1	-	-		
CO-3	3	1	1	-	-	-	2	-	-	-	-	2	1	-	-		
CO-4	3	1	1	1	-	-	2	-	-	-	-	2	2	-	-		
CO-5	3	2	1	-	-	-	2	-	-	-	-	2	2	-	-		
1: Weakly related, 2: Moderately related and 3: Strongly related																	

MODULE 1: CRYSTAL STRUCTURE AND PHASE RULE (9 L)	
Basic crystal systems – Types, characteristics, examples – Space lattice, Unit cell – types – X-ray diffraction and crystal structure. Basic terminology - Derivation of Gibbs Phase rule-Phase diagrams: One component system (water), Two component system— Reduced phase rule: Simple Eutectic system, examples, Phase diagram: Ag-Pb system, Pb-Sn system—Applications of phase rule.	CO-1 BTL-3
MODULE 2: POWDER METALLURGY, INORGANIC MATERIALS AND COMPOSITES. (9L)	
Steel – Composition, types, heat-treatment, Abrasives – Classification, Properties, Uses - Refractories – Classification, Properties, Applications. Glasses – Properties, Types, Specialty glasses. Composites - Introduction - Definition – Constituents – Classification -Fiber-reinforced Composites –Types and Applications. Powder Metallurgy – Preparation of metal/alloy– Advantages and limitations.	CO-2 BTL-3
MODULE 3: NANOMATERIALSAND MOLECULAR SIEVES (9L)	
Introduction – Synthesis of Nanomaterials - Bottom-up and Top-down approaches – Methods of preparation – Sol-gel process, Gas-phase condensation, Chemical Vapour Deposition. Properties – Optical, Electrical, Magnetic, Chemical properties (introduction only).Characterization – FE-SEM, TEM (Principle and Applications only). Zeolite Molecular sieves – composition, structure, classification - applications – ion exchange, adsorption, separation, laundry, catalysis.	CO-3 BTL-3
MODULE 4: MATERIALS FOR ELECTRONIC APPLICATIONS (9L)	
Liquid Crystals- Introduction – Characteristics – Classification- Thermotropic crystals- Polymorphism in Thermotropic Liquid Crystals – Molecular arrangement in various states of Liquid Crystals, Lyotropic Liquid Crystals- Applications. Conducting and Super conducting Organic electronic materials - Applications. Engineering plastics: Polycarbonate – Properties and uses- Conducting Polymers: Classification, Intrinsic Conducting Polymers, Extrinsic Conducting Polymers, Applications - Biodegradable Polymers, examples and applications.	CO-4 BTL-2
MODULE 5: LUBRICANTS, ADHESIVES AND EXPLOSIVES (9L)	
Lubricants – Mechanism of Lubrication, Classification and Properties, Semi Solid Lubricants, Solid Lubricants, MoS ₂ and Graphite - Adhesives – Development of Adhesive strength, Physical and Chemical factors influencing adhesive action, Classification of Adhesives – Epoxy Resin (Preparation, Properties and Applications). Explosives – Requisites, Classification, Precautions during storage – Rocket propellants – Requisites - Classification.	CO-5 BTL-2
TEXT BOOKS	
1.	P.S. Raghavan. (2018). <i>Engineering Materials</i> , Dhanam Publications
2.	P.C. Jain and Monicka Jain. (2012). <i>Engineering Chemistry</i> , Dhanpat Raj Publication (P) Ltd, New Delhi
REFERENCE BOOKS	
1.	Puri Sharma and Pathania. (2020). <i>Principles of Physical Chemistry</i> , Vishal Publishing Co. Jalandar.
E BOOKS	
1.	http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html
MOOC	
1.	https://www.edx.org/course/materials-science-engineering-misix-mse1x

COURSE TITLE	ENGINEERING PHYSICS				CREDITS	3
COURSE CODE	PHA4101	COURSE CATEGORY	BS		L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL		BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with fundamental principles of physics, using mathematical derivations, for first year B. Tech students; the principles and applications of elasticity, acoustics, ultrasonics, quantum physics, crystal physics, lasers and fiber optics are dealt in this course. Intended for Aeronautical, Automobile, Bio tech., Chemical, Civil and Mechanical branches.
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Course Objective	<p>The course should enable the student to,</p> <ol style="list-style-type: none"> 1. Explain stress, strain and elastic moduli and apply the concepts to solve basic problems 2. Apply principles of acoustics to solve basic problems and use ultrasonics as an engineering tool 3. Explain particle nature of radiation, compute Schrodinger's wave equation and apply it to infinite potential well 4. Identify crystal structures and crystal planes, describe different magnetic materials and hysteresis based on concept of ferromagnetic domains. 5. Discuss the principles, working and applications of lasers and fiber optics
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Solve the basic problems in elasticity and explain the properties of matter 2. Apply the knowledge of acoustics in designing acoustical buildings and employing ultrasonic as an engineering tool. 3. Use mathematical derivations to solve quantum problems. 4. Identify the crystal lattice planes, distinguish different magnetic materials, and explain the ferromagnetic domain. 5. Familiarize with the principles, working and applications of lasers and fiber optics.
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Prerequisites: Knowledge in fundamentals of Physics at higher secondary level

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO- 3	PO -4	PO- 5	PO -6	PO -7	PO -8	PO -9	PO- 10	PO -11	PO- 12	PSO -1	PSO -2	PSO -3
CO-1	3	2	0	0	0	0	0	0	0	0	0	3	-	-	-

B.TECH – CIVIL ENGINEERING

[illegible]

1.	P.Mani. (2011). <i>Engineering Physics</i> , Vol I & II, Dhanam Publications, Chennai.
REFERENCE BOOKS	
1.	Gaur R.K. and Gupta S.L. (2010). <i>Engineering Physics</i> , 8 th edition, DhanpatRai publications (P) Ltd., New Delhi.
2.	P.Charles, Poople and Frank J. Owens. (2007). <i>Introduction to Nanotechnology</i> , Wiley India.
3.	Arthur Beiser. (2007). <i>Concepts of Modern Physics</i> , Tata McGraw – Hill Publications.
4.	Rajendran V, Marikani A. (2003). <i>Applied Physics for engineers</i> , 3rd edition, Tata McGraw – Hill publishing company Ltd., New Delhi.
E BOOKS	
1.	https://books.google.co.in/books?id=w4crDAAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2.	https://www.goodreads.com/book/show/789047.Physics_for_Scientists_and_Engineers
MOOC	
1.	https://www.coursera.org/learn/how-things-work
2.	https://www.coursera.org/learn/quantum-physics
3.	https://onlinecourses.nptel.ac.in/noc21_ph21
4.	https://onlinecourses.swayam2.ac.in/aic20_sp64

[illegible]

CO-2	-	-	2	-	3	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-
CO-5	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: BASICS OF ENGINEERING GRAPHICS AND PLANE CURVES (6L+6P=12)															
Importance of graphics - BIS conventions and specifications - drawing sheet sizes - Lettering – Dimensioning - Scales. Drafting methods - introduction to Computer Aided Drafting – Computer Hardware – Workstation – Printer and Plotter – Introduction to software for Computer Aided Design and Drafting – Exposure to Solid Modelling software – Geometrical Construction-Coordinate Systems/Basic Entities – 3D printer. Practical component: AutoCAD – Solid modelling tool - Basics. Suggested Readings: Basics of drafting and dimensioning														CO-1 BTL-2	
MODULE 2: VISUALIZATION, ORTHOGRAPHIC PROJECTIONS AND FREE HAND SKETCHING(6L+6P=12)															
Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three-Dimensional objects — Pictorial Projection methods - Layout of views- Free hand sketching of multiple views from pictorial views of objects. Drafting of simple Geometric Objects/Editing General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Conversion to orthographic views from given pictorial views of objects, including dimensioning – Drafting of Orthographic views from Pictorial views. Practical component: 2D drafting, Orthographic projections Suggested Readings: AutoCAD tool – Commands for sketching, Projections														CO-2 BTL-2	
MODULE 3: GEOMETRICAL MODELLING, ISOMETRIC AND DEVELOPMENT OF SURFACES(6L+6P=12)															
Principles of isometric projection and solid modelling. Isometric drawing – IsoPlanes and 3D Modelling commands. Projections of Principal Views from 3-D Models. Solid Modeling – Types of modelling - Wire frame model, Surface Model and Solid Model – Introduction to graphic software for solid modelling. Development of Surfaces Practical component: 3D modelling and surface development Suggested Readings: Surface modelling and solid modelling														CO-3 BTL-3	
MODULE 4: COMPUTER AIDED DESIGN AND DRAFTING (6L+6P=12)															
Preparation of solid models of machine components like slide block, solid bearing block, bushed bearing, gland, wall bracket, guide bracket, shaft bracket, jig plate, shaft support (open type), vertical shaft support etc using appropriate modelling software. 2D views and sectional view, computer aided drafting and dimensioning. Generate 2D drawing														CO-4 BTL-2	

from the 3D models – generate and develop the lateral surfaces of the objects. Presentation Techniques of Engineering Drawings – Title Blocks – Printing/Plotting the 2D/3D drawing using printer and printing solid object using 3D printer. Practical component: 2D to 3D transformation, plotting of drawings Suggested Readings: 3D modelling – view generations and commands		
MODULE 5: SIMPLE DESIGN PROJECTS – COMPUTER AIDED DESIGN		(6L+6P=12)
Creation of engineering models and their presentation in standard 2D form, 3D Wire-Frame and shaded solids, meshed topologies for engineering analysis, tool-path generation for component manufacture, geometric dimensioning and tolerancing. Use of solid-modelling software for creating associative models at the components and assembly levels in their respective branch of engineering like building floor plans that include: windows, doors, fixtures such as WC, Sink, shower, slide block, etc. Applying color coding according to drawing practice. Practical component: 3D solid meshed topology, geometrical dimensioning, simple components Suggested Readings: AutoCAD dimensioning, assembly of solid components		CO-5 BTL-3
TEXT BOOKS		
1.	Jeyapoovan, T. (2016). <i>Engineering Drawing and Graphics Using AutoCAD</i> , 7 th Edition, Vikas Publishing House Pvt Ltd., New Delhi.	
REFERENCE BOOKS		
1.	Warren J. Luzadder and Jon. M. Duff. (2016). <i>Fundamentals of Engineering Drawing</i> , Prentice Hall of India Pvt. Ltd., Eleventh Edition.	
2.	Jensen, J.D. Helsel, D.R. Short. (2012). <i>Engineering Drawing and Design</i> , McGraw-Hill, Sixth Edition.	
E BOOKS		
1.	http://keralatechnologicaluniversity.blogspot.in/2015/06/engineering-graphics-i-benjamin-pentex-freebook-pdf-download.html	
2.	http://keralatechnologicaluniversity.blogspot.in/2015/06/engineering-graphics-p-i-varghese.html	
MOOC		
1.	http://nptel.ac.in/courses/112103019/	
2.	http://nptel.ac.in/courses/105104148/	

COURSE TITLE	PROFESSIONAL ENGLISH AND SOFT SKILLS			CREDITS	3
COURSE CODE	ELA4101	COURSE CATEGORY	HS	L-T-P-S	2-0-2-1
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL	BTL-4
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%
Course Description	This course has been designed to meet students' current and future language and communication needs. It attempts to develop their proficiency in the four language skills and knowledge of grammar and vocabulary. This course teaches students how to communicate accurately, appropriately and fluently in professional and social situations.				
Course Objective	<ol style="list-style-type: none"> 1. To acquire self-confidence by which the learner can improve upon their informative listening skills by an enhanced acquisition of the English language. 2. To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate. 3. To equip the students to Read, comprehend and answer questions based on literary, scientific and technological texts. 4. To enhance the writing skills of the students via training in instructions, recommendations, checklists, process-description, letter-writing and report writing. 5. To equip the learners in analyzing and applying creative thinking skills and participate in brainstorming, mind-mapping, audiovisual activities and excel in employability skills 				
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Demonstrate the ability to construct sentences with accuracy with focus on syntax. 2. Enrich vocabulary, use of phrases, expressions, idioms, and proverbs. Derive the contextual meaning through reading and listening from general and academic situations, Identify specific details and general ideas. Learn to give instructions and make suggestions. 3. Analyse and transcode data, construct different types of written essays, read complex passages and summarize ideas, create personal profiles in the form of a resume. 4. Organize and articulate ideas, concepts, and perceptions in a comprehensive manner in written business correspondence, and speaking in formal and informal situations. 				

5. Apply critical thinking skills and participate in brainstorming sessions on general topics, and transact information with an audience. Prepare students for interview questions, presentation skills. Produce complex written documents such as reports, business/scientific documents, and project proposals.

Prerequisites: Plus, Two English-Intermediate Level

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO-2	-	-	-	-	-	-	-	2	2	3	-	-	-	-	-
CO-3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO-4	-	-	-	-	-	-	2	-	-	3	2	-	-	-	-
CO-5	-	-	-	-	-	-	-	-	2	3	2	3	-	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FUNCTIONAL GRAMMAR AND VOCABULARY

(6L+6P=12)

Introduction to communication skills –Self Introduction - Basic grammar (tenses, subject verb agreement) - Basic vocabulary (prefixes, suffixes, roots, phrasal verbs and idioms)- Topic sentences, paragraph writing

Suggested Activities:

Short conversations-Situational Communication-Dialogue Writing - Writing short paragraph based on environment protection, societal issues, health, cultural contexts etc., identifying topic sentences, linking pairs of sentences.

Suggested Reading:

1. An Introduction to Professional English and Soft Skills with audio CD by Dr. Bikram K. Das et al. Published by Cambridge University Press. 2009
2. Professional Speaking Skills by ArunaKoneru, Oxford Press, 2015
3. Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.
4. English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition

**CO-1
BTL-2**

MODULE 2 – LISTENING AND SPEAKING SKILLS

(6L+6P=12)

Academic listening (listening to lectures different topics, audio excerpts and answering question) - General listening (conversations, speeches: formal and informal) - Giving instructions and suggestions- Active and Passive Voice

Suggested activities:

Listen and repeat, listening to audio excerpts-Listening to native speakers - TED Talks, short prepared speeches, Table topics – Speaking in different situations- MCQ's - Cloze exercises- Complete the Dialogue

Suggested sources:

(Listening and Speaking Modules) – Language Lab
Professional Speaking Skills by ArunaKoneru, Oxford Press

**CO-2
BTL-3**

English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition		
MODULE – 3: FUNCTIONAL READING AND WRITING		(6L+6P=12)
<p>Reading comprehension (academic texts and general texts)-Reading and Interpreting visual data, charts, tables and graphs-- Report writing- accident, industrial, survey, general reports –Direct and Indirect speech</p> <p>Suggested Activities: Identify the errors in sentences, grammar exercise, reading passage for identifying the contextual meaning, interpreting charts, tables and graphs, choose the right meaning of the word given</p> <p>Assignment on suggested reading activity – Book review</p> <p>Suggested sources: Essential English Grammar by Raymond Murphy, Cambridge University Press, 2016 edition Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.</p>		CO-4 BTL-3
MODULE – 4: BUSINESS CORRESPONDENCE		(6L+6P=12)
<p>Memo-Notice - Agenda – Minutes of the Meeting-Action Taken report- Report Writing- Connectives - Cause and effect</p> <p>Suggested activities: Drafting agenda, notice, memo, minutes of the meeting- ATR- Cause and effect exercises - Presentation in the language lab (Technical or Non-technical topic)</p> <p>Suggested sources: Cambridge Advanced English, Newspapers, library books, IELTS , IELTS Academic Writing 1, New Insights into IELTS, CUP</p>		CO-3 BTL-3
MODULE 5 – PRESENTATION SKILLS AND INTERVIEW SKILLS		(6L+6P=12)
<p>Presentation Skills - Reading and Interpreting Advertisements—Job Application- Covering Letter -Curriculum Vitae –E-mail - Project proposal –Interview skills (HR questions) – Group Discussion</p> <p>Suggested Activities: Presentation in the language lab (Technical or Non-technical topic) Group Discussion (Tutorial Classes)</p> <p>Suggested Sources: English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition Soft Skills and Employability Skills by Sabina Pillai and Agna Fernandez, Cambridge University Press, 2018. Education and personality development by K. Manoharan, APH Publishing Home, 2016</p>		CO-5 BTL-3
TEXT BOOKS		
1.	Dr. Bikram K. Das et al. (2009). <i>An Introduction to Professional English and Soft Skills</i> , Cambridge University Press	
2	Dolly John . (2014). <i>English for Life and the Workplace Through LSRW&T skills</i> , Pearson Publications	
REFERENCE BOOKS		
1.	Sabina Pillai and Agna Fernandez. (2018). <i>Soft Skills & Employability Skills</i> , Cambridge University Press 2018.	

2.	Steve Hart et al. (2016). <i>English for Undergraduates</i> , Cambridge University Press
3.	Collins. (2012). <i>Skills for the TOEFL IBT Test</i> , Collins publisher
4.	Jeff Butterfield. (2010). <i>Soft Skills for Everyone</i> , Cengage Learning.
5.	Aruna Koneru. (2015). <i>Professional Speaking Skills</i> , Oxford Publications.
E BOOKS	
1	https://www.britishcouncil.in/english/courses-business
2	http://www.bbc.co.uk/learningenglish/english/features/pronunciation
3	http://www.bbc.co.uk/learningenglish/english/
4	http://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/
5	https://oneshopenglish.com/
6	https://breakingnews.com/
MOOC	
1	https://www.mooc-list.com/tags/english
2	https://www.mooc-list.com/course/adventures-writing-stanford-online
3	http://www.cambridgeenglish.org/learning-english/free-resources/mooc/

COURSE TITLE		PROBLEM SOLVING USING C								CREDITS			3		
COURSE CODE		CSA4101		COURSE CATEGORY			PC			L-T-P-S			2-0-2-1		
Version		1.0		Approval Details			24 ACM 30 th May 2018			LEARNING LEVEL			BTL-4		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Practical Component						ESE					
15%		15%		20%						50%					
Course Description		To introduce computers and programming in C and also explore the power of computational techniques that are currently used by engineers and scientists and to develop programming skills with reasonable complexity.													
Course Objective		The course should enable the student to, <ol style="list-style-type: none"> 1. To acquire the basic knowledge in computer hardware, programming languages and Problem-solving techniques. 2. Learn the fundamentals of C programming. 3. Gain knowledge in Functions, arrays and strings in C programming. 4. Understand the pointers, Structures and Union in C programming 5. Gain Knowledge on Embedded Programming 													
Course Outcome		Upon completion of this course, the students will be able to, <ol style="list-style-type: none"> 1. Describe the basics of digital computer and programming languages. 2. Demonstrate problem solving techniques using flowchart, algorithm/pseudo code to solve the given problem. 3. Design and Implement C program using Control Statements and Functions. 4. Design and Implement C program using Pointers and File operations. 5. Identify the need for embedded C in real-time applications. 													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS O-1	PS O-2	PS O-3
CO-1	2	2	2	-	-	2	-	2	-	-	1	2	2	-	-
CO-2	3	3	3	2	2	1	-	2	2	1	-	1	2	3	-
CO-3	3	3	3	2	2	2	-	1	3	3	2	1	2	3	-
CO-4	3	3	3	2	-	-	-	-	-	-	1	-	1	2	-
CO-5	1	1	1	-	1	2	-	1	-	-	-	2	1	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: COMPUTER FUNDAMENTALS (6L+6P=12)	
<p>Introduction – Fundamentals of digital computers - Programming languages - Programming Paradigms – Types of Programming Languages – Language Translators – Problem Solving Techniques: Algorithm – Flow Chart - Pseudo code.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Drawing Flowcharts using E- Chart & Writing pseudo code for the following problems • Greatest of three numbers • Sum of N numbers • Computation of nCr 	CO-1 BTL-1
MODULE 2: PROBLEM SOLVING TECHNIQUES AND LANGUAGES (6L+6P=12)	
<p>Evolution of C -Why C language - Applications of C language - Data Types in C – Operators and Expressions – Input and Output statements in C – Decision Statements – Loop Control Statements.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Program to illustrate arithmetic and logical operators • Program to read and print data of different types • Program to calculate area and volume of various geometrical shapes • Program to compute biggest of three numbers • Program to print multiplication table • Program to convert days to years, months and days • Program to find sum of the digits of an integer 	CO-2 BTL-3
MODULE 3: FUNDAMENTALS OF C (6L+6P=12)	
<p>Functions – Storage Class – Arrays – Strings and standard functions - Pre-processor Statements.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Program to compute Factorial, Fibonacci series and sum of n numbers using recursion • Program to compute sum and average of N Numbers stored in an array • Program to sort the given n numbers stored in an array • Program to search for the given element in an array • Program to do word count • Program to insert a substring in a string • Program to concatenate and compare two strings • Program using pre-processor statements 	CO-3 BTL-4
MODULE 4: FUNCTIONS, ARRAYS AND STRINGS (6L+6P=12)	
<p>Pointers – Dynamic Memory allocation – Structure and Union – Files.</p> <p>Practical Component:</p> <ul style="list-style-type: none"> • Program to compute sum of integers stored in a 1-D array using pointers and dynamic memory allocation • Program to read and print records of a student/payroll database using structures • Program to simulate file copy • Program to illustrate sequential access file • Program to illustrate random access file 	CO-4 BTL-3

MODULE 5: POINTERS, STRUCTURES AND UNION (6L+6P=12)	
Structure of embedded C program - Data Types - Operators - Statements - Functions - Keil C Compiler. Practical component: Simple programs using embedded C	CO-5 BTL-2
TEXT BOOKS	
1.	Jeyapoovan T. (2015). <i>Fundamentals of Computing and Programming in C</i> , Vikas Publishing house.
2.	Mark Siegesmund. (2014). <i>Embedded C Programming</i> , first edition, Elsevier publications.
REFERENCE BOOKS	
1.	Ashok Kamthane. (2017). <i>Computer Programming</i> , Pearson Education, 7 th Edition.
2.	Yashavant Kanetkar. (2016). <i>Let us C</i> , 15th edition, BPP publication.
3.	S.Sathyalakshmi, S.Dinakar. (2013). <i>Computer Programming Practicals – Computer Lab Manual</i> , Dhanam Publication, First Edition.
E BOOKS	
1.	https://en.wikibooks.org/wiki/C_Programming
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc18-cs10/preview
2.	http://nptel.ac.in/courses/106105085/2
3.	https://www.udemy.com/c-programming-for-beginners/
4.	https://www.coursera.org/specializations/c-programming

COURSE TITLE		SUSTAINABLE ENGINEERING SYSTEMS						CREDITS			2				
COURSE CODE		GEA4102		COURSE CATEGORY			PC			L-T-P-S			2-0-0-1		
Version		1.0		Approval Details			24 th ACM, 30.5.2018			LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE		
15%		15%		10%			5%			5%			50%		
Course Description		This course will provide an insight about the principles of Sustainability.													
Course Objectives		<div>1. To explain the principles of sustainability with case studies.</div> <div>2. To compare assessing technologies for ensuring sustainability.</div> <div>3. To apply the concepts of green engineering.</div> <div>4. To analyze the need of waste, reuse and redistribution management.</div> <div>5. To study water cycle and role of human beings for ensuring sustainability.</div>													
Course Outcomes		<div>Upon completion of this course, the students will be able to</div> <div>1. Explain the principles of sustainability with case studies.</div> <div>2. Compare assessing technologies for ensuring sustainability.</div> <div>3. Apply the concepts of green engineering.</div> <div>4. Analyze the need of waste, reuse and redistribution management.</div> <div>5. Study water cycle and role of human beings for ensuring sustainability.</div>													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO -10	PO-11	PO-12	PS O-1	PS O-2	PS O-3
CO-1	3	1	3	0	1	-	-	2	2	2	2	3	1	2	3
CO-2	2	2	2	0	1	-	-	2	2	2	2	3	3	3	3
CO-3	2	1	1	0	1	-	-	2	2	2	2	3	2	1	3
CO-4	1	2	2	0	1	-	-	2	2	2	2	3	2	3	3

CO-5	3	2	2	0	1	-	-	2	2	2	2	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related														
MODULE 1 – PRINCIPLES OF SUSTAINABLE SYSTEMS (6L)														
Sustainability Definitions - Principles of Sustainable Design, Sustainable Engineering - Frameworks for Applying Sustainability Principles . Summary & Activities.													CO-1 BTL-2	
MODULE 2 – TECHNOLOGY DEVELOPMENT AND LIFECYCLE ASSESSMENT (6L)														
Technology as a part of anthropogenic environment - Technology readiness levels (TRL) – technical metrics - Emerging, converging, disruptive technologies - Life Cycle Assessment (LCA) methodology - Summary & Activities.													CO-2 BTL-3	
MODULE 3 - GREEN ENGINEERING(6L)														
Principles of Green Engineering - Frameworks for assessment of alternatives - Green Engineering examples - Multifunctional Materials and Their Impact on Sustainability - Summary & Activities.													CO-3 BTL-3	
MODULE 4 - RESOURCE MANAGEMENT TECHNOLOGIES (6L)														
Waste management purpose and strategies - Recycling: open-loop versus closed-loop thinking - Recycling efficiency - Management of food waste and composting technologies - E-waste stream management - Reuse and redistribution programs - LCA approach to waste management systems - Summary and Activities.													CO-4 BTL-3	
MODULE 5 - SUSTAINABLE WATER AND WASTEWATER SYSTEMS (6L)														
Water cycle - Water conservation and protection technologies - Water treatment systemsMetrics for assessment of water management technologies-Summary & Activities.Collaborative Decision Making - Role of Community and Social Networking - Human Factor in Sustainability Paradigm - Summary & Activities.													CO-5 BTL-3	
TEXT BOOKS														
1.	Vanek, F.M and L.D. Albright. (2018). <i>Energy Systems Engineering - Evaluation and Implementation</i> , McGraw Hill.													
2	C.U. Becker. (2012). <i>Sustainability Ethics and Sustainability Research</i> , Springer.													
REFERENCES														
1.	J.B. Guinee et al. (2015). <i>Life Cycle Assessment: Past, Present, and Future</i> , Environ. Sci. Technol, pp.90-96.													
2	Anastas, P.T., Zimmerman, J.B. (2016). <i>Innovations in Green Chemistry and Green Engineering</i> , Springer.													
3.	Christensen T., Ed. (2016). <i>Solid Waste Technology & Management</i> , Volume 1 & 2., Wiley and Sons.													
4.	Stermann, J.D, Weinstein, M.P. and Turner R.E. (Eds.). (2015). <i>Sustainability Science: The Emerging Paradigm</i> , Springer Science, Business Media,													
E BOOKS														

1.	David T. Allen, David R. Shonnard. (2017). <i>Sustainable Engineering Concepts, Design and Case Studies</i> , Pearson Education.
2.	Gerald Jonker Jan Harmsen. (2014). <i>Engineering for Sustainability - A Practical Guide for Sustainable Design</i> , Elsevier, 1st Edition
MOOC	
1.	https://www.coursera.org/learn/sustainability
2.	https://www.academiccourses.com/Certificate/Sustainability-Studies/India/
3.	https://onlinecourses.nptel.ac.in/noc18_ce08/preview
4.	https://www.coursera.org/learn/ecosystem-services

COURSE TITLE	INTRODUCTION TO DIGITAL SYSTEMS			CREDITS	3
COURSE CODE	MHB4102	COURSE CATEGORY	DE	L-T-P-S	2-0-2-1
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical component	ESE
15%	15%	10%	50%

Course Description	Introduction to digital system is concerned with the design, selection, analysis of digital circuits as well as the various electronics components to be used in a mechatronics system
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Course Objective	<p>The course should enable the student to,</p> <ol style="list-style-type: none"> 1. Practice the different number systems, Logic gates, Minimization Techniques 2. Design of adders, subtractors and other combinational circuits. 3. Apply the underlying principle and applications of various sequential circuits 4. Design of asynchronous circuits and the various issues in it. Real time interfacing concepts and its application. 5. Understand the principle of various electronic devices 6. Synergetic combination of above in the design of mechatronic systems.
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Simplify mathematical expressions using Boolean functions 2. Design combinational circuits 3. Design sequential circuits and Asynchronous circuits for simple problems 4. Select appropriate electronic devices for mechatronic systems
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Prerequisites:**CO, PO AND PSO MAPPING**

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
CO-1	3	3	-	-	-	-	-	2	2	-	-	2	2	-	-
CO-2	3	3	3	3	3	-	-	2	2	-	-	2	2	-	-
CO-3	3	3	-	-	-	-	-	2	2	-	-	2	2	-	-
CO-4	3	3	-	-	-	-	-	2	2	-	-	2	2	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO DIGITAL SYSTEMS	(6L+6P=12)
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<p>Introduction to Digital systems – Number systems - Binary, Hexadecimal - Boolean theorems – Basic Logic Gates, Minimization – Midterm, Maxterm, Karnaugh Map, Kmap up to 4 variables. Simplification of logic functions with K-map, tabular minimization procedures</p> <p>Practical component: (To be done in Simulation environment)</p> <p>1. Implementation of Boolean Expressions using Basic Logic Gates</p> <p>Suggested Readings: Basics of number systems.</p>	<p>CO-1 BTL-2</p>
MODULE 2: COMBINATIONAL CIRCUITS (6L+6P=12)	
<p>Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, De-multiplexer, Magnitude Comparator, Decoder, Encoder.</p> <p>Practical component: (To be done in Simulation environment)</p> <p>1. Implementation of Boolean Relations using Digital Comparators 2. Implementation of Arithmetic Expressions using Adders / Subtractors 3. Implementation of BCD-TO-7-segment Decoder / Driver and Operation of 7-segment LED Display</p> <p>Suggested Readings: Priority Encoder.</p>	<p>CO-2 BTL-2</p>
MODULE 3: SEQUENTIAL CIRCUITS (6L+6P=12)	
<p>Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers.</p> <p>Practical component: - (To be done in Simulation environment)</p> <p>1. Implementation of Sequential Circuits using Basic Flip-Flops 2. Implementation of Multi-bit Sequential Circuits using Shift Registers</p> <p>Suggested Readings: Best practices for Cyber security standards</p>	<p>CO-3 BTL-3</p>
MODULE 4: ASYNCHRONOUS SEQUENTIAL CIRCUITS (6L+6P=12)	
<p>Asynchronous sequential circuits- fundamental mode pulse mode sequential circuits. cycles and races, Race free assignments, hazards</p> <p>Practical component: - (To be done in Simulation environment)</p> <p>1. Implementation of Logic Functions using Multiplexers 2. Implementation of Logic Functions using Decoders</p> <p>Suggested Readings: ASM chart</p>	<p>CO-3 BTL-2</p>
MODULE 5: BASIC ELECTRONIC DEVICES (6L+6P=12)	
<p>Voltage – Current – Ohms Law – introduction to electronic devices – PN Junction Diode, V-I characteristics, Transistors, Rectifiers.</p> <p>Practical component: V-I characteristics of PN junction diode, transistors</p> <p>Suggested Readings:</p>	<p>CO-4 BTL-2</p>

Inverters, Converters and Voltage regulators	
TEXT BOOKS	
1.	Thomas I. Floyd. (2014). <i>Digital Fundamentals</i> , 11th edition, Pearson
REFERENCE BOOKS	
1	M. Morris Mano. (2016). <i>Digital Logic and Computer Design</i> , Prentice-Hall
2.	W.H.Gothmann. (1992). <i>Digital Electronics-Introduction Theory and Practice</i> , PH
3.	S. Salivahanan and S. Arivazhagan. (2006). <i>Digital Circuits and Design</i> , 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi
E BOOKS	
1.	http://nptel.ac.in/courses/106108099/Digital%20Systems.pdf
2.	https://onlinecourses.nptel.ac.in/noc18_ee33/preview
MOOC	
1	http://nptel.ac.in/courses/106108099/Digital%20System

COURSE TITLE			ENGINEERING AND DESIGN								CREDITS		3		
COURSE CODE			ATB4101		COURSE CATEGORY			DE			L-T-P-S		3-0-0-0		
Version			1.0		Approval Details			24th ACM, 30.5.2018			LEARNING LEVEL		BTL-4		
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE		
15%			15%		10%			5%			5%		50%		
Course Description			This course will provide an insight about procedure and steps involved in design of a product as well as a process.												
Course Objectives			1. To analyze various element in design of a product. 2. To examine and explain the stages in design of automobile components. 3. To discriminate the process involved in prototype making. 4. To explain the significance of quality and safety in design of a product. 5. To classify the parameters in user centered design concepts.												
Course Outcomes			Upon completion of this course, the students will be able to 1. Analyze various elements in design of a product. 2. Examine and explain the stages in design of automobile components. 3. Discriminate the process involved in prototype making. 4. Explain the significance of quality and safety in design of a product. 5. Classify the parameters in user centered design concepts.												
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO -1	PSO -2	PSO -3
CO-1	1	1	2	1	1	3	3	1	2	2	3	3	2	1	-
CO-2	2	2	2	1	2	3	3	1	2	2	3	3	3	2	-
CO-3	3	1	2	1	1	3	3	1	2	2	3	3	1	2	-
CO-4	3	1	2	1	1	3	3	1	2	2	3	3	3	2	-
CO-5	2	1	2	1	1	3	3	1	2	2	3	3	2	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1 – INTRODUCTION TO AUTOMOBILE ENGINEERING DESIGN (7L + 2P =9)	
<p>Design and its objectives; Design constraints, Design functions, Design means and Design from; Role of Science, Engineering and Technology in design; Engineering as a business proposition; Functional and Strength Designs. Design form, function and strength; How to initiate creative designs? Initiating the thinking process for designing a product of daily use. Need identification; Problem Statement; Market survey-customer requirements; Design attributes and objectives; Ideation; Brainstorming approaches; arriving at solutions; Closing on to the Design needs.</p> <p>Project: An Exercise in the process of design initiation. A simple problem is to be taken up to examine different solutions- Vehicle, Group Presentation and discussion.</p>	CO-1 BTL-4
MODULE 2: PROCESSES IN DESIGN FOR AUTOMOTIVE SYSTEM (7L+2P=9)	
<p>Design process- Different stages in design and their significance; Defining the design space; Analogies and “thinking outside of the box”; Quality function deployment-meeting what the customer wants; Evaluation and choosing of a design. Design Communication; Realization of the concept into a configuration, drawing and model. Concept of “Complex is Simple”. Design for function and strength.</p> <p>Design detailing- Material selection, Design visualization- Solid modelling; Detailed 2D part drawings; Tolerance; Use of standard items in design; Research needs in design; Energy needs of the design, both in its realization and in the applications.</p> <p>Project: An exercise in the detailed design of any two automobile components</p>	CO-2 BTL-4
MODULE 3: PROTOTYPING OF AUTOMOBILE COMPONENTS (7L+2P =9)	
<p>Prototyping- rapid prototyping; testing and evaluation of design; Design modifications; Freezing the design; Cost analysis.</p> <p>Engineering the design – From prototype to product. Planning; Scheduling; Supply chains; inventory; handling; manufacturing/construction operations; storage; packaging; shipping; marketing; feed-back on design</p> <p>Project: List out the standards organizations. Prepare a list of standard items used in automobile original equipment manufacturers. Develop any design with over 50% standard items as parts.</p>	CO-3 BTL-4
MODULE 4: QUALITY ASPECTS IN AUTOMOBILE ENGINEERING (7L+2P =9)	
<p>Design for “X”; covering quality, reliability, safety, manufacturing/construction, assembly, maintenance, logistics, handling; disassembly; recycling; re-engineering etc.</p> <p>Project: List out the design requirements(x) for designing a car.</p>	CO-4 BTL-4
Module 5: USER CENTRED DESIGNS IN AUTOMOBILE ENGINEERING (7L+2P =9)	
<p>Product centered and user centered design. Product centered attributes and user centered attributes. Bringing the two closers. Example: Motorcycle and Car, Aesthetics and ergonomics. Value engineering, Concurrent engineering, Reverse engineering in design; Culture based design; Architectural designs; Motifs and cultural background; Tradition and design; Study the evolution of Wheels; Printed motifs; Role of colours in design. Make sharp corners and change them to smooth curves-check the acceptance. Design as a marketing tool; Intellectual Property</p>	CO-5 BTL-4

rights – Trade secret; patent; copy-right; trademarks; product liability. Group presentation of any such products covering all aspects that could make or mar it.

Project: Examine the possibility of value addition for an existing product.

TEXT BOOKS

1.

Balmer, R. T, Keat, W. D and Wise, G, and Kosky P. (2012). *Exploring Engineering: An Introduction to Engineering and Design*. Elsevier, Third Edition.

2

Dym C. L., Little P. and Orwin E. J. (2014). *Engineering Design: A Project based introduction*, Wiley.

REFERENCES

1.

Eastman C. M. (Ed.). (1996). *Design for X Concurrent engineering imperatives*, Springer

2.

Haik, Y. and Shahin, M. T. (2012). *Engineering Design Process*, Cengage Learning.

3.

Pahl, G., Beitz, W., Feldhusen, J and Grote, K. H. (2007). *Engineering Design: A Systematic approach*, Springer.

4.

Voland, G. (2012). *Engineering by Design*, Pearson India.

COURSE TITLE			MECHANICS OF STRUCTURES I								CREDITS			4	
COURSE CODE			CEB4117		COURSE CATEGORY			PC			L-T-P-S			3-1-0-0	
Version			1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL			BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE	
15%			15%		10%			5%			5%			50%	
Course Description			This course investigates the behavior of structures under mechanical loads												
Course Objective			<ol style="list-style-type: none"> 1. To determine a given system of forces using laws of mechanics 2. To Interpret requirements of stable equilibrium and analyze the system of forces 3. To illustrate the magnitude and nature of forces in truss members. 4. To compare centroid and moment of inertia for various shapes 5. To apply basic dynamic principles to analyze particles in motion. 												
Course Outcome			<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Find out the forces in different systems 2. Check the stability and analyze the forces in systems. 3. Analyze the forces in various perfect trusses. 4. Compute centroid and moment of inertia for various cross sections. 5. Apply dynamic principles for particles in motion. 												
Prerequisites: Physics, Mathematics															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO-3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO -11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	3	2	1	1	1	-	-	-	-	1	-	2	3	2	-
CO-2	3	3	2	1	1	1	1	1	2	1	-	3	3	2	-
CO-3	3	3	1	-	1	-	-	-	2	2	-	2	3	1	-
CO-4	2	2	1	-	-	-	-	-	2	2	1	1	3	1	1
CO-5	3	3	2	1	1	1	1	1	-	1	-	3	3	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: BASICS & STATICS OF PARTICLES (9L+3T)	
Introduction - Units and Dimensions - Laws of Mechanics - Lamé's theorem, Parallelogram and triangular Law of forces - Vectors - Vectorial representation of forces and moments - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Equivalent systems of forces - Principle of transmissibility - Single equivalent force- Free body diagram - Types of supports and their reactions. Moment of a force about a point and about an axis - Moments and Couples- Varignon's theorem - Frictional force - Laws of Coulomb friction - Simple contact friction.	CO-1 BTL-3
MODULE 2 :EQUILIBRIUM OF RIGID BODIES (9L+3T)	
Requirements of stable equilibrium Static determinacy - Vectorial representation of moments and couples - Scalar components of a moment - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions - Examples.	CO-2 BTL-3
MODULE 3: ANALYSIS OF TRUSS (9L+3T)	
Stability and equilibrium of plane frames - types of trusses – Types of forces - tension, compression analysis of forces in truss members method of joints – Method of sections.	CO-3 BTL-3
MODULE 4: PROPERTIES OF SURFACES AND SOLIDS (9L+3T)	
Determination of Areas and Volumes - Determination of first moment of area Centroid of sections, Second and product moments of plane area - Rectangle, circle, triangle, T section, I section, Angle section, Hollow section- Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia -Product moment of inertia	CO-4 BTL-3
MODULE 5: DYNAMICS OF PARTICLES (9L+3T)	
Displacements, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion Newton's law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies.	CO-5 BTL-3
Self-study Topic: Impulse and Momentum	
TEXT BOOKS	
1	Kottiswaran. (2014). <i>Engineering Mechanics Static and Dynamics</i> , Sri Balaji Publication Erode.
2	Beer, F.P and Johnson Jr. E.R. (2017). <i>Vector Mechanics for Engineers, Dynamics</i> , McGraw-Hill International, 10th Edition
3	Rajasekaran S, Sankarasubramanian G. (2003). <i>Fundamentals of Engineering Mechanics</i> , Vikas Publishing House Pvt. Ltd.
4	Bedford and N. Fowler. (2007). <i>Engineering Mechanics Statics & Dynamics</i> , Pearson.
REFERENCE BOOKS	
1	Hibbeler R.C.. (2013). <i>Engineering Mechanics</i> , Pearson Education Asia Pvt. Ltd.
2	Ashok Gupta. (2002). <i>Interactive Engineering Mechanics - Statics - A Virtual Tutor (CDROM)</i> , Pearson Education Asia Pvt. Ltd.

E BOOKS	
1	http://www.engineeringbookspdf.com/engineering-mechanics-by-r-s-khurmi/
MOOC	
1	https://www.coursera.org/learn/engineering-mechanics-statics
2	https://www.edx.org/course/engineering-mechanics-urfux-engm1-1-x-0a
3	https://onlinecourses.nptel.ac.in/noc16_ph02/preview
4	https://swayam.gov.in/courses/1364-engineering-mechanics-statics-and-dynamics

COURSE TITLE			SURVEYING & GEOMATICS								CREDITS			3	
COURSE CODE			CEB4118		COURSE CATEGORY			PC		L-T-P-S			3-0-0-0		
Version			1.0		Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-4		
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment			Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance			ESE		
15%			15%			10%		5%		5%			50%		
Course Description			This course deals with the principles of surveying. To study about compass surveying, plane table surveying, tachometric surveying, traversing, concepts of leveling and measurement using electronic instruments.												
Course Objective			1. To understand the principles of surveying 2. To know about compass surveying, plane table surveying and Traversing. 3. To understand the concepts of levelling and its applications. 4. To understand the concepts of Tachometric surveying 5. To get exposed to measurements using Electronic Instruments.												
Course Outcome			Upon completion of this course, the students will be able to 1. Illustrate the use of different surveying instruments. 2. Carryout levelling and contouring using theodolite 3. Use total station and GIS techniques for surveying 4. Carryout aerial Surveying 5. Interpret the data apply remote sensing techniques for surveying.												
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
CO-1	2	1	-	1	2	3	1	3	2	1	2	2	3	2	-
CO-2	2	1	2	1	2	3	1	3	2	1	2	2	3	2	-
CO-3	2	1	1	1	2	3	1	3	2	1	2	2	3	2	-
CO-4	1	1	1	1	2	3	1	3	2	1	2	2	3	2	-
CO-5	1	1	1	1	2	3	1	3	2	1	2	2	3	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: BASICS OF SURVEYING		9L
Definition - Principles - Classification Scales - Conventional signs - Survey instruments, their care and adjustment - Ranging and chaining - Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction - Magnetic declination – Dip – Correction of errors.		CO-1 BTL-2
MODULE 2: LEVELLING AND CONTOURING9L		
Theodolite – Fundamental and Desired lines – Uses – Adjustments – Angle Measurements. Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.		CO-2 BTL-4
MODULE 3: EDM, TOTAL STATION, GPS		9L
Electro-optical system, Measuring Principle, Working Principle, Sources of error, Total station, Microwave system Measuring and working principle, Sources of error, GPS - Fundamentals - Introduction space, Control segments User segment- GPS Survey Types-Kinematic and static survey techniques.		CO-3 BTL-3
MODULE 4: PHOTOGRAMMETRY SURVEYING		9L
Aerial photographs - vertical and oblique photographs - height determination contouring - photographic interpretations - stereoscopy – parallax Flight Planning- Photo Interpretation, Applications of aerial Photos.		CO-4 BTL-2
MODULE 5: REMOTE SENSING		9L
Introduction – Historical Background - Electromagnetic Radiation (EMR) - Electromagnetic Spectrum -. Airborne Platforms – Platform, Sensors - Definition, Types- Parameter, optical Remote Sensing, Microwave remote sensing Scanners - Radiometer - Radar		CO-5 BTL-2
TEXT BOOKS		
1	Basak N N . (2017). <i>Surveying and Levelling</i> , McGraw-Hill Book Company.	
2	Dr. B. C. Punmia. (2016). <i>Surveying</i> , Laxmi Publications.	
3	S.C. Rangwala and P. S. Rangwala. (2014). <i>Surveying and leveling</i> , Charotar Publishing House Pvt. Ltd.	
REFERENCE BOOKS		
1.	Clark D. (2004). <i>Plane and Geodetic Surveying for Engineers</i> , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition.	
2.	James M.Anderson and Edward M.Mikhail. (2012). <i>Surveying Theory and Practice</i> , McGraw-Hill Book Company.	
E BOOKS		
1.	http://www.engineeringbookspdf.com/fundamentals-of-surveying-by-s-k-roy/	
MOOC		

1	https://swayam.gov.in/course/3613-digital-land-surveying-and-mapping
2	https://onlinecourses.nptel.ac.in/noc17_ce09/preview

COURSE TITLE		SURVEYING LAB										CREDITS	1		
COURSE CODE	CEB4141	COURSE CATEGORY					PC					L-T-P-S	0-0-2-0		
Version	1.0	Approval Details					24th ACM - 30.5.2018					LEARNING LEVEL	BTL-3		
ASSESSMENT SCHEME															
CIA										ESE					
80%										20%					
Course Description	Surveying laboratory deal with the practical study to prepare contour maps by finding the elevation, angles and to interpret results using software.														
Course Objective	1. To acquire knowledge on preparing contour maps. 2. To acquire knowledge on using total station and theodolite 3. To acquire knowledge on interpret field data. 4. To acquire knowledge on use of modern equipment's and software.														
Course Outcome	Upon completion of this course, the students will be able to 1. Find the difference in elevation and prepare contour maps using dummy level. 2. Find the angles using theodolite and total station. 3. Prepare field data and interpret results. 4. Create schematic maps using GIS software. 5. Use modern survey equipment to measure angles and distances.														
Prerequisites: Matrics& Calculus															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	2	-	-	3	3	-	2	2	-	-	-	2	-	-
CO-2	1	-	2	-	3	3	-	2	2	-	-	-	2	-	-
CO-3	-	-	2	-	3	3	-	2	2	-	-	-	2	-	-
CO-4	-	2	-	-	3	3	-	2	2	-	-	-	2	-	-
CO-5	-	2	-	-	3	3	-	2	2	-	-	-	2	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Determination of elevation between two points.														
2	Plotting the profile of a canal / road.														
3	Plotting of contour maps														
4	Measurement of heights and horizontal distance using theodolite.														

5	Determination of elevation using Total Station Determination of area of given plot using Total Station.
6	Setting of layouts using Total Station
7	Measurement of distance using GPS.
8	Creation of schematic map using GIS
REFERENCE BOOKS	
1	Basak N N. (2017). <i>Surveying and Levelling</i> , McGraw-Hill Book Company.
2	B.C. Punmia, Ashok K Jain, Arun K Jain. (2016). <i>Surveying</i> , Vol. I, Laxmi Publications.
3	S.C. Rangwala and P. S. Rangwala. (2014). <i>Surveying and leveling</i> , Charotar Publishing House Pvt. Ltd,

COURSE TITLE		ENGINEERING IMMERSION LAB						CREDIT		0.5					
COURSE CODE		GEA4131		COURSE CATEGORY			BS		L-T-P-S		0-0-2-2				
VERSION		1.0		APPROVAL DETAILS			24 th ACM - 30.5.2018		LEARNING LEVEL		BTL-3				
ASSESSMENT SCHEME															
CIA										ESE					
80%										20%					
Course Description		To provide the students with hands on experience on various basic engineering Practices													
Course Objective		The course should enable the students to 1. Relate theory and practice of basic Civil and Mechanical Engineering 2. Learn basic concepts in Aeronautical and Automobile Engineering 3. Learn basic concepts in Electrical, Electronics, mechatronics and Computer Science													
Course Outcome		Upon completion of this course, the students will be able to 1. Identify and use of tools, Types of joints used in welding, carpentry and plumbing operations. 2. Have hands on experience on basic fabrication techniques such as carpentry and plumbing practices. 3. Have hands on experience on basic fabrication techniques of different types of welding and basic machining practices.													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS O-1	PS O-2	PSO-3
CO-1	3	2	-	2	-	1	-	-	-	-	-	-	-	-	-
CO-2	3	2	-	2	-	1	-	-	-	-	-	-	-	-	-
CO-3	3	2	-	2	-	1	-	-	-	-	-	-	-	-	-
SLOT X -LIST OF EXPERIMENTS															
I. MECHANICAL ENGINEERING WORKSHOP 1. Welding: Arc welding: Butt joints 2. Lap joints. 3. Machining: Facing 4. Turning															
II. AUTOMOBILE ENGINEERING 1. Dismantling and studying of two stroke gasoline engines. 2. Assembling of two stroke gasoline engines. 3. Dismantling and studying of four stroke gasoline engines 4. Assembling of four stroke gasoline engines.															
III. AERONAUTICAL ENGINEERING															

1. Study of Flow Pattern around Various Objects.
2. Force measurement on Aircraft Model
3. Determination of Young's Modulus for Aluminum Cantilever Beam
4. Binary Addition & Subtraction using Microprocessor

IV. CIVIL ENGINEERING

1. Plumbing- Basic Pipe Connection using valves, couplings and elbows.
2. Carpentry – Sowing, Planning and making common Joints.
3. Bar Bending
4. Construction of a 50 cm height brick wall without mortar using English Bond.

SLOT Y -LIST OF EXPERIMENTS**V. ELECTRICAL ENGINEERING**

1. Study of tools and accessories.
2. Study of cables.
3. Staircase wiring, Tube light and Fan connection.
4. Measurement of energy using single phase energy meter.

VI. ELECTRONICS ENGINEERING

1. Study of Active and Passive Components.
2. Study of Logic Circuits.
3. Making simple circuit using Electronic Components.
4. Measuring of parameters for signal using CRO.

VII. COMPUTER SCIENCE

1. Troubleshooting different parts of the computer peripherals, Monitor, Keyboard & CPU.
2. Installation of various operating systems, their capabilities, Windows, Unix, Linux.
3. Installation of commonly used software like MS Office
4. Assembling digital computer.

VIII. MECHATRONICS ENGINEERING

1. Study of Key Elements of Mechatronics Systems
2. Sensors – Load Cell, Thermocouple
3. Actuators – Linear & Rotary Actuators
4. Interfacing & Measurements – Virtual Instrumentation

REFERENCE

- | | |
|---|--|
| 1 | Jeyapoovan T and Saravanapandian M. (2015). <i>Engineering practices lab manual</i> , 4th Edition, Vikas publishing House, New Delhi. |
| 2 | Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K. (2008). <i>Elements of Workshop Technology</i> . Media promoters and publishers private limited, Mumbai. |
| 3 | Ibrahim Zeid. (2011). <i>CAD/CAM Theory and Practice</i> , Tata McGraw-Hill Publishing Company Ltd., New Delhi |
| 4 | Robert Quesada, Jeyapoovan T. (2006). <i>Computer Numerical Control Machining and Turning Centers</i> , Pearson Education, New Delhi. |

METHOD OF ALLOCATION FOR ENGINEERING IMMERSION LAB**SLOT X : MECH, AERO, AUTO, CIVIL EXPERIMENTS****SLOT Y : EEE, ELECTRONICS, CSE, MECHATRONICS EXPERIMENTS**

➤ EVERY CLASS OF

- GROUP A (AERO, AUTO, MECH, MCT, CHEM, BIO, CIVIL)
- GROUP B (CSE, IT, ECE, EEE, AEROSPACE)

GETS DIVIDED INTO 4 SUB - GROUPS NAMELY a, b, c, d -- EACH CONSISTING OF 15 TO 20 STUDENTS MAX.

- FOR EXAMPLE: **GROUP A STUDENTS WILL OCCUPY SLOT X**
 - WEEK 1 : SLOT X ---
a – MECH; b – AUTO; c – AERO ; d – CIVIL
 - WEEK 2 : SLOT X ---
b – MECH; c – AUTO; d – AERO ; a – CIVIL
- THE ABOVE SCHEDULE WILL BE ON ROTATION EVERY MONTH (ONE CYLCE PER MONTH)
- **GROUP B STUDENTS WILL OCCUPY SLOT Y**
 - WEEK 1 : SLOT Y ---
a – EEE; b – ECE; c – CSE ; d – MCT
 - WEEK 2 : SLOT Y ---
b – EEE; c – ECE; d – CSE ; a – MCT
- THE ABOVE SCHEDULE WILL BE ON ROTATION EVERY MONTH (ONE CYLCE PER MONTH)

COURSE TITLE	ENGINEERING PHYSICS			CREDITS	3
COURSE CODE	PHA4101	COURSE CATEGORY	BS	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24 ACM 30 th May 2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with fundamental principles of physics, using mathematical derivations, for first year B. Tech students; the principles and applications of elasticity, acoustics, ultrasonics, quantum physics, crystal physics, lasers and fiber optics are dealt in this course. Intended for Aeronautical, Automobile, Bio tech., Chemical, Civil and Mechanical branches.
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<p>Course Objective</p>	<p>The course should enable the student to,</p> <ol style="list-style-type: none"> 1. Explain stress, strain and elastic moduli and apply the concepts to solve basic problems 2. Apply principles of acoustics to solve basic problems and use ultrasonics as an engineering tool 3. Explain particle nature of radiation, compute Schrodinger's wave equation and apply it to infinite potential well 4. Identify crystal structures and crystal planes, describe different magnetic materials and hysteresis based on concept of ferromagnetic domains. 5. Discuss the principles, working and applications of lasers and fiber optics
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<p>Course Outcome</p>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Solve the basic problems in elasticity and explain the properties of matter 2. Apply the knowledge of acoustics in designing acoustical buildings and employing ultrasonic as an engineering tool. 3. Use mathematical derivations to solve quantum problems. 4. Identify the crystal lattice planes, distinguish different magnetic materials, and explain the ferromagnetic domain. 5. Familiarize with the principles, working and applications of lasers and fiber optics.
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Prerequisites: Knowledge in fundamentals of Physics at higher secondary level

CO, PO AND PSO MAPPING

[illegible]

CO-2	3	2	1	1	3	1	1	1	1	1	1	1	1	1	-
CO-3	3	2	1	1	3	1	1	1	1	1	1	1	1	1	-
CO-4	3	2	1	1	2	1	1	1	1	1	1	1	1	1	-
CO-5	3	2	1	1	3	1	1	1	1	1	1	1	1	1	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: PROPERTIES OF MATTER AND HEAT (5L+4P=9)															
Elasticity - Hooke's law- Elastic Moduli - Young's modulus of elasticity - Rigidity modulus - Bulk modulus - Twisting couple on a wire - Torsional pendulum - determination of rigidity modulus of a wire - Depression of a cantilever - Young's modulus by cantilever - uniform and non-uniform bending.														CO-1 BTL-3	
Thermal conductivity - experimental determination of thermal conductivities of good and bad conductors -Forbe's method - theory and experiment - Lee's disc method for bad conductors.															
MODULE 2: ACOUSTICS AND ULTRASONIC (5L+4L=9)															
Classification of sound - Characteristics of musical sound – intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time (Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies														CO-2 BTL-3	
Ultrasonics- Production – Magnetostriction and Piezoelectric methods – properties – Applications															
MODULE 3: QUANTUM PHYSICS(5L+4L=9)															
Black body radiation- Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jean's law from Planck's theory - Compton effect – Theory and experimental verification - Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Extension to 3 dimension (no derivation)														CO-3 BTL-3	
MODULE 4: CRYSTAL PHYSICS AND MAGNETISM (5L+4L=9)															
Crystal - Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number - Packing factor for SC, BCC, FCC and HCP structures.Magnetic dipole moment - atomic magnetic moments- magnetic permeability and susceptibility - Types of magnetism: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism- ferrimagnetism - domain structure - hysteresis - hard and soft magnetic materials - applications.														CO-4 BTL-3	
MODULE 5: PHOTONICS AND FIBER OPTICS (5L+4L=9)															
Principle of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - population inversion - pumping action - active medium - laser characteristics – Nd-YAG laser - CO ₂ laser - Semiconductor laser – applications														CO-5 BTL-3	

Optical fiber - principle and propagation of light in optical fibers - Numerical aperture and acceptance angle - types of optical fibers - single and multimode, step index and graded index fibers - fiber optic communication system.	
TEXT BOOKS	
1.	P. Mani. (2011). <i>Engineering Physics</i> , Vol I & II, Dhanam Publications, Chennai.
REFERENCE BOOKS	
1.	Gaur R.K. and Gupta S.L. (2010). <i>Engineering Physics</i> , 8 th edition, DhanpatRai publications (P) Ltd, New Delhi.
2.	P. Charles, Poople and Frank J. Owens. (2007). <i>Introduction to Nanotechnology</i> , Wiley India.
3.	Arthur Beiser. (2007). <i>Concepts of Modern Physics</i> , Tata McGraw – Hill Publications.
4.	Rajendran V. and Marikani A. (2003). <i>Applied Physics for engineers</i> , 3rd edition, Tata McGraw –Hill publishing company Ltd., New Delhi.
E BOOKS	
1.	https://books.google.co.in/books?id=w4crDAAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2.	https://www.goodreads.com/book/show/789047.Physics_for_Scientists_and_Engineers
MOOC	
1.	https://www.coursera.org/learn/how-things-work
2.	https://www.coursera.org/learn/quantum-physics
3.	https://onlinecourses.nptel.ac.in/noc21_ph21
4.	https://onlinecourses.swayam2.ac.in/aic20_sp64

COURSE TITLE		MATERIALS CHEMISTRY LABORATORY (Common to ALL branches of Engineering)										CREDITS		1	
COURSE CODE		CYA4131			COURSE CATEGORY			BS		L-T-P-S			0-0-2-0		
Version		1.0			Approval Details			24 th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
Experimental		Calculation			Result			Viva		Record			ESE		
30%		10%			10%			20%		10%			20%		
Course Description		This course imparts practical exposure on basic techniques employed for the analyses of lubricants, refractories & other engineering materials and spectrophotometric analyses for metal ions.													
Course Objectives		1. To train the students in characterization of lubricants by viscosity measurement. 2. To give a practical exposure for the construction of phase diagram, for partially- miscible liquids (phenol-water system) 3. To provide the students practical knowledge in preparation of polymers (urea-formaldehyde resin) 4. To impart hands-on training in characterization of refractories. 5. To equip the students with practical skill in estimation of metal ions by spectrophotometry.													
Course Outcomes		Upon completion of this course, the students will be able to 1. grade the lubricants based on viscosity 2. analyze the phase diagram and interpret the critical solution temperature. 3. apply the practical knowledge gained on the preparation of polymers, for the preparation of other similar macromolecules. 4. analyze the strength of refractories. 5. apply the spectrophotometric method for the determination of metal ions in different environment.													
Prerequisites: Knowledge in fundamentals of chemistry at higher secondary level.															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-2	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-3	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-4	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
CO-5	3	2	1	-	-	-	2	-	-	-	-	2	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: PROPERTIES OF LUBRICANTS (6 L)	
1. Determination of viscosity of polymer using Ostwald Viscometer. 2. Determination of Viscosity Index of lubricants. 3. Determination of viscosity of oil using Red-Wood Viscometer.	CO-1 BTL-3
MODULE 2: PHASE DIAGRAM IN LIQUID SYSTEM (6 L)	
1. Construction of phenol-water phase diagram. 2. Determination of adsorption isotherm for acetic acid on activated charcoal.	CO-2 BTL-3
MODULE 3: PREPARATION POLYMER RESIN. (6 L)	
1. Preparation of urea-formaldehyde resin.	CO-3 BTL-3
MODULE 4: BASIC PROPERTIES OF REFRACTORIES(6 L)	
2. Determination of porosity of a refractory. 3. Determination of apparent density of porous solids.	CO-4 BTL-3
MODULE 5: ESTIMATION METAL ION CONTENTS IN THE SAMPLE (6 L)	
1. Estimation of dye content in the effluent by UV-Visible spectrophotometry. 2. Determination of copper / iron content in the alloy by colorimetry. 3. Estimation of sodium and potassium ions by flame photometry. 4. Verification of Beer-Lambert's law using gold nanoparticles.	CO-5 BTL-3
TEXT BOOKS	
1.	P.S. Raghavan. (2018). <i>Materials Chemicals Laboratory Manual</i> , Dhanam Publications.
REFERENCE BOOKS	
1.	J. Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas Vogel's. (2009). <i>Textbook of Quantitative Chemical Analysis</i> , Pearson Education, 6 th Edition.
E BOOKS	
1.	http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html
MOOC	
1.	https://www.coursetalk.com/providers/coursera/courses/introduction-to-chemistry-1

SEMESTER II

COURSE TITLE	PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS											CREDITS		4	
COURSE CODE	MAA 4201				COURSE CATEGORY			BS				L-T-P-S		3-1-0-1	
Version	1.0				Approval Details			24 th ACM - 30.5.2018				LEARNING LEVEL		BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment	Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz				Attendance		ESE	
15%	15%				10%			5%				5%		50%	
Course Description	To make the student understand the basic concepts of partial differential equations and transforms and its applications														
Course Objective	The course should enable the students to <ol style="list-style-type: none"> 1. Present the main results in the context of partial differential equations and to study numerical methods for the approximation of their solution 2. Introduce the wave equation including time and position dependence 3. Mathematically model the way thermal energy moves through the plate 4. Understand the concept of Fourier transform 5. Understand the concept of Z-transform and its properties 														
Course Outcome	Upon completion of this course, the students will be able to <ol style="list-style-type: none"> 1. Formulate and solve some of the physical problems involving partial differential equations 2. Classify and solve the Wave and Heat equations 3. Classify and solve two-dimensional heat equations 4. Solve problems related to engineering applications by using Fourier Transform techniques 5. Understand the discrete transform applied to engineering problems 														
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
CO-1	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
CO-2	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
CO-3	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
CO-4	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
CO-5	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: PARTIAL DIFFERENTIAL EQUATIONS (9L+3T=12)															

Formation of partial differential equations by elimination of arbitrary constants, arbitrary functions - Solution of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients. Suggested Reading: Partial Differentiation		CO-1 BTL-3
MODULE 2: ONE DIMENSIONAL WAVE AND HEAT FLOW EQUATION (9L+3T=12)		
Classification of second order linear partial differential equations - Solutions of one-dimensional wave equation (without proof) - One dimensional heat flow equation (without proof) and application in string and rod problems. Suggested Reading: Partial Differential Equations, Half range sine series.		CO-2 BTL-3
MODULE 3: TWO DIMENSIONAL HEAT FLOW EQUATION (9L+3T=12)		
Steady state solution of two-dimensional heat equations and applications in finite plates and infinite plates problems. Suggested Reading: Partial Differential Equations, Half range sine series.		CO-3 BTL-3
MODULE 4: FOURIER TRANSFORM (9L+3T=12)		
Fourier Integral Theorem (without proof) - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of Simple functions - Convolution theorem - Parseval's identity. Suggested Reading: Basic integration.		CO-3 BTL-3
MODULE 5: Z-TRANSFORM AND DIFFERENCE EQUATIONS (9L+3T=12)		
Z-Transform - Elementary Properties - Inverse Z-Transform - Convolution theorem - Formation of Difference equations - Solution of difference equations using Z-Transform Suggested Reading: Basic calculus		CO-4 BTL-3
TEXT BOOKS		
1	P. Sivarama Krishna Das and C. Vijayakumar L. (2009). <i>Transforms and partial differential equations</i> , Pearson Publication	
2	Grewal. B.S. (2012). <i>Higher Engineering Mathematics</i> , Khanna Publishers, 42nd Edition, Delhi	
3	Chandrasekaran A. (2015). <i>A Text Book of Transforms and Partial Differential Equations</i> , Dhanam Publication.	
REFERENCE BOOKS		
1	Bal LN.P and Manish Goyal. (2007). <i>A Textbook of Engineering Mathematics</i> , Laxmi Publications Pvt Ltd, 7th Edition.	
2	Datta.K.B. (2013). <i>Mathematical Methods of Science and Engineering</i> , Cengage Learning India Pvt Ltd, Delhi	
3	Veerarajan. T. (2012). <i>Transforms and Partial Differential Equations</i> , Tata McGraw Hill Education Pvt. Ltd, New Delhi.	
E BOOKS		
1	https://nptel.ac.in/courses/122107037/	
2	https://nptel.ac.in/courses/122107037/22	
MOOC		
1	https://www.mooc-list.com/tags/laplace-transforms	
2	https://www.edx.org/course/introduction-differential-equations-bux-math226-1x-1	

COURSE TITLE				CONSTRUCTION MATERIALS								CREDITS		3	
COURSE CODE				CEB4201		COURSE CATEGORY			DE		L-T-P-S		3-0-0-0		
Version				1.0		Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment				Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance		ESE		
15%				15%		10%			5%		5%		50%		
Course Description				The course provides basic information on the structure and properties of construction materials to undergraduate students.											
Course Objectives				1. To study the properties of stones, Bricks, wood and Steel. 2. To study the properties of lime, cement, aggregate and concrete. 3. To study the properties and applications of special concrete in construction. 4. To study the properties and applications of polymer-based materials 5. To understand the basic properties of glass, aluminum, ferrocement, geosynthetics and modern materials.											
Course Outcome				Upon completion of this course, the students will be able to 1. Identify the properties and uses of stones, bricks, timber and Steel used for construction. 2. Illustrate the properties and application of lime, cement and concrete ingredients in building construction. 3. Classify special concrete for building construction. 4. Summarize the polymer-based building materials. 5. Classify modern materials used for construction.											
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	-	2	1	2	1	-	-	3	-	3	-
CO-2	2	1	1	1	-	2	1	1	1	-	-	3	-	3	-
CO-3	1	1	1	1	-	2	1	1	2	-	2	3	1	3	-
CO-4	1	1	1	1	-	2	1	1	1	-	1	1	-	3	-
CO-5	1	1	1	1	-	2	-	1	1	-	1	2	-	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: BASIC CONSTRUCTION MATERIALS		9L
Stones – Types and properties of natural stone materials - Criteria for selection - Tests on stones -uses of stones –Treatment of stones - Bricks-classification-manufacturing-types- tests- Timber general characteristics of wood – defects of wood – preservation of wood and its application – Steel – types and properties – advantages and uses.		CO-1 BTL-2
MODULE 2: CEMENT AND CONCRETE		9L
Lime, Cement, Ingredients - Types and Grades - Properties of cement and Cement mortar – tests - Concrete - Ingredients - Aggregates – Types- - Grading - Manufacture - Batching plants –Tests.		CO-2 BTL-2
MODULE 3: SPECIAL CONCRETES		9L
Ready Mix Concrete -Hollow concrete blocks- Lightweight concrete, High Performance concrete, High Strength concrete- Fibre reinforced concrete - Self Compacting concrete – polymer modified concrete - pre stressed concrete - properties and application.		CO-3 BTL-3
MODULE 4: POLYMER BASED MATERIALS		9L
Plastics – composition – properties – Polymers – classification – uses. Paints, Varnishes - Composition – Types and its application in Construction – Polymer and Geopolymer concrete – ingredients – advantages – uses.		CO-4 BTL-2
MODULE 5: MISCELLANEOUS MATERIALS		9L
Glass and Aluminum –Glass Fibre reinforced plastics – steel concrete composite Materials – Ferro cement - Geosynthetics - types, use and application in construction industry.		CO-5 BTL-2
TEXT BOOKS		
1.	P. C Varghese. (2005). <i>Building Materials</i> , Prentice Hall of India.	
2.	M.S. Shetty. (2006). <i>Concrete Technology (Theory and Practice)</i> , S. Chand & Company Ltd.	
3.	S.K. Duggal. (2012). <i>Building Materials</i> , New age Publication, 4th edition.	
REFERENCE BOOKS		
1.	S Christian Johnson. (2017). <i>Concrete Technology</i> , Dipti Press.	
2.	G.C Sahu and Jayagopal Jena. (2017). <i>Building Materials and Construction</i> , McGrawhill Publication.	
E BOOKS		
1.	http://www.mu.edu.et/iphc/images/liblary/Heritage/Construction_Materials/Construction_Materials_4th_editionPeter_Domone_and_John_Illston.pdf	
2.	http://www.engineeringbookspdf.com/building-materials-by-s-k-duggal/	

MOOC	
1.	https://onlinecourses.nptel.ac.in/noc15_ce05/preview
2.	https://swayam.gov.in/courses/1338-modern-construction-materials

COURSE TITLE			MECHANICS OF STRUCTURES II								CREDITS			4	
COURSE CODE			CEB4202			COURSE CATEGORY			PC		L-T-P-S			3-1-0-1	
Version			1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE	
15%			15%			10%			5%		5%			50%	
Course Description			This course covers the fundamental concepts of structural mechanics with applications to civil engineering structures.												
Course Objective			1. To gain knowledge in the analysis of simple and compound bars 2. To be familiar with Determinate and Indeterminate beams 3. To understand Euler’s and Rankine’s theory and its applications 4. To be familiar with deflection of beams using classic analysis methods 5. Be acquainted with analysis of shafts, springs and curved beams												
Course Outcome			Upon completion of this course, the students will be able to 1. Analyze simple and compound bars using direct application of Hooke’s Law. 2. Analyze Determinate and Indeterminate beams. 3. Compare Euler’s and Rankine’s theory and apply the appropriate one for analysis of columns. 4. Determine deflection of beams using classic analysis methods. 5. Analyze shafts, springs and curved beams.												
Prerequisites: Mechanics of Structures I															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	1	2	3	3	3	3	-	3	-	1	2	3	2	3	-
CO-2	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
CO-3	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
CO-4	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
CO-5	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: STRESS STRAIN AND DEFORMATION OF SOLIDS,STATES OF STRESS (9L+3T)															

Rigid bodies and deformable solids – Normal and shear stresses - Elasticity, Hooke's law, Strain, Stress-strain curve, lateral strain, Volumetric Strain - temperature stresses - deformation of simple and compound bars - shear modulus, bulk modulus, relationship between elastic constants - biaxial state of stress - stress at a point - stress on inclined plane - principal stresses and principal planes - Mohr's circle of stresses, Three dimensional components of stresses, Theories of failure.		CO-1 BTL-3
MODULE 2 :DETERMINATE AND INDETERMINATE BEAMS		(9L+3T)
Beams - types of supports - simple and fixed, types of load - concentrated, uniformly distributed, varying distributed load, combination of above loading - relationship between bending moment and shear force - bending moment, shear force diagram for simply supported, cantilever and over hanging beams - Theory of simple bending - load carrying capacity of beams. Determinate and Indeterminate beams - Propped cantilever and fixed beams-fixed end moments and reactions for different types of loads. Theorem of three moments - analysis of continuous beams.		CO-2 BTL-3
MODULE 3: COLUMNS, CYLINDERS AND SHELLS		(9L+3T)
Columns – Types - Eccentrically loaded short columns - middle third rule. Euler's theory of long columns - critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns - thick cylinders – compound cylinders, thin cylinders and shells		CO-3 BTL-3
MODULE 4: DEFLECTION OF BEAMS AND DETERMINATE STRUCTURES		(9L+3T)
Deflection of beams - double integration method - Macaulay's method -variation of shear stress -shear center. Strain energy and strain energy density - strain energy in traction, shear in flexure and torsion - Castigliano's theorems - principle of virtual work - application of energy theorems for computing deflections in beams, trusses and pin-jointed frames - Maxwell's reciprocal theorems-Williot diagram - Mohr's correction (concepts).		CO-4 BTL-3
MODULE 5: TORSION, SPRINGS AND ADVANCED TOPICS IN BENDING OF BEAMS		(9L+3T)
Stresses and deformation in circular (solid and hollow shafts) - stepped shafts - shafts fixed at both ends- stresses in helical springs - deflection of springs. Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - curved beams - Winkler Bach formula - stress concentration.		CO-5 BTL-3
Self-study Topic: MacAulay's method		
TEXT BOOKS		
1	Kottiswaran. (2014). <i>Engineering Mechanics Static and Dynamics</i> , Sri Balaji Publication Erode.	
2	Beer F.P and Johnson Jr. E.R. (2017). <i>Vector Mechanics for Engineers</i> , Vol. 1 Statics and vol. 2 Dynamics, McGraw-Hill International 10th Edition	
3	Rajasekaran, S, Sankar Subramanian, G. (2003). <i>Fundamentals of Engineering Mechanics</i> , Vikas Publishing House Pvt., Ltd.	
4	Bedford and N. Fowler. (2007). <i>Engineering Mechanics Statics & Dynamics</i> , Pearson.	
REFERENCE BOOKS		
1	Hibbeller R.C. (2013). <i>Engineering Mechanics</i> , Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education AsiaPvt. Ltd.	
2	Ashok Gupta. (2001). <i>Interactive Engineering Mechanics - Statics - A Virtual Tutor (CDROM)</i> , Pearson Education Asia Pvt., Ltd.	

E BOOKS

- | | |
|---|---|
| 1 | https://www.pdfdrive.net/strength-of-materials-i-e11311976.html |
|---|---|

MOOC

- | | |
|---|---|
| 1 | https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-2004/ |
| 2 | https://onlinecourses.nptel.ac.in/noc17_ce17 |
| 3 | https://onlinecourses.nptel.ac.in/noc15_ce02 |

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: DEFINITIONS AND FLUID PROPERTIES (6L+3T=9)	
Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties. Detection of various cyber-attacks using Wireshark. Suggested Readings: Application of surface tension, capillarity	CO-1 BTL-2
MODULE 2: FLUID STATICS AND KINEMATICS (6L+3T=9)	
Hydrostatic equation – Forces on plane surfaces- Pressure measurement. Stream, streak and path lines – Classification of flows – Continuity equation Suggested Readings: Buoyancy	CO-2 BTL-3
MODULE 3: FLUID DYNAMICS (6L+3T=9)	
Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes- turbulent flow – Darcy-Weisbach formula – Moody diagram. Suggested Readings: Forces on submerged bodies.	CO-3 BTL-3
MODULE 4: FLOW THROUGH PIPES (6L+3T=9)	
Major and minor losses of flow in pipes – Pipes in series and in parallel Suggested Readings: Boundary layer theory	CO-4 BTL-3
MODULE 5: DIMENSIONAL AND MODEL ANALYSIS (6L+3T=9)	
Dimensional Analysis – Rayleigh's method, Buckingham's Pi-theorem – Similitude and models.	CO-5 BTL-3
TEXT BOOKS	
1.	Dr. R.K. Bansal. (2017). <i>Fluid Mechanics and Hydraulic Machines</i> , Laxmi Publication, 9th edition
2	Fox, Robert, W. and Macdonald, Alan, T. (2011). <i>Introduction to Fluid Mechanics</i> , John Wiley & Sons
3	Rajput, R.K. (2016). <i>A text book of Hydraulic Machines</i> , S. Chand Publications, Sixth edition.
REFERENCE BOOKS	
1	Streeter, Victor, L and Wylie, Benjamin. (2010). <i>Fluid Mechanics</i> , McGraw-Hill Ltd.
2	E. John Finnemore. (2010). <i>Fluid Mechanics with Engineering Applications</i> , McGraw-Hill, International Edition.
3	Pernard Messay. (2005). <i>Mechanics of Fluids</i> , Nelson Thornes Ltd.
E BOOKS	
1	https://drive.google.com/file/d/0B9_2yANiGJ12aWJrSGJZVjlxhBM/view
2	http://www.engineeringbookspdf.com/fluid-mechanics-hydraulic-machines/
MOOC	
1	https://onlinecourses.nptel.ac.in/noc17_me04/preview

COURSE TITLE		CONSTRUCTION MATERIALS LAB							CREDITS		1				
COURSE CODE		CEB4231			COURSE CATEGORY		PC		L-T-P-S		0-0-2-0				
Version		1.0			Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3				
ASSESSMENT SCHEME															
CIA								ESE							
80%								20%							
Course Description		Construction materials laboratory deal with the practical study on properties of bricks, cement, coarse aggregate and fine aggregate.													
Course Objective		1. To acquire knowledge on properties of bricks. 2. To acquire knowledge on properties of cement. 3. To acquire knowledge on properties of fine aggregate. 4. To acquire knowledge on properties of coarse aggregate.													
Course Outcome		Upon completion of this course, the students will be able to 1. Determine the properties of bricks according to IS Codes. 2. Determine the properties of cement according to IS Codes. 3. Determine the properties of fine aggregates according to IS Codes. 4. Determine the properties of coarse aggregates according to IS Codes. 5. Determine the properties of fresh concrete according to IS Codes.													
Prerequisites: Construction Materials															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	3	3	-	3	2	-	-	-	-	2	-	-
CO-2	1	2	2	3	3	2	3	2	-	-	-	-	2	-	-
CO-3	1	2	2	3	3	-	3	2	-	-	-	-	2	-	-
CO-4	1	2	2	3	3	2	3	2	-	-	-	-	2	-	-
CO-5	1	2	2	3	3	2	-	-	-	-	-	-	2	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Compressive Strength and Water Absorption of brick														
2	Tests on Cement, Specific gravity,														
3	Consistency test on Cement														

4	Setting Time of cement
5	Soundness test on cement
6	Tests on Fine Aggregate: Specific Gravity
7	Fineness Modulus of fine aggregate
8	Coarse Aggregate: Specific Gravity
9	Fineness Modulus of coarse aggregate
10	Crushing Strength
11	Flakiness and Elongation Index
12	Abrasion Test
REFERENCE BOOK	
1	IS:383-2016 specifications for coarse and fine aggregates from natural sources for concrete.

COURSE TITLE		Mechanics of Fluids Lab										CREDITS		1	
COURSE CODE		CEB4232			COURSE CATEGORY			PC			L-T-P-S		0-0-2-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME															
CIA				80%				ESE				20%			
Course Description		The experiments in Fluid mechanics Laboratory deal with the flow measuring devices used to find rate of flow in pipes and open channels. The major and minor losses in pipes can also be found.													
Course Objective		1. To study the flow measuring devices in pipes and measure the flow. . 2. To study the flow measuring devices in open channels and measure the flow 3. To understand the principles of Bernoulli's Theorem. 4. To be acquainted with the losses of flow in pipes.													
Course Outcome		Upon completion of this course, the students will be able to 1. Calibrate the given venturimeter 2. Calibrate the orificemeter to find the discharge through pipes 3. Calibrate the notches and orifice used to find discharge through open channels. 4. Determine the major and minor losses in pipes 5. Verify Bernoulli’s theorem													
Prerequisites: CEB4203- Mechanics of Fluids															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	3	-	3	1	2	3	2	-	1	2	2	-
CO-2	1	2	3	3	-	3	1	2	3	2	-	1	2	2	-
CO-3	1	2	3	3	-	3	1	2	3	2	-	1	2	2	-
CO-4	1	2	3	3	-	3	1	2	3	2	-	1	2	2	-
CO-5	1	2	3	3	-	3	1	2	3	2	-	1	2	2	-
LIST OF EXPERIMENTS															
1. Determination of coefficient of discharge of venturimeter 2. Determination of coefficient of discharge of Orifice meter. 3. Determination of coefficient of discharge of Orifice. 4. Determination of coefficient of discharge of Notches. 5. Determination of frictional losses in pipes.															

6. Determination of Minor losses in pipes
7. Study of the impact of jet on vanes.
8. Verification of Bernoulli's theorem

REFERENCE BOOKS

1	Ven Te Chow. (2009). <i>Open-Channel Hydraulics</i> , The Blackburn Press.
2	Ramamirtham S. (2006). <i>Fluid Mechanics, Hydraulics and Fluid Machines</i> , Dhanpat Rai & Sons, Delhi.
3	John A. Roberson. (2013). <i>Hydraulic Engineering</i> , John Wiley & Sons.
4	Streeter, Victor, L. and Wylie, Benjamin E. (2010). <i>Fluid Mechanics</i> , McGraw-Hill Ltd.
5	Ven Te Chow. (2009). <i>Open-Channel Hydraulics</i> , The Blackburn Press.

COURSE TITLE		COMPUTER AIDED BUILDING DRAWING						CREDITS		1					
COURSE CODE		CEB4233		COURSE CATEGORY		PC		L-T-P-S		0-0-2-0					
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-6					
ASSESSMENT SCHEME															
CIA								ESE							
80%								20%							
Course Description		This course will enable the students to draft the plan, elevation, and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code													
Course Objective		To develop plan, elevation and sectional views of buildings as per National Building Code													
Course Outcome		Upon completion of this course, the students will be able to 1. Develop building layouts, Plan, Section and Elevation 2. Create perspective views of buildings. 3. Summarize requirements of an approval drawing for a new building project 4. Summarize the guidelines for a building as per National Building Code Provisions 5. Design and develop building permit drawings for given customer requirements as per National Building code and local building rules													
Prerequisites: Engineering Graphics & CAD															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	1	2	3	3	2	1	3	2	2	-	3	3	2	3
CO-2	1	1	2	3	3	2	1	3	2	2	2	2	3	1	3
CO-3	1	1	1	3	3	2	1	3	-	-	1	2	3	2	3
CO-4	1	1	1	3	3	2	1	3	-	-	1	2	3	2	3
CO-5	2	1	2	3	3	2	1	3	-	2	1	2	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Introduction to Building Drawing														
2	Conventional Signs, Doors, Windows, Footings														
3	Develop Section and Front Elevation for Single Room Building														

4	Develop Section and Front Elevation For 2BHK Plan
5	Develop Section and Front Elevation for Given Cottage
6	Study on General Building Requirements as Per NBC 2016
7	Develop Plan, Section and Front Elevation for Given line sketch
8	Develop Plan, Section and Front Elevation for Residential Building as per Given Customer Requirement
9	Develop Plan, Section and Front Elevation for Commercial Building as per Given Customer Requirement
10	Develop Plan, Section and Front Elevation for Educational Building as per Given Customer Requirement
LIST OF EQUIPMENTS (For a batch of 30 students)	
1.	AutoCAD Software (30 License)
2	30 Systems
TEXT BOOKS	
1	B.P. Verma. (2012). <i>Civil Engg. Drawing & House Planning</i> , Khanna publishers, Delhi.
2	V.B.Sikka. (2014). <i>Civil engineering drawing</i> , S.K.Kataria & sons.
REFERENCE BOOKS	
1	M. G. Shah. (2012). <i>Building Drawing</i> , Tata McGraw Hill.
2	National Building Code of India 2016.

COURSE TITLE		DESIGN PROJECT I										CREDITS		1	
COURSE CODE		CEB4234				COURSE CATEGORY			PC			L-T-P-S		0-0-2-0	
Version		1.0				Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-5	
ASSESSMENT PATTERN															
First Review (CIA)			Second Review (CIA)				Third Review (CIA)				Project Report & Viva (CIA)				
20			20				30				30				
Course Description		To provide sufficient hands-on learning experience related to the design, development and analysis of suitable product / process so as to enhance the technical skill sets in the chosen field.													
Course Objective		<ol style="list-style-type: none"> 1. To enable the students to apply the theoretical knowledge in practice 2. To enable them to plan and organize a small Civil Engineering project and write a report on the work 3. To improve the level of confidence in presenting the civil engineering concepts. 													
Course Outcome		<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Formulate specific problem statements for real life problems 2. Perform literature search in the area of interest. 3. Conduct experiments / Design and Analysis / solution iterations and document the results. 4. Synthesize the results and arrive at scientific conclusions / products / solution 5. Document the results in the form of technical report / presentation 													
Prerequisites: Knowledge on Basic Core Courses															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	3	2	2	2	2	2	2	-	2	1	3	2	2	2
CO-2	-	2	-	-	-	2	2	-	-	2	1	1	1	2	2
CO-3	2	3	3	3	3	3	3	3	3	3	2	3	2	3	3
CO-4	2	3	3	3	3	3	3	2	3	2	1	3	2	3	2
CO-5	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
<u>LIST OF EXPERIMENTS</u>															

In this project each group consisting of four/five members is expected to design and develop practical solutions to real life problems related to Industry and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge gained from the subject should be applied to develop effective solutions to various computing problems. At the end of the course the group should submit a complete report of the project work carried out.

SEMESTER – IV

[illegible]

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: PROBABILITY AND RANDOM VARIABLES (9L+3T=12)	
Axioms of Probability- Bayes' Theorem -Random variables – Moments – Moment generating functions. Suggested Reading: Basic Probability	CO-1 BTL-3
MODULE 2: STANDARD DISTRIBUTIONS (9L+3T=12)	
Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions Suggested Reading: Discrete and Continuous Functions	CO-2 BTL-3
MODULE 3: TWO-DIMENSIONAL RANDOM VARIABLES (9L+3T=12)	
Joint distribution – Marginal and conditional distribution – Co-variance – Correlation and Regression Suggested Reading: Random Variables	CO-3 BTL-3
MODULE 4: TESTING OF HYPOTHESIS (9L+3T=12)	
Sampling distributions – Testing of Hypothesis –Small samples– t Test, F Test and Chi-square Test – Large samples– Single mean– Difference in means– single proportion and difference in proportions. Suggested Reading: Sampling Problems	CO-3 BTL-4
MODULE 5:DESIGN OF EXPERIMENTS (9L+3T=12)	
Analysis of variance– One Way Classification–Completely Randomized block design– Two Way Classification – Randomized block design – Latin Square design Suggested Reading: Analysis of variance	CO-4 BTL-4
TEXT BOOKS	
1.	Milton. J. S. and Arnold. J.C. (2017). <i>Introduction to Probability and Statistics</i> , Tata McGraw Hill, 4th Edition.
2.	Johnson. R.A, Gupta. C.B, Miller and Freund's. (2017). <i>Probability and Statistics for Engineers</i> , Pearson Education.
3.	A. Chandrasekaran, G. Kavitha. (2014). <i>Probability, Statistics, Random Processes and Queuing Theory</i> , Dhanam Publications
4.	Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma. (2016). <i>MATLAB and its Applications in Engineering</i> , Pearson Publication, Second Edition.
REFERENCE BOOKS	
1.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A. (2014). <i>Schaum's Outline of Theory and Problems of Probability and Statistics</i> , Tata McGraw Hill Edition.
2.	Devore. J.L. (2012). <i>Probability and Statistics for Engineering and the Sciences</i> , Cengage Learning, New Delhi, 8th Edition.
3.	Dean G. Duffy. (2013). <i>Advanced Engineering Mathematics with MATLAB</i> , CRC Press, Third Edition
E BOOKS	
1.	http://nptel.ac.in/courses/IIT-MADRAS/Principles_of_Communication1/Pdfs/1_5.pdf
MOOC	
1.	https://www.edx.org/course/introduction-probability-science-mitx-6-041x-2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: ANALYSIS OF INDETERMINATE STRUCTURES: FORCE METHOD (9L+3T)		
Determinate and Indeterminate structures - Statically indeterminate structures - Force method of analysis of indeterminate structures - Method of consistent deformation - theorem of least work.		CO-1 BTL-3
MODULE 2: SLOPE DEFLECTION METHOD (9L+3T)		
Continuous beams and rigid frames (with and without sway) - Simplification for hinged end -Support displacements.		CO-2 BTL-3
MODULE 3: MOMENT DISTRIBUTION METHOD (9L+3T)		
Distribution and carry over of moments - Stiffness and carry over factors - Analysis of continuous beam-- Plane rigid frames with and without sway. Self-Study: Analysis of a multi storied building		CO-3 BTL-3
MODULE 4: ARCHES (9L+3T)		
Arches as structural forms - Examples of arch structures - Types of arches - Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches - Settlement and temperature effects. Self-Study: Application of arches in the construction industry		CO-4 BTL-3
MODULE 5: MOVING LOADS AND INFLUENCE LINES (9L+3T)		
Influence lines for reactions in statically determinate structures - influence lines for member forces in pin-jointed frames - Influence lines for shear force and bending moment in beam sections. Muller Breslau's principle - Influence lines for continuous beams and single storey rigid frames. Self-Study: Arches – Types of Arches – Arch Structures case studies.		97 CO-5 BTL-3
TEXT BOOKS		
1.	Vaidyanthan, R. and Perumal, P. (2016). <i>Comprehensive structural Analysis</i> , Vol.I & II", Laxmi Publications, New Delhi.	
2	S.S. Bhavikatti. (2011). <i>Structural Analysis</i> , Vol I & II, Vikas Publishing House, Delhi, Pvt.Ltd.	
3	L.S. Negi & R.S. Jangid. (2003). <i>Structural Analysis</i> , Tata McGraw-Hill Publications, New Delhi.	
REFERENCE BOOKS		
1	Ghali.A, Nebille, A.M. and Brown,T.G. (2009). <i>Structural Analysis</i> , A unified classical and Matrix approach, CRC Press, 6 editions.	
2	Vazirani V.N, &Ratwani, M.M. (2008). <i>Analysis of Structures</i> , Khanna Publishers, Delhi.	
3	G.S. Pandit & S.P. Gupta. (2008). <i>Structural Analysis - A Matrix Approach</i> , Tata McGraw Hill.	
4	Devdas Menon. (2016). <i>Structural Analysis</i> , Narosa, Publishing house, Delhi.	
E BOOKS		
1	http://www.engineeringbookspdf.com/advanced-methods-of-structural-analysis/	

2	https://www.kopykitab.com/Structural-Analysis-II-by-S-S-Bhavikatti
3	http://bookslock.org/structural-analysis-2-textbook-download-in-pdf/
MOOC	
1.	http://freevideolectures.com/Course/3015/Advanced-Structural-Analysis
2.	https://pe.gatech.edu/user/login?destination=node/7781
3.	https://swayam.gov.in/course/3740-structural-analysis-i
4.	http://nptel.ac.in/courses/105106050/

COURSE TITLE		CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES							CREDITS			3			
COURSE CODE		CEB4217			COURSE CATEGORY			PC		L-T-P-S			3-0-0-1		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		This course aims to impart knowledge on various construction techniques, practices, equipment, and procedures needed for various construction activities													
Course Objective		<div>1. Be acquainted with different construction practices used in building construction.</div> <div>2. Understand the various practices in sub structure construction.</div> <div>3. Understand the various practices in super structure construction.</div> <div>4. Understand the techniques adopted in special structures.</div> <div>5. Familiarize with the various construction equipment used in the construction industry.</div>													
Course Outcome		<div>Upon completion of this course, the students will be able to</div> <div>1. Summarize the sequence of building construction</div> <div>2. Identify and enumerate the various techniques adopted for substructure construction.</div> <div>3. Identify and enumerate the various techniques adopted for superstructure construction.</div> <div>4. Adopt the techniques used for the construction of special structures.</div> <div>5. Illustrate the various equipment needed for construction.</div>													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO -2	PO- 3	PO- 4	PO -5	PO- 6	PO- 7	PO- 8	PO -9	PO -10	PO -11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	2	2	-	-	1	2	1	-	-	-	2	2	1	-
CO-2	2	2	1	1	-	-	-	3	-	-	-	2	1	2	-
CO-3	-	1	1	-	-	1	-	-	-	-	2	3	2	2	-
CO-4	-	2	2	-	-	1	2	2	-	-	3	3	2	2	-
CO-5	1	1	3	-	-	2	2	2	-	-	-	3	1	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1 : CONSTRUCTION PRACTICES (9)	
Specifications, details and sequence of activities and construction co-ordination - Site Clearance - Marking - Earthwork - masonry - stone masonry - concrete hollow block masonry - flooring - damp proof courses- laying brick -- weather and water proof - roof finishes - construction joints - movement and expansion joints - pre cast pavements - Building foundations - basements - temporary shed - centering and shuttering- Scaffoldings - slip forms	CO-1 BTL-2
MODULE 2: SUB STRUCTURE CONSTRUCTION (9)	
Techniques of Box jacking - Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques - Piling techniques- driving well and caisson - Dewatering-- well points- sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting	CO-2 BTL-2
MODULE 3: SUPERSTRUCTURE CONSTRUCTION (9)	
Launching girders, bridge decks, off shore platforms - special forms for shells - techniques for heavy decks -Introduction to pre-stressing and Post tensioning, aerial transporting handling - erection of transmission towers. Self study :Ready mix concrete production	CO-3 BTL-3
MODULE 4 : CONSTRUCTION PRACTICES – SPECIAL STRUCTURES (9)	
Fabrication and erection of steel trusses - Construction sequences in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges -Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.	CO-4 BTL-3
MODULE5: CONSTRUCTION EQUIPMENT (9)	
Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, earth movers - Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling, drilling, blasting -- dewatering and pumping equipment - Transporters. Self-study: Form-work - Material and latest techniques Next-generation digital forensics	CO-5 BTL-3
TEXT BOOKS	
1	Varghese, P.C. (2016). <i>Building construction</i> , Prentice Hall of India Pvt. Ltd, New Delhi, 2nd revised edition.
2	M.S Shetty. (2012). <i>Concrete Technology Theory and Practice</i> , S. Chand & Company Ltd.
3	Arora S.P. and Bindra S.P. (2010). <i>Building Construction</i> , Dhanpat Rai and Sons.
4	P.Purushothama Raja. (2012). <i>Construction Techniques Equipment and practice</i> , Sri Krishna Publishers, Chennai.

REFERENCE BOOKS	
1	Gambhir, M.L. (2013). <i>Concrete Technology</i> , Mc Graw Hill India.
2	J Jha. (2004). <i>Construction and Foundation Engineering</i> , Khanna Publishers.
3	Sharma S.C. (2008). <i>Construction Equipment and Management</i> , Khanna Publishers New Delhi.
4	Deodhar, S.V. (2012), <i>Construction Equipment and Job Planning</i> , Khanna Publishers, New Delhi.
E BOOKS	
1	https://www.pdfdrive.net/rapid-pavement-construction-tools-materials-and-methods-e6088890.html
MOOC	
1	https://onlinecourses.nptel.ac.in/noc17_ce18/
2	http://nptel.ac.in/courses/105104161/21
3	http://nptel.ac.in/courses/105103093/11
4	https://onlinecourses.nptel.ac.in/noc16_ce02/

COURSE TITLE				ENVIRONMENTAL ENGINEERING				CREDITS		3					
COURSE CODE				CEB4218		COURSE CATEGORY		PC		L-T-P-S		3-0-0-0			
Version				1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment				Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance		ESE			
15%				15%		10%		5%		5%		50%			
Course Description				To make the students understand about the water borne diseases, important of water treatment including disinfection of water.											
Course Objective				The course should enable the students to: 1. Learn about the population forecasting methods, water demand, source identifications, transportation and treatment of surface water. Also to study water treatment units and distribution networks. 2. Know about the various water treatment processes. 3. Study about sewerage system for collection and transmission of sewage. 4. Understand the design principles of sludge and wastewater treatment methods. 5. Study about the safe disposal of sewage.											
Course Outcome				Upon completion of this course, the students will be able to 1. Design the various water treatment units in the water supply system. 2. Illustrate the various water treatment processes. 3. Design sewers for transmission of sanitary sewage and the pumping units. 4. Design sedimentation tanks, aeration tank, trickling filter and septic tank. 5. Apply the suitable technique for the disposal of sewage.											
Prerequisites:															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO -9	PO - 10	PO -11	PO- 12	PS O- 1	PS O- 2	PS O- 3
CO-1	3	2	2	1	1	1	1	1	3	1	1	1	3	3	-
CO-2	1	0	1	0	0	1	3	1	2	3	1	1	1	0	-
CO-3	3	2	2	1	1	1	1	1	3	1	1	1	3	3	-

[illegible]

4	Gray N.F. (2006). <i>Water Technology</i> , Elsevier India Pvt. Ltd., New Delhi.
5	Birdie, G.S. and Birdie. (2010). <i>Water Supply and Sanitary Engineering</i> , Dhanpat Rai & Sons.
E BOOKS	
1	https://www.pdfdrive.net/environmental-engineering-fourth-edition-e13522425.html
2	http://www.tnu.edu.vn/sites/quynhntt/references/8064517-Environmental-Engineering.pdf
MOOC	
1	https://www.shortcoursesportal.com/studies/75474/making-environmental-decisions.html
2	https://ocw.mit.edu/courses/civil-and-environmental-engineering/
3	https://ep.jhu.edu/programs-and-courses/programs/environmental-engineering

B.TECH – CIVIL ENGINEERING

4	Tests on springs
5	Hardness tests.
6	Shear test.
7	Test for impact resistance of steel and concrete.
8	Verification of Maxwell's Reciprocal Theorem
9	Determination of Modulus of Elasticity of Concrete using Strain gauges.
10	Durability test on concrete – RCPT, Sulphate attack, carbonation test.
11	Non-Destructive tests on beams and columns.
LIST OF EQUIPMENTS (For a batch of 30 students)	
1.	Universal Testing Machine
2	Computerized Universal Testing Machine
3	Torsion Testing Machine
4	Pendulum Impact Tester
5	Deflection Test Bench Apparatus
6	UPV Testing Equipment
7	Spring Testing Machine
8	Motorized Digital Rockwell Hardness Tester
9	Optical Brinell Hardness Tester
10	Rebound Hammer
MOOC	
1	https://www.coursera.org/learn/mechanics-1

COURSE TITLE		ENVIRONMENTAL ENGINEERING LAB								CREDITS		1			
COURSE CODE		CEB4242			COURSE CATEGORY			PC		L-T-P-S		0-0-2-0			
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
CIA								ESE							
80%								20%							
Course Description		To get exposure about water and sewage analysis.													
Course Objective		1. To acquire knowledge water quality and wastewater analysis 2. To acquire knowledge on working principal of AAS to determine various heavy metals 3. To acquire knowledge on water and wastewater quality standards 4. To understand the impacts of various water and wastewater pollutants													
Course Outcome		Upon completion of this course, the students will be able to 1. Analyze water and wastewater quality parameters 2. Recall the standards for water and wastewater 3. Recommend the application of sample based on the quality and standards 4. Evaluate the impacts (or) toxicity of various wastewater pollutants													
Prerequisites:															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	1	-	2	2	1	3	2	-	1	2	3	-
CO-2	2	1	2	1	-	2	2	1	3	2	-	1	2	3	-
CO-3	2	1	2	1	-	2	2	1	3	2	-	1	2	3	-
CO-4	2	1	2	1	-	2	2	1	3	2	-	1	2	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Sampling and preservation methods and significance of characterization of water and wastewater.														
2	Determination of i) PH and Turbidity; ii) Hardness														
3	Determination of iron & fluoride														
4	Determination of residual chlorine														
5	Determination of Chlorides														

6	Determination of Ammonia Nitrogen
7	Determination of Nitrate in waste water
8	Determination of Sulphate
9	Determination of Optimum Coagulant Dosage
10	Determination of available Chlorine in Bleaching powder
11	Determination of dissolved oxygen
12	Determination of suspended, volatile and fixed solids
13	B.O.D. test
14	C.O.D. test
15	Introduction to Bacteriological Analysis (Demonstration only)
16	Heavy metals determination - Chromium, Lead and Zinc. (Demonstration only)
LIST OF EQUIPMENTS (For a batch of 30 students)	
1.	Muffle Furnace
2	BOD Inhibitor
3	COD Digester
4	Weighing Balance
5	PH meter; Turbidity meter
6	Atomic Absorbance Spectroscopy (AAS)
7	Hot air Oven

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS

In this project each group consisting of four/five members is expected to design and develop practical solutions to real life problems related to Industry and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge gained from the subject should be applied to develop effective solutions to various computing problems. At the end of the course the group should submit a complete report of the project work carried out.

SEMESTER – V

COURSE TITLE				DESIGN OF CONCRETE STRUCTURES								CREDITS			4	
COURSE CODE				CEB4301		COURSE CATEGORY			PC			L-T-P-S			3-1-0-1	
Version				1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL			BTL-3	
ASSESSMENT SCHEME																
First Periodical Assessment				Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE	
15%				15%		10%			5%			5%			50%	
Course Description				This course deals with the different types of philosophies related to design of reinforced concrete structures and design of basic elements such as slab, beam, column and footing which form part of any structural system.												
Course Objective				<div><div>1.</div><div>To know the concepts of limit state method and international codes of practices.</div><div>2.</div><div>To Know the behavior of RC beams in shear and torsion.</div><div>3.</div><div>To throw light on the design concept of Limit state design of columns.</div><div>4.</div><div>To be familiar with the design of prestressed beams</div><div>5.</div><div>To introduce yield line theory for the design of slabs.</div></div>												
Course Outcome				<div><div>Upon completion of this course, the students will be able to</div><div>1.</div><div>Apply the concepts of limit state method and international codes of practices in the design of concrete structures</div><div>2.</div><div>Design beams for flexure, shear and torsion using limit state method.</div><div>3.</div><div>Design reinforced concrete columns</div><div>4.</div><div>Compute the losses in prestressing and analyze the prestressed beams</div><div>5.</div><div>Apply yield line theory to analyze and design slabs.</div></div>												
Prerequisites: NIL																
CO, PO AND PSO MAPPING																
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	
CO-1	3	3	3	2	1	2	1	2	2	2	1	3	2	3	-	
CO-2	3	3	3	2	2	2	1	2	1	1	1	2	2	3	-	
CO-3	3	3	3	2	2	2	1	2	1	1	1	2	2	3	-	
CO-4	3	3	3	2	2	2	1	2	1	1	1	3	2	3	-	

CO-5	3	3	3	2	3	2	1	2	1	2	1		1	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: METHODS OF DESIGN OF CONCRETE STRUCTURES (9L+3T)															
Concept of elastic method ultimate load method and limit state method- advantages of limit state method over other methods-design codes and specification -Introduction to working stress method-IS 456 - limit state philosophy as detailed in current IS code. Introduction to British Codes, Euro codes, and American standards for design of concrete structures.														CO-1 BTL-2	
MODULE 2: LIMIT STATE DESIGN FOR FLEXURE, SHEAR AND TORSION (12L+3T)															
Analysis and design of one way and two-way slabs - rectangular slab subjected to uniformly distributed - boundary conditions and corner effects - singly and doubly reinforced rectangular and flanged beams - design aids for flexure-deflection and crack width control. Behavior of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of RC members for combined bending shear and torsion- use of design aids.														CO-2 BTL-3	
MODULE 3:LIMIT STATE DESIGN OF COLUMNS (9L+3T)															
Types of columns-analysis and design of short columns for uniaxial and biaxial and bi axial bending- design of long columns- use of design aids. Design of staircases (ordinary and doglegged)														CO-3 BTL-3	
MODULE 4: PRINCIPLES OF PRESTRESSING (9L+3T)															
Materials for pre-stressed concrete - Different methods and systems - introduction to pre-stressing and post tensioning- Uniform and non uniform pre-stressing - Losses in pre-stress - Analysis of simply supported beams with straight and parabolic tendons.														CO-4 BTL-3	
MODULE 5: YIELD LINE THEORY AND SPECIAL STRUCTURAL MEMBERS (6L+3T)															
Application of virtual work method to Square, Rectangular and Triangular slabs. Design of flat slabs.														CO-5 BTL-3	
SELF STUDY: Comparison of various codes of practices in the design of concrete structures															
TEXT BOOKS															
1	N. Krishnaraju, and R. N.Pranesh. (2009). Reinforced Concrete Design, New Age International Pvt.Ltd.														
2	Varghese P C. (2010). <i>Limit State Design of Reinforced Concrete</i> , Prentice Hall of India, Private, Limited, New Delhi.														
3	Gambhir. M.L. (2011). <i>Fundamentals of Reinforced Concrete Design</i> . Prentice Hall of India Private Limited, New Delhi.														
REFERENCE BOOKS															
1.	Subramanian,N. (2013). <i>Design of Reinforced Concrete Structures</i> , Oxford University Press, New Delhi,														
2.	IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.														
3	SP16, IS 456:2000, Design Aids for Reinforced Concrete to Bureau of Indian Standards														

4	Sinha, S.N. (2014). Reinforced Concrete Design, Third Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.
5	Punmia B.C, Ashok Kumar Jain, ArunK. Jain. (2012). R.C.C. Designs Reinforced Concrete Structures, Laxmi Publications Pvt. Ltd., New Delhi, 2012
E BOOKS	
1	https://www.pdfdrive.net/design-of-concrete-structures-nilson-14th-edition-e19804731.ht%20ml
MOOC	
1	https://onlinecourses.nptel.ac.in/noc17_ce23/preview
2	http://nptel.ac.in/courses/105105105/

COURSE TITLE		STRUCTURAL ANALYSIS-II						CREDITS		4					
COURSE CODE		CEB4302		COURSE CATEGORY		PC		L-T-P-S		3-1-0-1					
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3					
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance		ESE					
15%		15%		10%		5%		5%		50%					
Course Description		To introduce the students to basic theory and concepts of structural analysis and, the modern methods of analysis of buildings.													
Course Objectives		<div>1. To understand the constraints in beams, frames and truss elements thus select suitable analysis method for analysis.</div> <div>2. To study the matrix approach for analysis of complex engineering problems which incorporates solution for unknown forces and moments</div> <div>3. To understand the concepts involved in Finite Element Analysis</div> <div>4. To study the plastic behavior of structural elements.</div> <div>5. To understand and infer the nature of forces in arches, cables and suspension bridges.</div>													
Course Outcome		<div>Upon completion of this course, the students will be able to</div> <div>1. Compare shape factors for various configurations and compute plastic moments for structural elements</div> <div>2. Analyze and compare matrix methods for analysis of various structural elements</div> <div>3. Solve forces in space frames and suspension bridges</div> <div>4. Elaborate the concepts of Finite Element Analysis for applications in advanced software.</div> <div>5. Formulate stiffness matrix using MATLAB.</div>													
Prerequisites: CEB4216- Structural Analysis-I															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	3	-	3	-	1	-	1	-	2	3	3	-
CO-2	1	2	3	3	3	3	-	1	-	1	-	2	3	3	-
CO-3	1	2	3	3	3	3	-	1	-	1	-	2	3	3	-
CO-4	1	2	3	3	-	3	-	1	-	1	-	3	3	3	-
CO-5	1	2	3	3	-	3	-	1	-	1	-	3	3	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related		
MODULE 1: PLASTIC ANALYSIS OF STRUCTURES (9L+3T)		
Statically indeterminate axial problems - Beams in pure bending - Plastic moment of resistance - Plastic modulus - Shape factor - Load factor - Plastic hinge and mechanism - Plastic analysis of indeterminate beams and frames - Upper and lower bound theorems <i>Self-Study: Shape factor for different sections of a beam</i>		CO-1 BTL-3
MODULE 2 : FLEXIBILITY METHOD FOR INDETERMINATE FRAMES (9L+3T)		
Equilibrium and compatibility - Determinate Vs Indeterminate structures - Indeterminacy - Primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).		CO-2 BTL-3
MODULE 3: MATRIX STIFFNESS METHOD (9L+3T)		
Element and global stiffness matrices - Analysis of continuous beams - Co-ordinate transformations - Rotation matrix - Transformations of stiffness matrices, load vectors and displacements vectors - Analysis of pin-jointed plane frames and rigid frames. Formulation of stiffness matrix for Beams and Trusses using MAT LAB.		CO-2,5 BTL-3
MODULE 4: SPACE AND CABLE STRUCTURES(9L+3T)		
Analysis of Space trusses using method of tension coefficients – Suspension bridges- cables with two and three hinged stiffening girders <i>Self-Study: Application of cable structures and space frames in the construction industry</i>		CO-3 BTL-3
MODULE 5: FINITE ELEMENT METHOD (9L+3T)		
Finite element method: Introduction to FEM-Historical development – General procedure of FEA-Discretisation of a structure -Displacement approach – shape functions- Beam element.		CO-4 BTL-3
TEXT BOOKS		
1.	Vaidyanthan, R. and Perumal, P. (2016). <i>Comprehensive structural Analysis</i> , Vol.I& II, Laxmi Publications, New Delhi.	
2	S.S. Bhavikatti. (2011). <i>Structural Analysis</i> , Vol I & II, Vikas Publishing House, Delhi,Pvt.Ltd	
3	L.S. Negi & R.S. Jangid. (2003). <i>Structural Analysis</i> , Tata McGraw-Hill Publications, New Delhi.	
REFERENCE BOOKS		
1	Ghali.A, Nebille, A.M. and Brown,T.G. (2009). <i>Structural Analysis: A unified classical and Matrix Approach</i> , CRC Press, 6 editions.	
2	Vazirani V.N, & Ratwani, M.M. (2008). <i>Analysis of Structures</i> , Khanna Publishers, Delhi.	
3	G.S. Pandit & S.P. Gupta. (2008). <i>Structural Analysis - A Matrix Approach</i> , Tata McGraw Hill.	

4	Devdas Menon. (2016). <i>Structural Analysis</i> , Narosa Publishing house, Delhi.
E BOOKS	
1	http://www.engineeringbookspdf.com/advanced-methods-of-structural-analysis/
2	http://bookslock.org/structural-analysis-2-textbook-download-in-pdf
3	https://www.kopykitab.com/Structural-Analysis-II-by-S-S-Bhavikatti
MOOC	
1.	http://freevideolectures.com/Course/3015/Advanced-Structural-Analysis
2.	https://pe.gatech.edu/user/login?destination=node/7781
3.	https://swayam.gov.in/course/3740-structural-analysis-i
4.	http://nptel.ac.in/courses/105106050/

COURSE TITLE		GEO TECHNICAL ENGINEERING						CREDITS				3			
COURSE CODE		CEB4303		COURSE CATEGORY		PC		L-T-P-S				3-0-0-0			
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL				BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance				ESE			
15%		15%		10%		5%		5%				50%			
Course Description		This course describes the Engineering Properties of soil.													
Course Objective		The course should enable the students to: 1. Develop an understanding of the index properties of soils and the various methods of soil classification. 2. Be acquainted with permeability, effective stress concepts and seepage through porous media and flow nets. 3. Understand the stress distribution and types of settlement in soil. 4. Gain knowledge about the compaction and consolidation theory 5. Gain knowledge about the different tests carried to find out the shear strength of soil.													
Course Outcome		Upon completion of this course, the students will be able to 1. Summarize the various types and classification of soil. 2. Analyze various water flow properties. 3. Explain the stresses in soil through various methods 4. Describe compaction and consolidation and determine the factors affecting them 5. Apply the Shear strength parameters for the different types of soil under various conditions.													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	2	1	1	1	-	1	1	1	1	1	-	1	2	1	-
CO-2	2	1	1	2	-	1	1	1	1	1	-	1	2	1	-
CO-3	2	1	1	1	-	1	1	1	1	1	-	1	2	1	-
CO-4	2	1	1	1	-	1	1	1	1	1	-	1	2	1	-
CO-5	2	1	1	2	-	1	1	1	1	1	-	1	2	1	-

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: INDEX PROPERTIES AND CLASSIFICATION OF SOIL	
9L	
Nature of Soil - Soil - phase relation - sieve analysis - sedimentation analysis - Atterberg limits - classification for engineering purposes - BIS Classification system	CO-1 BTL-3
MODULE 2: SOIL WATER AND WATER FLOW	
9L	
Soil water - Various forms – Capillary rise - Effective stress concepts in soil - Total, neutral and effective stress distribution in soil - Permeability - Darcy's Law-Permeability measurement in the laboratory - quick sand condition - Seepage - Laplace Equation - Introduction to flow nets-properties and uses - Simple problems.	CO-2 BTL-3
MODULE 3: STRESS DISTRIBUTION	
9L	
Stress distribution in soil media - Boussinesque formula - stress due to line load and circular and rectangular loaded area -Use of influence charts - Westergaard equation for point load.	CO-3 BTL-3
MODULE 4: COMPACTION AND CONSOLIDATION	
9L	
Soil compaction - factors affecting compaction - field compaction methods and monitoring. Components of settlement - Immediate and consolidation settlement - laboratory consolidation test - - Normal Consolidated and Over Consolidated clays – problems.	CO-4 BTL-3
MODULE 5: SHEAR STRENGTH	
9L	
Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - Saturated soil and unsaturated soil (basics only) - Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests - Drained and undrained behavior of clay and sand.	CO-5 BTL-3
TEXT BOOKS	
1	Punmia B.C. (2017). <i>Soil Mechanics and Foundations</i> , Laxmi Publications Pvt. Ltd., New Delhi, 16 th Edition
2	Gopal Ranjan and Rao A.S.R. (2006). <i>Basic and applied soil mechanics</i> , New Age International Publishers, New Delhi.
3	Venkatramaiah C. (2010). <i>Geotechnical Engineering</i> , New Age International Publishers, New Delhi.
REFERENCE BOOKS	
1	Coduto, D.P. (2002). <i>Geotechnical Engineering Principles and Practices</i> , Prentice Hall of India Private Limited, New Delhi.
2	McCarthy D.F. (2002). <i>Essentials of Soil Mechanics and Foundations Basic Geotechniques</i> , Prentice-Hall, New Jersey, Sixth Edition.
3	Das, B.M. (2002). <i>Principles of Geotechnical Engineering</i> , Thomas Books/ cole, fifth edition.
4	Muni Budhu. (2015). <i>Soil Mechanics and Foundations</i> , Wiley- Blackwell, Inc, New York.
E BOOKS	
1	https://www.pdfdrive.net/soil-mechanics-e15995601.html
2	https://www.pdfdrive.net/elements-of-soil-mechanics-7th-edition-e19806140.html

MOOC	
1	https://onlinecourses.nptel.ac.in/noc18_ce05/preview
2	https://swayam.gov.in/course/1376-geology-and-soil-mechanics
3	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-%20mecha%20nics-fall-2004/

COURSE TITLE	TRANSPORTATION ENGINEERING - I			CREDITS	3
COURSE CODE	CEB4304	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with fundamental principles of highway engineering. It has three key areas covered: geometric design of highways, materials used in highway construction and traffic engineering.
Course Objective	<ol style="list-style-type: none"> 1. To introduce students with the basics of highway engineering. 2. To teach students how to carry out geometric design for different types of roads. 3. To demonstrate to students on how to design flexible and rigid pavements. 4. To make students familiar with highway materials and construction practice. 5. To teach the importance of traffic characteristics.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the various elements of a highway. 2. Develop Geometric Design for highways. 3. Design flexible and rigid pavements. 4. Explain highway materials and construction practice. 5. Explain traffic characteristics and signal systems

Prerequisites: A course on Surveying.

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	1	2	2	1	2	2	2	1	1	3	3	-
CO-2	3	3	3	1	2	2	1	2	2	2	1	1	3	3	-
CO-3	3	3	3	1	2	2	1	2	2	2	1	1	3	3	-
CO-4	3	3	3	1	2	2	1	2	2	2	1	2	3	3	-
CO-5	3	3	2	1	2	2	1	2	2	2	1	1	3	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: HIGHWAY ALIGNMENT (9L)	
Classification of Urban and Rural roads Requirements of Ideal Alignment, Factors Controlling Highway Alignment, Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques), Highway Cross Sectional Elements - Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads.	CO-1 BTL-3
MODULE 2: GEOMETRIC DESIGN OF HIGHWAYS (9L)	
Design of Horizontal Alignments –Sight Distances – Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD], Super elevation, Design Speed, Radius of horizontal curve, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves, Geometric Design of Hill Roads [IRC Standards Only]	CO-2 BTL-3
MODULE 3: DESIGN OF FLEXIBLE AND RIGID PAVEMENTS AND MATERIALS (9L)	
Types of pavements-pavement components and their roles, Design factors, Design practice for flexible and rigid pavements (IRC methods only). Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil - California Bearing Ratio Test, Field Density Test. Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening Point Tests. Aggregate test – Impact test, abrasion test, Crushing test, Flakiness and elongation test. Practical: Penetration test, Ductility test, Viscosity test, softening point, Flakiness and elongation test, Crushing test, Impact test, Los angles abrasion test, CBR test.	CO-3 BTL-3
MODULE 4: HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE (9L)	
Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil - California Bearing Ratio Test, Field Density Test; Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]	CO-4 BTL-3
MODULE 5: TRAFFIC ENGINEERING (9L)	
Traffic Characteristics, Traffic Studies – Volume study, Speed studies-spot speed, speed and delay- OD studies, Traffic flow characteristics on flow, Capacity studies-PCU, Fundamental relationships Control devices- Traffic Signs and signals (Webster’s method), Intersection, At Grade, Channelized, Rotary, Grade Separator.	CO-5 BTL-3
TEXT BOOKS	
1	Khanna K, Justo C E G Justo and Veeraraghavan, A. (2014). <i>Highway Engineering</i> , Khanna Publishers, Roorkee.
2	Alok Kumar Goel. (2016). <i>Highway Engineering</i> , S.K Kataria& Sons.
3	Kadiyali L R. (2011). <i>Traffic Engineering and Transport Planning</i> , Khanna publishers.
4	Dr. Purushothama Raj. (2013). <i>Railways, Airports and Harbour Engineering</i> , Sri Krishna Hitech Publishing Company Pvt. Ltd.

5	Saxena Subhash C and Satyapal Arora. (2011). <i>A Course in Railway Engineering</i> , Dhanpat Rai and Sons, Delhi.
REFERENCE BOOKS	
1.	Kadiyali L R & N.B. Lal. (2011). <i>Principles and Practice of Highway Engineering</i> , Khanna Publishers.
2.	Rangwala, (2009). <i>Airport Engineering</i> , Charotar Publishing House.
3.	Oza and Oza. (2012). <i>A course in Docks & Harbour Engineering</i> , Charotar Publishing House.
4.	Bureau of Indian Standards (BIS) Publications on Highway Materials.
E BOOKS	
1	https://www.pdfdrive.net/ism-for-transportation-engineering-an-introduction-e19463916.html
MOOC	
1	https://cee.illinois.edu/academics/graduate-programs/cee-online-program/cee-online-%20transportation-engineering
2	https://www.mastersportal.com/studies/161540/transportation.html

COURSE TITLE				CONSTRUCTION MANAGEMENT						CREDITS			3			
COURSE CODE				CEB4305		COURSE CATEGORY			DE		L-T-P-S			3-0-0-1		
Version				1.0		Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME																
First Periodical Assessment				Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%				15%		10%			5%		5%			50%		
Course Description				Learn the functions of management, network planning techniques, contract system & accounting procedures in government, organization& groom them to match to the requirements of employer expectation in construction industry.												
Course Objective				The course should enable the students to 1. Understand the functions of management and various organizational structures. 2. Understand the construction planning, resource planning and various labour legislations 3. Understand the concept of network planning methods and principles of cost control 4. Study the concept of tender and contracts and impart idea about quality control and safety requirements 5. Know various accounting procedures adopted in government organizations.												
Course Outcome				Upon completion of this course, the students will be able to 1. Explain the functions, importance of management and classify various organizational structures. 2. Plan for the resources and labor requirement 3. Prepare construction schedules by network analysis and gain a wide knowledge of cost control. 4. Organize the contract documents and execute construction project works with the practice of quality control. 5. Control of work measurement, payment of bills.												
Prerequisites: Nil																
CO, PO AND PSO MAPPING																
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	
CO-1	-	-	-	-	-	2	-	2	2	-	3	3	-	3	3	

B.TECH – CIVIL ENGINEERING

[illegible]

2.	Saurabh K Soni. (2016). <i>Construction Management and Equipment</i> , S.K. Kataria& Sons.
3.	Sengupta. (2002). <i>Construction Management</i> , Tata McGraw Hill.
4.	J.L. Sharma. (2002). <i>Construction Management and accounts</i> , Satya Publications.
5.	D. Lal. (2017). <i>Construction Management and P.W.D. Accounts</i> , S.K. Kataria& Sons
REFERENCE BOOKS	
1.	Kumar NeerajJha. (2016). <i>Construction Project Management -Theory and Practice</i> , Pearson publications, 2nd edition.
2.	Jimmie Hinze. (2013). <i>Construction Contracts</i> , McGraw hill education, 2013
3.	Joseph T. Bockreth. (2013). <i>Contracts and Legal environment</i> , McGraw hill education, 2013.
4.	C.P.W.D Manuals
5.	Public Works Accounts Code, PWD, Tamilnadu
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	http://www.nptel.ac.in/courses/10510309
2.	https://onlinecourses.nptel.ac.in/noc18_ce15/preview

COURSE TITLE		TRANSPORTATION ENGINEERING LAB						CREDITS		1					
COURSE CODE		CEB4331		COURSE CATEGORY		PC		L-T-P-S		0-0-2-0					
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-4					
ASSESSMENT SCHEME															
CIA						ESE									
80%						20%									
Course Description		This course provides practical experience for students in testing the quality of highway construction materials. It includes testing of bitumen, aggregates and soil.													
Course Objective		1. To conduct tests to check suitability of given pavement material 2. To know and identify tests suitable for any a pavement 3. To get familiar with field or in-situ tests 4. To demonstrate how to conduct laboratory-based tests.													
Course Outcome		Upon completion of this course, the students will be able to 1. Assess the quality of various pavement materials and their suitability in highway construction 2. Identify suitable tests for any given pavement construction material. 3. Conduct field or in-situ tests on highway materials. 4. Conduct laboratory-based tests on highway materials.													
Prerequisites: Transportation Engineering – I															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	1	3	3	1	2	1	1	1	2	2	3	-
CO-2	2	2	1	1	3	3	1	2	1	1	1	2	2	3	-
CO-3	2	2	1	1	3	3	1	2	1	1	1	2	2	3	-
CO-4	2	2	1	1	3	3	1	2	1	1	1	2	2	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Aggregate crushing value														
2	Aggregate impact value														
3	Los Angeles abrasion value														
4	Shape tests-Flakiness index and Elongation index														
5	Angularity of coarse aggregates and fine aggregates														

6	Specific gravity and water absorption of coarse aggregate
7	California Bearing Ratio test (Soaked and Un-soaked CBR)
8	Dynamic cone penetration test (ASTM D6951 (2015) procedure)
9	Penetration value of bitumen
10	Softening point of bitumen
11	Ductility of bitumen
12	Flash and Fire point of bitumen
13	Determination of theoretical specific gravity of loose mix and bulk specific gravity of compacted mix (ASTM D2041, ASTM D1188)
LIST OF EQUIPMENTS (For a batch of 30 students)	
1	Aggregate crushing machine
2	Los Angeles abrasion
3	Penetration value of bitumen
4	Softening point of bitumen
5	Ductility of bitumen
6	California bearing ratio test
7	Specific gravity test
8	Heating equipment
9	Measuring equipment (pycnometer etc)

COURSE TITLE		GEO TECHNICAL ENGINEERING LAB							CREDITS		1				
COURSE CODE		CEB4332			COURSE CATEGORY			PC		L-T-P-S		0-0-2-0			
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
CIA								ESE							
80%								20%							
Course Description		Geotechnical laboratory deal with testing of different types of soils and to determine its characteristics experimentally.													
Course Objective		1. To acquire knowledge on Grain size distribution of soils 2. To acquire knowledge on determine the characteristics of various soils. 3. To acquire knowledge on conducting tests on shear strength parameters of the Soil 4. To acquire knowledge on preparing the Soil Investigation report 5. To acquire knowledge on to Prepare the Field test report on Geotechnical investigation studies													
Course Outcome		Upon completion of this course, the students will be able to 1. Determine the grain size distribution. 2. Describe and determine the characteristics of various soils. 3. Find the shear strength parameters of the Soil 4. Explain and prepare the Soil Investigation report 5. Prepare the Field test report on Geotechnical investigation studies													
Prerequisites: Geo Technical Engineering															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO-2	2	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO-3	2	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO-4	2	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO-5	2	1	-	-	-				-	-	-	-	1	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Grain size distribution of soil														
2	Specific gravity of soil														

3	Relative density of sands
4	Determination of Atterberg limits
5	Moisture – density relationship using standard Proctor test.
6	Permeability of soil
7	Direct shear test on cohesion less soil
8	Unconfined compression test on cohesive soil
9	Triaxial compression test
10	Determination of co-efficient of consolidation
11	Field density test
LIST OF EQUIPMENTS (For a batch of 30 students)	
1.	Sieve shaker
2	Pycnometer
3	Core cutter
4	Liquid limit apparatus
5	Electrical oven
6	Constant head Permeameter
7	Falling head permeameter
8	Direct shear test
9	UCC testing machine
10	Triaxial shear apparatus
REFERENCE BOOKS	
1	IS: 4198 -1970, Classification and Identification of soils for general Engineering purposes.
2	IS:2720 –Methods of test for soils

COURSE TITLE		DESIGN PROJECT III										CREDITS		1	
COURSE CODE		CEB4333			COURSE CATEGORY			PC		L-T-P-S			0-0-2-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-5		
ASSESSMENT PATTERN															
First Review (CIA)				Second Review (CIA)				Third Review (CIA)				Project Report & Viva (CIA)			
20				20				30				30			
Course Description		To provide sufficient hands-on learning experience related to the design, development and analysis of suitable product / process so as to enhance the technical skill sets in the chosen field.													
Course Objective		1. To enable the students to apply the theoretical knowledge in practice 2. To enable them to plan and organize a small Civil Engineering project and write a report on the work 3. To improve the level of confidence in presenting the civil engineering concepts.													
Course Outcome		Upon completion of this course, the students will be able to 1. Formulate specific problem statements for real life problems 2. Perform literature search in the area of interest. 3. Conduct experiments / Design and Analysis / solution iterations and document the results. 4. Synthesize the results and arrive at scientific conclusions / products / solution 5. Document the results in the form of technical report / presentation													
Prerequisites: Knowledge on Basic Core Courses															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	3	2	2	-	1	1	-	3	3	1	3	2	3	3
CO-2	2	3	2	3	3	2	3	2	3	2	1	3	2	3	3
CO-3	2	3	2	3	3	2	3	2	3	2	1	3	2	3	3
CO-4	2	3	3	3	3	2	3	2	3	2	1	3	2	3	3
CO-5	2	3	3	3	2	2	2	2	3	3	3	3	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															

In this project each group consisting of four/five members is expected to design and develop practical solutions to real life problems related to Industry and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge gained from the subject should be applied to develop effective solutions to various computing problems. At the end of the course the group should submit a complete report of the project work carried out.

COURSE TITLE		OPTIMIZATION TECHNIQUES								CREDITS			4		
COURSE CODE		MAA 4301		COURSE CATEGORY			BS			L-T-P-S			3-1-0-0		
Version		1.0		Approval Details			24 th ACM, 30.5.2018			LEARNING LEVEL			BTL-4		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE		
15%		15%		10%			5%			5%			50%		
Course Description		To make the student develop a knowledge in the field of optimization techniques ,basic concepts, principles of linear and integer programming, assignment and transportation problems													
Course Objectives		1. To understand the concept of optimization 2. To formulate linear programming model 3. To understand the concept of integer programming 4. To understand the assignment and transportation problem 5. To understand the concept of network analysis													
Course Outcomes		Upon completion of this course, the students will be able to 1. Formulate mathematical model 2. Cast engineering maxima/minima problems into optimization framework. 3. Solve the integer programming problems 4. Solve the assignment and transportation problems 5. Analyze the designs of networks													
Prerequisites:															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	-	1	-	1	1	-	-	-	-	-	-	2	1	-
CO-2	3	-	1	-	-	1	-	-	-	-	-	-	1	1	-
CO-3	2	-	-	-	1	1	-	-	-	-	-	-	2	2	-
CO-4	3	-	1	-	1	1	-	-	-	-	-	-	1	1	-
CO-5	2	-	3	-	-	1	-	-	-	-	-	-	2	1	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: INTRODUCTION TO OPTIMIZATION (9L+3T=12)	
Introduction to operations research – objective – scope of OR – Limitations of OR – Introduction and formulation of linear programming – Solving LPP using Graphical method. Suggested Reading: Basics of inequalities	CO-1 BTL-2
MODULE 2: LINEAR PROGRAMMING PROBLEM (9L+3T=12)	
Solving LPP using simple method – Big-M method – Two phase method – conversion of primal to dual. Suggested Reading: System of equations	CO-2 BTL-3
MODULE 3: INTEGER PROGRAMMING (9L+3T=12)	
Integer programming – Cutting plane method – Gomory's Mixed integer method – Branch and Bound method Suggested Reading: System of equations	CO-3 BTL-4
MODULE 4: ASSIGNMENT AND TRANSPORTATION PROBLEM (9L+3T=12)	
Hungarian Method – Maximization and unbalanced assignment problem – Basic feasible solution of transportation problem – Modi method – Degeneracy – Unbalanced Transportation problem. Suggested Reading: Arithmetic Calculation	CO-3 BTL-4
MODULE 5: PERT AND CPM (9L+3T=12)	
Network diagram – Representation – Labeling – CPM – PERT probabilities of CPM – PERT probabilities of project duration. Suggested Reading: Basics of graphs	CO-4 BTL-4
TEXT BOOKS	
1.	Chandrasekaran A. (2017). <i>A Textbook of Operation Research</i> ", Dhanam Publications, Chennai.
2.	V. Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan. (2014). <i>Resource Management Techniques</i> , A. R. Publications.
3.	S. D. Sharma. (2012). <i>Operation Research</i> , Kedarnath Ramnath & Co.
REFERENCE BOOKS	
1.	Hamdy A. Taha. (2010). <i>Operations Research: An Introduction</i> , Prentice Hall, 9 th edition.
2.	D S Hira & Prem Kumar Gupta. (2012). <i>Introduction to Operations Research</i> , S. Chand Publishing
E BOOKS	
1.	http://nptel.ac.in/courses/112106134/1
2.	https://onlinecourses.nptel.ac.in/noc17_mg10/preview
MOOC	
1.	https://www.edx.org/course/operations-management-iimbx-om101-1x

COURSE TITLE			DESIGN OF STEEL STRUCTURES								CREDITS		4		
COURSE CODE			CEB4316		COURSE CATEGORY			PC			L-T-P-S		3-1-0-1		
Version			1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE		
15%			15%		10%			5%			5%		50%		
Course Description			This course deals with the limit state design of steel structural components as per the current code of practice.												
Course Objective			1. To gain knowledge in the limit state design of steel structures and the design of connections. 2. To be familiar with the design concepts of steel structural members subjected to tension. 3. To understand the design concepts of the structural steel members subjected to compression. 4. To be familiar with the design concepts of structural members subjected to bending. 5. Be acquainted with the design concepts of the components of industrial structures.												
Course Outcome			Upon completion of this course, the students will be able to 1. Design the connections for the steel structural members using bolts and welds. 2. Design the structural members subjected to tension. 3. Design single and compound compression members. 4. Design laterally supported and unsupported beams. 5. Design the components of industrial structures.												
Prerequisites: Structural Analysis, Advanced structural analysis															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO -4	PO-5	PO- 6	PO- 7	PO -8	PO- 9	PO - 10	PO- 11	PO -12	PSO -1	PSO -2	PS O-3
CO-1	1	2	3	3	1	3	1	3	1	2	1	3	2	3	-
CO-2	1	2	3	3	1	3	1	3	1	2	1	3	2	3	-
CO-3	1	2	3	3	1	3	1	3	1	2	1	3	2	3	-
CO-4	1	2	3	3	1	3	1	3	1	2	1	3	2	3	-
CO-5	1	2	3	3	1	3	1	3	1	2	1	3	2	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION											(12L+3T)				

Properties of steel - Structural steel sections - Limit State Design Concepts - Loads on Structures - Metal joining methods using welding, bolting - Design of bolted, and welded joints - Eccentric connections - Efficiency of joints - High Tension bolts		CO-1 BTL-3
MODULE 2 : TENSION MEMBERS (9L+3T)		
Types of sections - Net area - Net effective sections for angles and Tee in tension - Design of connections in tension members - Use of lug angles - Design of tension splice - Concept of shear lag		CO-2 BTL-3
MODULE 3: COMPRESSION MEMBERS (9L+3T)		
Types of compression members - Theory of columns - Basis of current code provision for compression member design - Slenderness ratio - Design of single section and compound section compression members - Design of lacing and battening type columns- Built up columns.		CO-3 BTL-3
MODULE 4: BEAMS (9L+3T)		
Design of laterally supported and unsupported beams – Built up beams., Design of Plate Girder		CO-4 BTL-3
MODULE 5: ROOF STRUCTURES AND INDUSTRIAL STRUCTURES (6L+3T)		
Roof trusses - Roof and side coverings - Design loads, design of purlin and elements of truss; end bearing– Introduction to pre-engineered buildings.		CO-5 BTL-3
Self-study Topic: Pre-engineered buildings.		
TEXT BOOKS		
1	N.Subramanian. (2011). <i>Design of Steel Structures</i> , Oxford University press.	
2	S.K.Duggal. (2010). <i>Limit State Design of Steel Structures</i> , Tata McGraw Hill Education Pvt. Ltd.	
REFERENCE BOOKS		
1	<i>Teaching Resources for Structural Steel Design - Vol. I & II</i> ", INSDAG, Kolkatta.	
2	Dr.Ramachandra, Virendra Gehlot. (2010). <i>Limit State Design of Steel Structures</i> , Scientific Publishers, New Delhi.	
3	Dr. V.L. Shah, S.S. Karve. (2009). <i>Limit State Design of Steel Structures</i> , Structures Publications.	
E BOOKS		
1	https://www.pdfdrive.net/design-of-steel-structures-e38351494.html	
2	https://www.pdfdrive.com/search?q=steel+structures&pagecount=&pubyear=&searchin=&em	
MOOC		
1	https://en.learncafe.com/courses/steel-structural-design	
2	https://onlinecourses.nptel.ac.in/noc17_ce21	
3	https://www.udemy.com/structural-steel-design/	

COURSE TITLE	HYDRAULIC ENGINEERING			CREDITS	4
COURSE CODE	CEB4203	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course introduces the students to the basic concepts of open channel flow and describes the type of flow. The working principles of pumps and turbines are also introduced.
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Course Objective	<ol style="list-style-type: none"> To understand the principles behind open channel flow. To differentiate between uniform and non- uniform flow. To study the impulse momentum principle. To study the design concepts of turbines. To be familiar with the design the concepts of pumps
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> Demonstrate the types of Open channel flow Identify uniform and non-uniform flows and determine the most Economical sections Analyze the force exerted by a jet of water on various plates using impulse momentum principle Apply the concept of impulse momentum principle on turbines to design and select turbines. Apply the concept of impulse momentum principle on pumps to design and select Pumps
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Prerequisites: CEB4203- Mechanics of Fluids**CO, PO AND PSO MAPPING**

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	3	-	3	2	1	1	1	-	2	3	2	-
CO-2	1	2	2	3	-	3	2	1	1	1	-	2	3	2	-
CO-3	1	2	2	3	1	3	2	1	1	1	-	2	3	2	-
CO-4	1	2	2	3	1	3	2	1	1	1	-	2	3	2	-
CO-5	1	2	2	3	-	3	2	1	1	1	-	2	3	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: OPEN CHANNEL FLOW		(9L+3T)
Open channel flow – Types of flow – Velocity distribution in open channel – Wide open channel –Specific energy – Critical flow and its computation.		CO-1 BTL-3
MODULE 2: UNIFORM AND NON UNIFORM FLOW		(9L+3T)
Uniform flow – Velocity measurement – Manning’s and Chezy’s formula – Determination of roughness coefficients –Most economical rectangular and trapezoidal sections- Hydraulic Jumps		CO-2 BTL-3
MODULE 3 :IMPULSE MOMENTUM PRINCIPLE		(9L+3T)
Application of momentum principle – Introduction to impact of jets on vanes – velocity triangles.		CO-3 BTL-3
MODULE 5: PUMPS		(9L+3T)
Centrifugal pump – multistage Pumps – Jet and submersible pumps – reciprocating pump – negative slip – flow separation conditions – air vessels –indicator diagram.		CO-4 BTL-3
MODULE 5: TURBINES		(9L+3T)
Impulse Turbine-pelton wheel- Reaction Turbines- Francis Turbine- Kaplan Turbine- Characteristics curves		CO-5 BTL-3
TEXT BOOKS		
1.	Subramanyam K. (2015). <i>Flow in Open channels</i> , Tata McGraw-Hill Publishing Company.	
2	P.N.Modi, S.M.Seth. (2005). <i>Hydraulics and Fluid Mechanics</i> , 12 th Edition.	
3	R.K. Bansal. (2016). <i>Fluid Mechanics and Hydraulic Machines</i> , Laxmi Publication (P) Publishing House (P) Ltd, 9 th Edition.	
4	Subramanyam K, (2015). <i>Flow in Open channels</i> , Tata McGraw-Hill Publishing Company.	
REFERENCE BOOKS		
1	Ven Te Chow. (2009). <i>Open-Channel Hydraulics</i> , The Blackburn Press.	
2	John A. Roberson. (2013). <i>Hydraulic Engineering</i> , John Wiley & Sons, Incorporated.	
E BOOKS		
1	http://www.engineeringbookspdf.com/civil-engineering-hydraulics-3rd-edition/	
2	http://www.engineeringbookspdf.com/hydraulics-in-civil-and-environmental-engineering-third-edition-by-andrew-chadwick-and-john-morfett/	
MOOC		
1	https://www.coursera.org/learn/fluid-power	
2	https://www.class-central.com/course/nptel-fluid-machines-6562	

COURSE TITLE		PROFESSIONAL ETHICS AND LIFE SKILLS										CREDITS		2	
COURSE CODE		GEA4316				COURSE CATEGORY			BS			L-T-P-S		2-0-0-1	
Version		1.0				Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE	
15%		15%				10%			5%			5%		50%	
Course Description		This course covers concepts related to professional ethics and life skills. It includes both personal and professional aspects. It also includes several aspects of life skills that can add value into one's life significantly.													
Course Objective		<ol style="list-style-type: none"> 1. To introduce value systems that make humanity to thrive. 2. To explain theories about life and moral dilemmas. 3. To elaborate on the rights a person can have in his employment 4. To introduce basic life skills 5. To explain about social sense and responsibilities for communal harmony. 													
Course Outcome		<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain human value systems. 2. Apply theories about moral dilemmas in life. 3. Explain how safety and rights are critical in a profession. 4. Apply basic life skills learned in both life and profession. 5. Explain the importance of social sense and responsibilities. 													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	1	2	2	3	2	1	1	2	2	3	3
CO-2	1	2	1	2	1	2	2	3	2	2	2	2	2	3	3
CO-3	1	2	1	2	1	3	2	3	2	2	2	1	2	3	3
CO-4	1	2	1	2	1	2	2	3	2	2	2	2	2	3	3
CO-5	1	2	1	2	1	2	2	3	2	2	2	2	2	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: HUMAN VALUES (9L)	
Definition of Ethics-Morals values and ethics – Integrity-Work ethics- Service Learning-Civic Virtue-Respect for Others-Caring-Sharing-Honesty-Courage-Valuing Time-Cooperation-Commitment-Empathy-Self-Confidence-Character-Spirituality-Introduction to Yoga and meditation for professional excellence and stress management. Self-Study: Case study of Discovery failure.	CO-1 BTL-3
MODULE 2: ENGINEERING ETHICS (9L)	
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories. Self-study: Study the Bhopal gas tragedy.	CO-2 BTL-3
MODULE 3: SAFETY, RESPONSIBILITIES AND RIGHTS (9L)	
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination. Self-study: Chernobyl explosion, Nuclear and thermal power plant issues.	CO-3 BTL-3
MODULE 4: LIFE SKILLS (9L)	
Definition, Relevance, Types of values, changing concepts of values-aims and values of value education- basic etiquette-morals and values in life-dealing with people. Personal values – Self – Strengths (self-confidence, self-assessment, self-reliance, self-discipline, determination, self-restraint, contentment, humility, sympathy and compassion, gratitude, forgiveness) Weaknesses. Self-study: Influences - Peer pressure, familial and societal expectations, media.	CO-4 BTL-3
MODULE 5: SOCIETIES IN PROGRESS (9L)	
Definition of society; Units of society; Communities – ancient and modern – Agents of change – Sense of survival, security, desire for comfort and ease sense of belonging, social consciousness and responsibility. Self-study: Personal value and professional value of Engineers on societies perception.	CO-5 BTL-3
TEXT BOOKS	
1	Subramanian R. (2017). <i>Professional ethics</i> , Oxford University press.
2	Manoharan P.K. (2008). <i>Education and Personality Development</i> , APH Publishing Corporation, New Delhi.
REFERENCE BOOKS	
1.	Megan J. Murphy, Lorna Hecker. (2016). <i>Ethics and Professional Issues in Couple and Family Therapy</i> , Routledge; 2nd edition.
2.	Andrew Belsey , Ruth Chadwick. (1992). <i>Ethical Issues in Journalism and the Media (Professional Ethics)</i> , Routledge; 1st edition
3.	Warwick Fox. (2000). <i>Ethics and the Built Environment (Professional Ethics)</i> , Routledge, 1st edition
4.	RuchikaNath, <i>Value Education</i> , APH Publishing Corporation, New Delhi, 2008

COURSE TITLE		HYDRAULIC ENGINEERING LAB						CREDITS		1					
COURSE CODE		CEB4341		COURSE CATEGORY		PC		L-T-P-S		0-0-2-0					
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3					
ASSESSMENT SCHEME															
CIA			80%			ESE			20%						
Course Description		The experiments in Hydraulic Engineering lab demonstrates the working principles of pumps and turbines and helps to study the performance of hydraulic machines													
Course Objective		1. To study the performance of centrifugal pump 2. To study the performance of displacement pump 3. To study the characteristics of gear oil pump 4. To study the performance of impulse turbine. 5. To study the performance of reaction turbine													
Course Outcome		Upon completion of this course, the students will be able to 1. Classify pumps based on efficiency and draw the characteristic curves of centrifugal, submersible and jet pump 2. Draw the characteristic curves of Reciprocating pump and Gear oil pump 3. Study the performance of Impulse turbine. 4. Compare the performance of Pelton wheel and reaction turbines 5. Evaluate the power produced by a turbine													
Prerequisites: CEB4317- Hydraulic Engineering															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	1	3	3	1	1	3	1	-	-	3	-	-
CO-2	1	2	3	1	3	3	1	1	3	1	-	-	3	-	-
CO-3	1	2	3	1	3	3	1	1	3	1	-	-	3	-	-
CO-4	1	2	3	1	3	3	1	1	3	1	-	-	3	-	-
CO-5	1	2	3	1	3	3	1	1	3	1	-	-	3	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

LIST OF EXPERIMENTS

1. Study on the Performance of Centrifugal pump
2. Study on the Performance of submersible pump.
3. Study on the Performance of Jet pump.
4. Study on the Performance of Reciprocating pump.
5. Study on the Performance of Gear oil pump.
6. Study on the Performance of Turbo Impulse Turbine.
7. Study on the Performance of Pelton Wheel Turbine
8. Study on the Performance of Francis Turbine.
9. Study on the Performance of Kaplan Turbine.

REFERENCE BOOKS

1	Ven Te Chow. (2009). <i>Open-Channel Hydraulics</i> , The Blackburn Press.
3	John A. Roberson. (2013). <i>Hydraulic Engineering</i> , John Wiley & Sons.
4	Streeter, Victor, L. and Wylie, Benjamin E. (2010). <i>Fluid Mechanics</i> , McGraw-Hill Ltd.

COURSE TITLE		COMPUTER AIDED STRUCTURAL ANALYSIS LAB				CREDITS		1							
COURSE CODE		CEB4342		COURSE CATEGORY		PC		L-T-P-S		0-0-2-2					
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3					
ASSESSMENT SCHEME															
CIA						ESE									
80%						20%									
Course Description		This course provides hands on experience to students to work with software’s for solving analysis problems.													
Course Objective		1. Use ETABS for structural analysis of structures 2. Training on virtual lab 3. Analyze Beams and Portal Frames using ETABS/SAP200/STAAD.PRO software. 4. Compute forces in Trusses using ETABS/SAP200/ STAAD. Pro software. 5. Find forces in building members using ETABS/SAP200/ STAAD. Pro software.													
Course Outcome		Upon completion of this course, the students will be able 1. To analyze Buildings using ETABS 2. To conduct experiments using virtual lab 3. To solve the internal forces in Beams and Portal Frames using ETABS/SAP2000/ STAAD. Pro software. 4. To identify the internal forces in Trusses using ETABS/SAP200/ STAAD. Pro software. 5. To analyze a building and find the forces in the members.													
Prerequisites: Structural Analysis I, Mechanics of Structures II															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-2	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-3	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-4	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-5	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Introduction to ETABS.														

2	Introduction to Structural Engineering virtual lab
3	Analysis of Beams and Portal Frames
4	Analysis of Trusses
5	Analysis of Multi Storied Buildings- Residential Buildings, Commercial Buildings
LIST OF SOFTWARE	
1.	ETABS
2	SAP2000
3	STAAD. Pro

LIST OF EXPERIMENTS

In this project each group consisting of four/five members is expected to design and develop practical solutions to real life problems related to Industry and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge gained from the subject should be applied to develop effective solutions to various computing problems. At the end of the course the group should submit a complete report of the project work carried out.

COURSE TITLE					FOUNDATION ENGINEERING					CREDITS		4			
COURSE CODE					CEB4401		COURSE CATEGORY		PC		L-T-P-S		3-1-0-1		
Version					1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment					Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance		ESE		
15%					15%		10%		5%		5%		50%		
Course Description					This course deals with the need of soil investigation, and the design of suitable foundation.										
Course Objective					<div><div>1.</div><div>To get a basic understanding of the geotechnical site investigation.</div><div>2.</div><div>To know the types of foundation and the design concepts of shallow foundation.</div><div>3.</div><div>To get exposed to the determination of load carrying capacity of piles.</div><div>4.</div><div>To be familiar with the analysis of stability of slopes.</div><div>5.</div><div>To be familiar with the lateral pressure acting on the retaining walls.</div></div>										
Course Outcome					<div><div>Upon completion of this course, the students will be able to</div><div>1.</div><div>Apply different techniques for soil exploration</div><div>2.</div><div>Find the safe bearing capacity and settlement of shallow foundations in cohesive and cohesions soils.</div><div>3.</div><div>Describe the type of piles and determine the load carrying capacity and settlement of single pile and group of piles.</div><div>4.</div><div>Analyze stability of slopes and suggest suitable slope protection method.</div><div>5.</div><div>Determine the active and passive earth pressure on retaining walls and the pressure on the wall due to line loads.</div></div>										
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO -4	PO- 5	PO- 6	PO -7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PS O-1	PS O-2	PS O-3
CO-1	1	2	3	3	-	3	-	3	-	1	-	3	1	3	-
CO-2	1	2	3	3	3	3	-	3	-	1	-	3	1	3	-
CO-3	1	2	3	3	-	3	-	3	-	1	-	3	1	3	-
CO-4	1	2	3	3	-	3	-	3	-	1	-	3	1	3	-

CO-5	1	2	3	3	-	3	-	3	-	1	-	3	1	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: SITE INVESTIGATION AND SELECTION OF FOUNDATION (6L)															
Scope and objectives - Methods of exploration- Wash boring and rotary drilling - Depth of boring - Spacing of bore holes - Sampling - Representative and undisturbed sampling - sampling techniques - Split spoon sampler, thin tube sampler, Stationary piston sampler - Bore log report - Penetration tests (SPT and SCPT)														CO-1 BTL-2	
MODULE 2: SHALLOW FOUNDATION (12L+6T)															
Introduction - Location and depth of foundation - Codal provisions - bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - factors affecting bearing capacity - problems - Bearing Capacity from insitu tests (SPT, plate load) - Allowable bearing pressure, Settlement - Components of settlement -Allowable settlements- Methods of minimizing settlement, differential settlement. Types of foundation - Contact pressure distribution below footings and raft - Isolated and combined footings - types - proportioning of combined footing mat foundation –types.														CO-2 BTL-3	
MODULE 3: PILE FOUNDATIONS (9L+3T)															
Types of piles and their functions - Factors influencing the selection of piles - Load carrying capacity single pile in granular and cohesive soil - Static formula – dynamic formulae (Engineering news a Hiley's)-Negative skin friction - uplift capacity - Group capacity by different methods (Field's ru Converse Labarra formula) - Settlement of pile groups – Interpretation of pile load test – under reamed piles														CO-3 BTL-3	
MODULE 4: STABILITY OF SLOPES (9L+6T)															
Slope failure mechanisms - Modes - Infinite slopes - Finite slopes - Total and effective stress analysis - Stability analysis for purely cohesive and C- soils - Method of slices - Friction circle method - Stability number - problems - Slope protection measures.														CO-4 BTL-2	
MODULE 5 : LATERAL EARTH PRESSURE (9L)															
Plastic equilibrium in soils - active and passive states - Rankine's theory - cohesion less and cohesive soil - Coloumb's wedge theory - condition for critical failure plane - Earth pressure on retaining walls of simple configurations - Graphical methods (Rebhann and Culmann) - pressure on the wall due to line load.														CO-5 BTL-2	
SELF STUDY TOPIC: Case Studies on Pile foundations															
TEXT BOOKS															
1.	Arora K.R. (2016). <i>Soil Mechanics and Foundation Engineering</i> , Standard Publishers.														
2.	Purushothama Raj. P. (2013). <i>Soil Mechanics and Foundation Engineering</i> . 2nd Edition, Pearson Education.														
3.	Gopal Ranjan and Rao A.S.R. (2016). <i>Basic and Applied soil mechanics</i> . New Age International Pvt Ltd; Third edition.														
4.	Varghese, P.C. (2005). <i>Foundation Engineering</i> . Prentice Hall of India Private Limited, New Delhi.														
REFERENCE BOOKS															

1.	Das, B.M. (2015). <i>Principles of Foundation Engineering</i> , Thompson Asia Pvt. Ltd., Singapore. 5 th edition.
2.	Bowles J.E. (2017). <i>Foundation analysis and design</i> . McGraw-Hill.
3.	Swami Saran. (2008). <i>Analysis and Design of Substructures – Limit state Design</i> , Oxford IBH Publishing Co-Pvt. Ltd., New Delhi.
4.	Kaniraj, S.R. (2016). <i>Design aids in Soil Mechanics and Foundation Engineering</i> , Tata McGraw Hill publishing company Ltd., New Delhi.
5.	B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain. (2017). <i>Soil Mechanics and Foundations</i> . Laxmi Publications; Sixteenth edition.

E BOOKS

1	https://www.pdfdrive.net/principles-of-foundation-engineering-7th-edition-e18909928.html
2	https://www.pdfdrive.net/foundation-engineering-e33514153.html

MOOC

1	https://www.online.colostate.edu/courses/CIVE/CIVE550.dot
2	https://ocw.mit.edu/courses/civil-and-environmental-engineering/
3	http://academicearth.org/masters-in-geotechnical-engineering/

COURSE TITLE	TRANSPORTATION ENGINEERING - II							CREDITS			3				
COURSE CODE	CEB4304			COURSE CATEGORY			PC		L-T-P-S			3-0-0-0			
Version	1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment	Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE			
15%	15%			10%			5%		5%			50%			
Course Description	This course provides students with basic introduction of three major aspects of transportation: railways, airports, and seaports. (Road transport is covered elsewhere earlier in another course). It also provides a broad outlook on how these systems are critical in our country’s growth and productivity.														
Course Objective	<div>1. To introduce students about how railway system plays a major role in country’s development.</div> <div>2. To make students familiarize about how some of the critical control systems in railways work.</div> <div>3. To teach about the importance of civil engineering side of airports.</div> <div>4. To teach how to design basic layouts for airports.</div> <div>5. To explain how harbours and ports are built.</div>														
Course Outcome	<div>Upon completion of this course, the students will be able to</div> <div>1. Explain how railway planning and design can be performed.</div> <div>2. Explain how railway line turnouts work.</div> <div>3. Identify the components of airports and execute the design.</div> <div>4. Explain the airport layout and traffic control.</div> <div>5. Explain classification of harbours, their planning and layouts, coastal structures and the navigational aids</div>														
Prerequisites: Nil.															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	1	1	2	1	2	1	1	2	1	3	3	-
CO-2	1	2	3	2	1	2	1	1	1	1	2	1	3	3	-
CO-3	1	2	3	1	2	2	1	1	1	1	2	1	3	3	-

CO-4	1	2	3	1	1	2	1	1	1	1	2	1	3	3	-
CO-5	1	2	3	1	1	2	1	1	1	1	2	1	3	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: RAILWAY PLANNING AND DESIGN (9L)															
Role of Indian Railways in National Development - Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipment's) Permanent Way, its Components and Functions of each Component: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density Ballasts – Functions, Materials, Ballast less Tracks Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems)														CO-1 BTL-3	
MODULE 2: RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION (9L)															
Points and Crossings - Design of Turnouts, Working Principle. Signaling, Interlocking and Track Circuiting Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage Track Modernization– Automated maintenance and upgrading, Technologies, Re-laying of Track, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings. Introduction to Mono rail, High Speed rail and MRTS														CO-2 BTL-3	
MODULE 3: AIRPORT PLANNING AND DESIGN (9L)															
Advantages and Limitations of Air Transport, Components of Airports Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional Arrangements Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage. Airport Zoning - Clearance over Highways and Railways														CO-3 BTL-3	
MODULE 4: AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL (9L)															
Airport Layouts – Apron, Terminal Building, Hangers, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings Air Traffic Control – Basic Actions, Air Traffic Control Network Helipads, Hangars, Service Equipment's.														CO-4 BTL-3	
MODULE 5: HARBOUR ENGINEERING & OTHER MODES OF TRANSPORT (9L)															
Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports Requirements and Classification of Harbours. Site Selection & Selection Investigation – Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Soundings, Anchoring Grounds, Geological Characteristics, Winds & Storms, Position and Size of Shoals Shore Considerations- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines Dry and Wet Docks, Planning and Layouts Entrance, Position of Light Houses, Navigating Terminal Facilities – Port Buildings, Warehouse, Transit														CO-5 BTL-3	

Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping, Inland Water Transport and Container Transportation. Pipe Ways, Rope Ways.	
TEXT BOOKS	
1	C Rangwala. (2011). <i>Railway Engineering</i> . Charotar Publishing House.
2	S.C. Rangwala. (2011). <i>Airport Engineering</i> , Charotar Publishing House.
3	Kadiyali L R. (1999). <i>Traffic Engineering and Transport Planning</i> , Khanna publishers.
4	Dr. Purushothama Raj. (2013). <i>Railways, Airports and Harbour Engineering</i> , Sri Krishna Hitech Publishing Company Pvt.Ltd.
5	Saxena Subhash C and Satyapal Arora. (2011). <i>A Course in Railway Engineering</i> , Dhanpat Rai and Sons, Delhi.
REFERENCE BOOKS	
1.	Oza and Oza. (2012). <i>A course in Docks & Harbour Engineering</i> , Charotar Publishing House.
2.	Bureau of Indian Standards (BIS) Publications on Highway Materials
3.	Specifications for Road and Bridges, MORTH (India)
E BOOKS	
1.	https://www.pdfdrive.net/ism-for-transportation-engineering-an-introduction-e19463916.html
MOOC	
1.	https://cee.illinois.edu/academics/graduate-programs/cee-online-%20program/cee-online-transportation-engineering
2.	https://www.mastersportal.com/studies/161540/transportation.html

COURSE TITLE	ESTIMATION AND QUANTITY SURVEYING			CREDITS	3
COURSE CODE	CEB4403	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation work, and ability to do rate analysis, valuation of properties
Course Objective	<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. Know about various methods of estimates 2. Familiar with the estimated of load bearing & framed structures. 3. Be familiar with the estimate of sanitary and water supply works including estimation of roads and cross drainage works. 4. Be familiar with specification and analysis of rates. 5. Understand the procedures involved in valuation of structure.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the various types of estimates. 2. Prepare an estimate of quantities for a building 3. Prepare estimates for various structures. 4. Prepare cost estimates for construction works. 5. Estimate the valuation of buildings by various methods

Prerequisites: Nil**CO, PO AND PSO MAPPING**

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	-	-	1	2	-	1	2	1	2	-	2	-	-
CO-2	3	-	2	-	-	2	1	1	2	1	2	-	2	-	-
CO-3	3	-	2	-	-	2	1	1	2	1	2	-	2	-	-
CO-4	3	-	2	-	-	2	1	1	2	1	2	-	2	-	-
CO-5	3	-	2	-	-	2	1	1	2	1	2	-	2	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (9)	
Units of measurements and conversion, Types of estimates, Methods of estimate – Advantages	CO-1 BTL-2
MODULE 2: ESTIMATE OF BUILDINGS (9)	
Load bearing and framed structure – Calculation of quantities of earth work, brick work, PCC, RCC, plastering, painting walls and doors and windows – Simple problems	CO-2 BTL-3
MODULE 3: ESTIMATE OF OTHER STRUCTURES AND ROAD WORK(9)	
Estimating of septic tank, soak pit – retaining wall – culvert – bituminous and concrete road,simple problems	CO-3 BTL-3
MODULE 4 :SPECIFICATION AND RATES (9)	
Schedule of rates, analysis of rates – RCC, Brick work, Plastering, Specification – RCC, Brick work, plastering <i>Self study: Specification for different items of work</i>	CO-4 BTL-3
MODULE 5: VALUATION (9)	
Methods of valuation – Land and building method, rent capitalization method, depreciation, calculation of rent, mortgage, lease, approved valuers <i>Self-study: Online certification from American Society of Professional Estimators</i>	CO-5 BTL-3
TEXT BOOKS	
1.	Dutta. B.N. (2016). <i>Estimating and Costing in Civil Engineering</i> , UBS Publishers & Distributors Pvt. Ltd.
2.	Rangwala. S.C. (2017). <i>Estimation, costing and valuation</i> , Jain Book agency, New Delhi.
REFERENCE BOOKS	
1.	CPWD, <i>CPWD Specification</i> , Government of India, New Delhi, 2016.
2.	CPWD, <i>Delhi Schedule of rates</i> , Government of India, New Delhi, 2016
3.	CPWD, <i>CPWD Analysis of Rates</i> , Government of India, New Delhi, 2016.
E BOOKS	
1.	http://www.uou.ac.in/sites/default/files/slm/Introduction-cyber-security.pdf
MOOC	
1	https://www.coursera.org/learn/construction-cost-estimating
2	http://www.billingengineer.com/quantity-surveying-blog.html
3	https://ww2.rics.org/en-in/events/e-learning/distance-learning/quantity-surveying-foundation-programme/

COURSE TITLE			QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION								CREDITS		3		
COURSE CODE			CEB4404			COURSE CATEGORY			PC		L-T-P-S		3-0-0-1		
Version			1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance		ESE		
15%			15%			10%			5%		5%		50%		
Course Description			Quality control is the contractor’s definition of how the project quality will be managed during construction of the project. Quality assurance is the process of identifying or deciding on all the quality requirements for a project.												
Course Objective			1. To understand the functions of Quality management stake holders. 2. To be familiar with the quality standards and systems. 3. To identify the quality importance in planning, ergonomics, taguchi’s concept and in quality methods. 4. To acquire knowledge in quality assurance and control requirements. 5. To be familiar with construction quality improvement.												
Course Outcome			Upon completion of this course, the students will be able to 1. Explain the various responsibilities of construction teams. 2. Prepare quality standard documents. 3. Apply quality policy to attain highest level of customer satisfaction in projects. 4. Summarize the quality control measures to be taken during the execution of the project. 5. Apply the relevant codes and standards for quality construction.												
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO -3	PO- 4	PO- 5	PO -6	PO -7	PO -8	PO-9	PO -10	PO- 11	PO -12	PSO- 1	PS O-2	PS O-3
CO-1	1	1	2	1	-	1	1	2	2	-	2	2	2	3	-
CO-2	-	1	1	1	-	1	-	2	1	-	2	3	2	2	-
CO-3	1	1	1	1	-	2	1	2	2	-	2	3	2	2	-
CO-4	1	1	1	1	-	2	-	2	2	-	2	3	2	3	-
CO-5	-	1	1	-	-	2	-	2	2	-	3	3	1	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: QUALITY MANAGEMENT										9L					

Quality - Introduction, Definitions, Objectives and Management functions, Types of Quality Organizational Structure- Responsibilities and authorities, Total Quality System, Inspection, Control and Improvement- Quality circles and Improvement Teams- Construction Team- Owner, engineers, Architect, Contractors.		CO-1 BTL-2
MODULE 2: QUALITY SYSTEMS9L		
Introduction - Quality System Standard- ISO family of standards and structure Requirement- Preparing quality systems Documents- Quality related training - Implementing Quality system- Third party certification.		CO-2 BTL-2
MODULE 3: QUALITY PLANNING 9L		
Quality Policy, Objectives and methods in construction Industry - Consumers Satisfaction- Ergonomics-Time of completion - Statistical tolerance - Taguchi's concept of quality - Contract Documents and Construction Programming - Factors influencing construction Quality - Inspection procedures for construction processes and products - Total QA/QC Programme- Cost of Quality.		CO-3 BTL-3
MODULE 4: QUALITY ASSURANCE AND CONTROL		9L
Definitions and Objectives - Techniques and needs of QA/QC- Regulatory agent, Contract and Construction oriented objectives and methods- Technical Control and Financial Control-- Different aspects of quality – Appraisals – organizing for quality and safety, Quality control by statistical methods, statistical quality control with sampling by attributes and variables – Quality control register, Quality control for concrete durability – Prescriptive specification, Maintenance of quality control register for road works and buildings.		CO-4 BTL-2
MODULE 5: QUALITY IMPROVEMENT		9L
Selection of Construction materials -Influence of drawings, detailing, work and material specifications – IS codes, Standardization-Bid Preparation-Construction Activity- Environmental safety, Social and Environmental factors -Natural causes and speed of construction- Life cycle costing- Value Engineering and value analysis.		CO-5 BTL-2
TEXT BOOKS		
1.	James, J.O Brian. (2002). <i>Construction Inspection Handbook - Quality Assurance and Quality Control</i> . Van Nostrand, New York.	
2.	Kwaku A., Tenah and Jose M.Guevera. (2005). <i>Fundamental of Construction Management and Organization</i> , Prentice Hall of India	
3.	Kumar Neeraj Jha. (2015). <i>Construction Project Management</i> , Pearson.	
REFERENCE BOOKS		
1.	Juran Frank, J.M. and Gryna, F.M. (2003). <i>Quality planning and Analysis</i> , Tata McGraw Hill.	
2.	Clarkson H. Oglesby. (2007). <i>Productivity Improvement in Construction</i> , McGraw Hill.	

E BOOKS	
1.	http://www.e-booksdirectory.com/details.php?ebook=6368
MOOC	
1	http://www.nptel.ac.in/courses/105103093
2	https://videoken.com/videodetail?videoID=nly3cxgsXOA&videoDuration=2945&videoName=Mod01%20Lec12%20Principles%20of%20quality%20control%20in%20concrete%20construction%20ructi%20on&keyword=Construction%20Management.
3	https://videoken.com/videodetail?videoID=ksR4Xy6tFcM&videoDuration=3442&videoName=Lec13%20Total%20Quality%20Management&keyword=Construction%20Management%20t.

COURSE TITLE		COMPUTER AIDED DESIGN AND DRAFTING LAB						CREDITS		1					
COURSE CODE		CEB4431			COURSE CATEGORY			PC		L-T-P-S		0-0-2-0			
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
CIA								ESE							
80%								20%							
Course Description		The course helps students to design important civil engineering structures and make neat structural engineering drawings for aiding in construction.													
Course Objective		1. To learn the design and drafting of deep beams and flat slab. 2. To acquire knowledge on the design and drafting of the solid slab bridge deck. 3. To learn the design and drafting of water tanks 4. To acquire knowledge on the design and drafting of steel trusses 5. To learn the design and drafting of plate girders with stiffeners													
Course Outcome		Upon completion of this course, the students will be able 1. To design and draft structural drawings for deep beams and flat slab. 2. To design and draft details of the solid slab bridge deck. 3. To design and draft water tanks 4. To design and draft trusses 5. To design and draft plate girders with stiffeners													
Prerequisites: <i>Design of Concrete Structures, Design of Steel Structures</i>															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-2	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-3	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
CO-4	2	3	3	3	3	2	-	1	-	1	1	2	1	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
LIST OF EXPERIMENTS															
1	Structural design and drafting of deep beams and flat slab.														
2	Structural design and drafting of the solid slab bridge deck.														
3	Structural design and drafting of water tanks														
4	Structural design and drafting of trusses														

5	Structural design and drafting of plate girders with stiffeners
LIST OF EQUIPMENTS	
1.	AutoCAD 2022 on P5 systems

Prerequisites: All Core Courses of Civil Engineering

1.	Trishna. (2020). <i>GATE Civil Engineering</i> . Pearson Publishers.
REFERENCE BOOKS	
1.	L.S Blake. (2017). <i>Civil Engineer's Reference Book</i> , CRC Press, Fourth Edition.
E BOOKS	
1.	https://www.amazon.in/Basic-knowledge-civil-engineering-including-ebook/dp/B07SHPSWHG
MOOC	
1.	https://www.my-mooc.com/en/categorie/civil-engineering

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS

In this project each group consisting of four/five members is expected to design and develop practical solutions to real life problems related to Industry and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge gained from the subject should be applied to develop effective solutions to various computing problems. At the end of the course the group should submit a complete report of the project work carried out.

SEMESTER – VIII

COURSE TITLE			PROJECT WORK & VIVA VOCE								CREDITS			8	
COURSE CODE			CEB4441			COURSE CATEGORY			PC		L-T-P-S			0-0-24-0	
Version			1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-6	
ASSESMENT PATTERN															
First Review (CIA)			Second Review (CIA)			Third Review (CIA)			Project Report & Viva (ESE)						
10			20			20			50						
Course Description			To provide sufficient hands-on learning experience related to the design, development and analysis of suitable product / process so as to enhance the technical skill sets in the chosen field.												
Course Objective			1. To enable the students to apply the theoretical knowledge in practice 2. To enable them to plan and organize a small Civil Engineering project and write a report on the work 3. To improve the level of confidence in presenting the civil engineering concepts.												
Course Outcome			Upon completion of this course, the students will be able to 1. Formulate specific problem statements for real life problems 2. Perform literature search in the area of interest. 3. Conduct experiments / Design and Analysis / solution iterations and document the results. 4. Synthesize the results and arrive at scientific conclusions / products / solution 5. Document the results in the form of technical report / presentation												
Prerequisites: Knowledge on Basic Core Courses															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	3	2	2	-	1	1	-	3	3	1	3	2	3	3
CO-2	2	3	2	3	3	2	3	2	3	2	1	3	2	3	3
CO-3	2	3	2	3	3	2	3	2	3	2	1	3	2	3	3
CO-4	2	3	2	3	3	2	3	2	3	2	1	3	2	3	3
CO-5	2	3	2	3	2	2	2	2	3	3	3	3	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															

The Project Work shall be carried out in any of the Civil Engineering areas such as Structural Engineering, Environmental Engineering, Water Resources Engineering, Transportation Engineering, Soil Mechanics and Remote sensing. Students shall work in convenient groups of not more than four members in a group. Every Project Work shall have a Guide who is a member of the faculty of the University. During this period the students shall receive directions from the Supervisor for the progress of the Project Work. The students shall give periodical presentations of the progress made in the Project Work.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, Project work details and conclusions. This final report shall be typewritten form as specified in the guidelines.

DEPARTMENT ELECTIVES

COURSE TITLE		ENGINEERING GEOLOGY								CREDITS		3			
COURSE CODE		CEC4251		COURSE CATEGORY			DE			L-T-P-S		3-0-0-0			
Version		1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE			
15%		15%		10%			5%			5%		50%			
Course Description		Engineering geology is the application of geology to engineering study for the purpose of assuring that the geological factors regarding the location, design, construction, operation and maintenance of engineering works are recognized and accounted for.													
Course Objective		1. To know about earth structures composition and earthquake belts. 2. To know about the physical properties and engineering significance of minerals. 3. To study about different classification of rocks and its engineering properties. 4. To know about seismic and electrical methods for Civil Engineering investigations. 5. To understand the geological conditions necessary for Civil Engineering constructions													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the earth structures, composition and earthquake belts. 2. Familiarize the physical properties of minerals. 3. Differentiate the types of rock materials. 4. Classify the seismic and electrical methods for Civil Engineering investigations. 5. Recognize remote sensing and GIS techniques in the field of Civil Engineering													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	1	-	-	1	-	-	-	-	-	-	-	2	-
CO-2	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-
CO-3	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-
CO-4	-	-	1	-	-	-	-	-	2	-	-	-	-	2	-

CO-5	-	-	1	-	-	-	-	-	-	-	3	-	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related														
MODULE 1: PHYSICAL GEOLOGY										9L				
Geology in civil engineering – branches of geology – structure of earth and its composition – weathering of rocks – scale of weathering – soils – landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering. Plate tectonics – Earth quakes – Seismic zones in India.													CO-1 BTL-2	
MODULE 2: MINERALOGY 9L														
Properties of minerals - study of rock forming minerals - Quartz family. Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - properties, behaviour and engineering significance of clay minerals - Fundamentals of process of formation of ore minerals - Coal and petroleum - Their origin and occurrence in India.													CO-2 BTL-2	
MODULE 3: PETROLOGY 9L														
Classification of rocks - distinction between igneous, sedimentary and metamorphic rocks, Description occurrence, engineering properties and distribution of rocks - Igneous rocks - Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt, Sedimentary rocks - sandstone, Limestone, shale congl, Conglomerate and breccia, Metamorphic rocks - Quartzite, Marble, Slate, Phyllite, Gneiss and Schist.													CO-3 BTL-3	
MODULE 4: STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS										9L				
Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and Electrical methods for subsurface investigations related to Civil Engineering.													CO-4 BTL-2	
MODULE 5: GEODESY										9L				
Remote Sensing – Concept, Application and its Limitations; Geographic Information System (GIS) and Global Positioning System (GPS) – Concept and their use resource mapping. LANDSAT Imagery –Definition and its use. Impact of Mining, Quarrying and Reservoirs on Environment.													CO-5 BTL-2	
TEXT BOOKS														
1.		Parbin Singh. (2015). <i>Engineering and General Geology</i> , S.K. Kataria and Sons												
2.		Krynine and Judd. (2005). <i>Engineering Geology and Geotechniques</i> , CBS Publisher.												
REFERENCE BOOKS														
1.		Subinoy Gangopadhyay. (2013). <i>Engineering Geology</i> , Oxford University Press.												
2.		Alan E Kehew. (2016). <i>Geology for Engineers and Environmental Scientists</i> , Pearson India												
E BOOKS														

1.	http://www.geology.cz/projekt681900/vyukove-materialy/Priloha%20JV_4.pdf
MOOC	
1.	http://www.open.edu/openlearn/science-maths-technology/science/geology

COURSE TITLE		IRRIGATION ENGINEERING										CREDITS		3	
COURSE CODE		CEC4252				COURSE CATEGORY			DE			L-T-P-S		3-0-0-0	
Version		1.0				Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE	
15%		15%				10%			5%			5%		50%	
Course Description		This course deals with the different cropping patterns and crop water requirements, irrigation scheduling, strategies in water use, operation of canal irrigation system and irrigation management.													
Course Objective		1. To understand the different cropping patterns and crop water requirements. 2. To be familiar with irrigation scheduling. 3. To gain knowledge on the strategies in water use. 4. To understand the operation of canal irrigation system. 5. To be familiar with participatory irrigation management.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the need for irrigation. 2. Design an irrigation system for different types of soils. 3. Develop knowledge on the diversion and impounding structures 4. Design the canal irrigation system 5. Explain the importance of cross drainage and canal regulation works.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	1	2	-	3	3	-	-	-	-	-	-	-	3	-
CO-2	-	1	2	-	3	3	3	-	-	-	-	-	-	3	-
CO-3	-	1	2	-	3	3	-	-	-	-	-	-	-	3	-
CO-4	-	1	2	-	3	3	3	-	-	-	-	-	-	3	-
CO-5	-	1	2	-	3	3	-	-	-	-	-	-	-	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: INTRODUCTION		9L
Classification of soil water- soil moisture contents- depth of soil water available to plants permanent and ultimate wilting point- Crop and crop seasons - consumptive use of water - Duty -Factors affecting duty - Irrigation efficiencies.		CO-1 BTL-2
MODULE 2: IRRIGATION METHODS AND DESIGN OF IRRIGATION CHANNEL		9L
Canal irrigation - Lift irrigation - Tank irrigation - Flooding methods - Merits and demerits - Sprinkler irrigation - Drip irrigation, FSL of canal- design of canal in alluvial soil and non-alluvial soils- use of Garrets diagrams and Lacey’s Regime diagrams- lining of irrigation channels.		CO-2 BTL-3
MODULE 3: DIVERSION AND IMPOUNDING STRUCTURES		9L
Weirs - elementary profile of a weir - weirs on pervious foundations - Types of impounding structures- Tanks, Sluices and Weirs - Gravity dams - Earth dams - Arch dams - Spillways – Factors affecting location and type of dams - Forces on a dam.		CO-3 BTL-2
MODULE 4: CANAL IRRIGATION		9L
Classification of canals - Alignment of canals- Canal drops -Cross drainage works - Canal Head works - Canal regulators - River Training works.		CO-4 BTL-2
MODULE 5: CROSS DRAINAGE AND CANAL REGULATION WORKS		9L
Types- selection of suitable type of CD works- aqueduct and Syphon aqueduct determination of maximum flood discharge and waterway for drain, fluming of canal- design of bank connections: Canal fall- necessity and location- types of falls- Cross regulator and distributary head regulator- their functions, Silt control devices, Canal escapes- types of escapes.		CO-5 BTL-2
TEXT BOOKS		
1.	S.K. Garg, "Irrigation Engineering And Hydraulic Structures" , Khanna publishers, 2004	
2.	Sharma R.K., and Sharma T.K., "Irrigation Engineering", S. Chand and company, New Delhi,2008.	
REFERENCE BOOKS		
1.	A.M.Michael. (2008). Irrigation, Theory and Practices, Vikas Publishing House Pvt.Ltd, Second Edition.	
2.	Dilip Kumar Majumdar. (2015). Irrigation Water Management (Principles & Practices), Prentice Hall of India (P), Ltd.	
E BOOKS		
1.	https://archive.org/details/irrigationengine00davarich	
2.	https://insightgovtexam.com/irrigation-engineering-and-hydraulic-structures-by-santo	
MOOC		
1.	https://www.mooc-list.com/tags/irrigation	
2.	https://www.coursera.org/courses?languages=en&query=civil%20engineering	

MODULE 1: SOLAR ENERGY (9L)		
Sun as a source, availability of solar energy, nature of solar energy, solar energy and environment, application of solar energy, photo thermal, photovoltaic, photosynthesis, present and future scope of solar energy		CO-1 BTL-3
MODULE 2: WIND ENERGY (9L)		
Basics and power analysis, wind resource assessment, power conversion technologies and applications, wind power estimations, principles of wind turbine designs, wind turbine generation,site selection, cost economics and viability of wind farm.		CO-2 BTL-3
MODULE 3: GEOTHERMAL, TIDE AND WAVE ENERGY (9L)		
Availability of Geo-thermal energy- size and distribution, recovery of Geo-thermal energy, various types of systems to use Geo-thermal energy, direct heat applications, power generation using geo-thermal heat, sustainability of Geo-thermal source, status of Geo-thermal technology, economics of Geo-thermal energy.		CO-3 BTL-3
MODULE 4: HYDEL (9L)		
Hydro power: potential, Hydro power generation and distribution, Mini and Microhydelpower(MHP), Generation: classification of hydel plants, concept of micro hydel, merits, MHP plants: Components, design and layout, Turbines, efficiencies, status in India. Integrated energysystems and their cost benefit analysis.		CO-4 BTL-3
MODULE 5:BIO MASS ENERGY (9L)		
Biomass: Generation and utilization, Properties of biomass, Agriculture Crop & Forestry residues used as fuels. Biochemical and Thermo-Chemical Conversion, Combustion, Gasification, Biomass gasifiers and types etc. Applications of Gasifiers to thermal power and Engines, Biomass as a decentralized power generation source for villages Concept of Bio-energy: Photosynthesis process, Bio-fuels, Biomass resources Bio based chemicals and materials Thermo-Chemical Conversion: Pyrolysis, Combustion, Gasification, Liquefaction.		CO-5 BTL-3
TEXT BOOKS		
1	Godfrey Boyle. (2012). <i>Renewable Energy Power for a sustainable future</i> , Oxford University Press.	
2	John Twidell, Tony Weir. (2005). <i>Renewable Energy Resources</i> , Routledge.	
REFERENCE BOOKS		
1.	Jeremy Shere. (2013). <i>Renewable – The World –Changing Power of Alternative Energy</i> , St. Martin's Press.	
2.	<i>Guidelines for the Design of Rigid Pavements for Highways</i> , IRC:58-1998, The Indian Roads Congress, New Delhi.	

COURSE TITLE		HOUSING PLANNING AND MANAGEMENT								CREDITS			3		
COURSE CODE		CEB4305			COURSE CATEGORY			DE		L-T-P-S			3-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		This course elaborates ehathe planning, design, evaluation, construction and financing of housing projects. The course focuses on cost effective construction materials and methods. Emphasis has also been given on the principles of sustainable housing policies and programmes.													
Course Objective		The course should enable the students to 1. make use of the basic terms of housing, housing laws and control regulations 2. Identify the role of public, private and non-government organization housing programmes 3. Identify the different types of sites and improve their knowledge in design and evaluation. 4. Attains adequate knowledge in cost effective construction materials and methods, principles of sustainable housing policies and funding agency s 5. Impart knowledge of construction project appraisal and financing of housing projects.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the policies and regulations in housing 2. Recall the various housing programs 3. Plan a housing project 4. Choose appropriate construction technique and cost effective construction materials 5. Evaluate Housing finance and cash flow analysis of housing projects													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	2	-	-	2	-	2	2	-	3	3	-	2	2
CO-2	-	-	2	-	-	2	1	2	-	-	-	3	-	2	2
CO-3	2	3	1	-	-	2	-	-	-	-	-	-	-	2	2
CO-4	-	-	-	2	-	2	3	2	-	-	-	3	-	2	2

CO-5	2	3	2	2	-	2	1	-	-		-	-	-	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION TO HOUSING (9)															
Definition of Basic Terms - House, Home, Household, Apartments, Multi-storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies - levels - Development Control Regulations, Institutions for Housing at National, State and Local levels.														CO-1 BTL-3	
MODULE 2:HOUSING PROGRAMMES(9)															
Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations														CO-2 BTL-3	
MODULE 3: PLANNING AND DESIGN OF HOUSING PROJECTS(9)															
Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Design Problems).														CO-3 BTL-3	
MODULE 4 :CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS (9)															
New Construction Techniques - Cost Effective Modern Construction Materials, Building Centres - Concept, Functions and Performance Evaluation														CO-4 BTL-3	
MODULE 5:HOUSING FINANCE AND PROJECT APPRAISAL (9)															
Appraisal of Housing Projects - Housing Finance, Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).														CO-5 BTL-3	
SELF STUDY: Development Control Regulations															
TEXT BOOKS															
1.	Meera Mehta and Dinesh Mehta. (2009). <i>Metropolitan Housing Markets</i> , Sage Publications Pvt. Ltd, New Delhi.														
2.	Francis Cherunilam and Odeyar D Heggade. (2008). <i>Housing in India</i> , Himalaya Publishing House, Bombay.														
3.	GOI, <i>National Urban Housing and Habitat Policy 2007</i> , Ministry of Housing and Urban Poverty Alleviation, Government of India, New Delhi, 2001.														
4.	Gautam Bhatia. (2015). <i>Laurie Baker Life, Work & Writings</i> , Penguin Books, India.														
5.	Peter Birch. (2013). <i>The Swedish housing market: Trends and risks</i> , university of Copenhagen publication.														
REFERENCE BOOKS															
1.	Development Control Rules for Chennai Metropolitan Aera, CMDA, Chennai, 2002														
2.	National Housing Policy, Government of India														
3.	Isaacs, N., Camilleri, M., French, L., Pollard, A., Saville-Smith, K., Fraser, R., Rossouw and P., Jowett, J. (2006). <i>Analysis on the Household Energy End-use Project</i> , Judgeford, New Zealand														

E BOOKS	
1.	https://www.rejinpaul.com/2016/10/ce6007-housing-planning-and-management-syllabus-notes-question-with-answers.html
MOOC	
1.	https://nptel.ac.in/courses/124/107/124107001/

COURSE TITLE	MODERN CONSTRUCTION MATERIALS			CREDITS	3
COURSE CODE	CEC4255	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	It describes the water proofing techniques, thermal insulation, acoustic insulation, floor and wall materials and coating materials used in construction industry,
Course Objective	<ol style="list-style-type: none"> 1. To understand the various materials and methods of water- proofing. 2. To study about thermal insulation. 3. To know about acoustic insulation. 4. To understand the various floor and wall finishing materials, their properties, method of laying. 5. To gain knowledge on the properties, and applications of various paints, enamels, emulsions, varnishes.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the appropriate water proofing technique in construction. 2. Familiarize with thermal insulation materials to be used in construction. 3. Choose the proper insulation material for acoustics. 4. Choose the floor and wall materials to be used in construction 5. Apply appropriate coating materials to be used in construction

Prerequisites: NIL

CO, PO AND PSO MAPPING

[illegible]

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: DAMP AND WATER PROOFING	
Damp proofing- hot applied and cold applied- Emulsified asphalt, Bentonite clays, butyl rubber, silicon, vinyl's Epoxy resins and metallic water proofing materials properties, uses.(Water proofing membranes such as rag, asbestos, glass, felt- plastic and synthetic rubber- vinyl, butyl rubber, neoprene polyvinyl chloride (PVC)- Application of the above under various situations- basement floors, swimming pool, terraces, etc.	CO-1 BTL-2
MODULE 2: THERMAL INSULATION	
Heat transfer and heat gain by materials- vapor barriers and rigid insulation- properties and uses of spun glass, foamed glass, cork, vegetable fibers, mineral fibers, foamed plastics, and vermiculite and glass fibers. Gypsum- manufacture, properties and uses, plaster of paris and hydride gypsum.	CO-2 BTL-2
MODULE 3: ACOUSTIC INSULATION	
Porous, Baffle and perforated materials such as acoustic plastic, acoustic tiles, wood, partial board, fiber board, cork, quilts and muts- Brief study on properties and uses of the above- current developments.	CO-3 BTL-3
MODULE 4: FLOOR AND WALL COVERINGS	
Floor coverings- flooring- softwood, hardwood- Resilient flooring- terrazzo- properties, uses and laying. Wall coverings - Porcelain, enameled metal, wood veneer, Vinyl, plastic surfaced paneling - properties uses and lying. Wall and floor tiles- Ceramic glazed mosaic, quarry and cement files- properties uses and lying. Market study of current developments.	CO-4 BTL-2
MODULE 5: PROTECTIVE AND DECORATIVE COATINGS	
Paints - Enamels, distempers, plastic emulsions, cement-based paints- properties, uses and applications- defects in painting, varnishes, special purpose paints- luminous & fire-retardant paints, properties, uses & application.	CO-5 BTL-2
TEXT BOOKS	
1.	Rangwala, S.C. (2008). <i>Building Construction</i> , Charotar Publishing House., Anand, India.
2.	Punmia, B.C. (2016). <i>Building Construction</i> , Laxmi Publications Pvt. Ltd., New Delhi.
3.	Arora S.P. and Bindra S.P. (2017). <i>Building Construction Planning Techniques and Method of Construction</i> , Dhanpat Rai Sons.
REFERENCE BOOKS	
1.	Seetharaman, Chinnasamy. (2012). <i>Construction Techniques, Equipment and Practices</i> , Anuradha Publications.
E BOOKS	

1.	https://www.whsmith.co.uk/.../ebooks-technology-and-engineering-building-construct..
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc15_ce05/course
2.	https://swayam.gov.in/courses/1338-modern-construction-materials

COURSE TITLE		APPLIED HYDROLOGY										CREDITS		3	
COURSE CODE		CEC4266				COURSE CATEGORY			DE			L-T-P-S		3-0-0-1	
Version		1.0				Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE	
15%		15%				10%			5%			5%		50%	
Course Description		This course deals with the different cropping patterns and crop water requirements, irrigation scheduling, strategies in water use, operation of canal irrigation system and irrigation management.													
Course Objective		1. To understand the concepts of hydrologic cycle. 2. To learn the various methods of measurement of rainfall. 3. To get acquainted with the principles of hydrograph. 4. To understand the concepts behind flood routing and control. 5. To understand the concepts of ground Water hydrology.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the various components of hydrologic cycle for rainfall 2. Analyze the basic data for rainfall prediction. 3. Apply the unit hydrograph techniques and its applications. 4. Apply various methods of flood routing. 5. Explain the principles of Ground water hydrology.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	1	2	2	-	3	-	-	-	-	-	-	2	2	-
CO-2	-	-	2	2	-	3	3	-	-	-	-	-	2	2	-
CO-3	-	1	2	2	-	3	3	-	-	-	-	-	2	2	-
CO-4	-	-	2	2	-	3	3	-	-	-	-	-	2	2	-
CO-5	-	-	2	2	-	3	-	-	-	-	-	-	2	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: PRECIPITATION		9L
Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall -Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.		CO-1 BTL-2
MODULE 2: ABSTRACTION FROM PRECIPITATION		9L
Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process -Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall.		CO-2 BTL-3
MODULE 3: HYDROGRAPHS		9L
Factors affecting Hydrograph – Base flow separation - Unit hydrograph - Derivation of unit hydrograph - S curve hydrograph - Unit hydrograph of different deviations - Synthetic Unit Hydrograph		CO-3 BTL-2
MODULE 4: FLOODS AND FLOOD ROUTING9L		
Flood frequency studies - Recurrence interval - Gumbel's method - Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control		CO-4 BTL-2
MODULE 5: GROUND WATER HYDROLOGY		9L
Types of aquifers - Darcy's law - Dupuit's assumptions - Confined Aquifer - Unconfined Aquifer - Recuperation test - Transmissibility - Specific capacity - Pumping test - Steady flow analysis only.		CO-5 BTL-2
TEXT BOOKS		
1.	Subramanya, K. (2000). <i>Engineering Hydrology</i> , Tata McGraw-Hill Publishing Co., Ltd.	
2.	Raghunath, H.M. (2000). <i>Hydrology</i> , Wiley Eastern Ltd.	
REFERENCE BOOKS		
1.	Ernest W. Tollner. (2016). <i>Engineering Hydrology for Natural Resources Engineers</i> , Wiley-Blackwell, 2 nd edition.	
2.	Singh, V.P. (2000). <i>Hydrology</i> , McGraw-Hill Inc., Ltd.	
3.	Dr.Jaya Rami Reddy. (2011). <i>A Text Book of Hydrology</i> , University Science Press, Laxmi Publications, second edition.	
E BOOKS		
1.	https://books.google.co.in/books?id=RRwidSsBJrEC&lpg=PP1&pg=PP1#v=onepage&q&f=false	
2.	http://blogbook.co/downloads/applied_hydrology_ven_te_chow_david_r_maidment.pdf	
MOOC		
1.	https://www.openlearning.com/courses/hydrology-2	
2.	https://www.class-central.com/tag/hydrology	

COURSE TITLE	REMOTE SENSING TECHNIQUES AND APPLICATIONS			CREDITS	3
COURSE CODE	CEC4266	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the concepts of electromagnetic radiance, types of land use/land, principles of mapping flood risk zone, concepts behind agriculture, forest and soil and concepts of earth science. Cover
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Course Objective	<ol style="list-style-type: none"> 1. To understand the concepts of Electromagnetic radiance. 2. To learn the various types of land use/ land cover. 3. To get acquainted with the principles of mapping flood risk zone. 4. To understand the concepts behind agriculture, forest and soil. 5. To understand the concepts of earth science.
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Illustrate the various components of electromagnetic radiation 2. Analyze the basic data for urban land use planning 3. Identify ground water potential zones, recharge area and assess drought. 4. Prepare crop inventory mapping and arrive at production estimation. 5. Use the principles of lithological and structural mapping.
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Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	2	2	3	3	-	-	-	-	-	-	2	-
CO-2	-	-	-	2	2	3	3	-	-	-	-	1	-	2	-
CO-3	-	1	-	2	2	3	3	-	-	-	-	1	-	2	-
CO-4	-	-	-	2	2	3	3	-	-	-	-	-	-	2	-
CO-5	-	-	-	2	2	3	3	-	-	-	-	-	-	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION		9L
Definition - Physics of remote sensing - electromagnetic radiation (EMR) - remote sensing windows - interaction of EMR with atmosphere, earth surface, soils, water and vegetation - platform and sensors - image interpretations.		CO-1 BTL-2
MODULE 2: LAND USE STUDIES9L		
Definition of land use - land use / land cover classification - schemes and levels of classification systems with RS data - land use mapping - change detection - urban land use planning, site suitability analysis, transportation planning.		CO-2 BTL-3
MODULE 3: WATER RESOURCES		9L
Aerial assessment of surface water bodies - Capacity survey of water bodies - mapping of snow - covered areas - flood risk zone mapping - identification of groundwater potential zones, recharge areas - droughts, definition, drought assessment and management.		CO-3 BTL-2
MODULE 4: AGRICULTURE, SOIL AND FORESTRY		9L
Crop inventory mapping - production estimation - command area monitoring - soil mapping - crop stress detection - estimation of soil erosion - forest types and density mapping - forest fire risk zone mapping.		CO-4 BTL-2
MODULE 5: EARTH SCIENCE		9L
Lithology - lithological mapping - structural mapping - Geomorphology - nature and type of landforms - identification - use of remote sensing data for landslides - targeting mineral resource - Engineering geology and Environmental geology.		CO-5 BTL-2
TEXT BOOKS		
1.	Michael Hord, R. (1986). <i>Remote Sensing Methods and Application</i> , John Wiley and Sons, New York.	
REFERENCE BOOKS		
1.	Thomas Lillesand, Ralph W. Kiefer & Jonathan Chipman. (2015). <i>Remote Sensing and Image Interpretation</i> , Wiley, 7 editions.	
E BOOKS		
1.	http://ebooks.iospress.nl/	
2.	https://www.topfreebooks.org/tag/remote-sensing/	
MOOC		
1.	https://www.coursera.org/learn/gis-applications/lecture/wr6Kd/remote-sensing-basics	
2.	https://www.mooc-list.com/tags/remote-sensing	

COURSE TITLE		AIR POLLUTION MANAGEMENT								CREDITS			3		
COURSE CODE		CEC4268			COURSE CATEGORY			DE		L-T-P-S			3-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-2		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		This course describes various types of Air Pollutants, their effects and control methods, and various Air Pollution dispersion models.													
Course Objective		The course should enable the students to: 1. Understand the various types of Air Pollutants and their effects of human beings, materials, vegetation’s and animals. 2. Understand the meteorological factor responsible for dispersion of pollutants. 3. Know about the measurement of the Air Pollutants in the ambient air using high volume air samplers. 4. Study about the control methods adopted for different types of Air Pollutants coming out from different types of industries. 5. Study about the noise pollution problems and the noise standards.													
Course Outcome		Upon completion of this course, the students will be able to 1. Categorize the various types of Air Pollutants from different sources. 2. Demonstrate the dispersion of pollutants, meteorological factors and dispersion models. 3. Select appropriate control equipment to minimize the air pollution problems in industries. 4. Explain the need for EIA and the importance of Air quality standards 5. Summarize the sources, effects, assessment, standards and control techniques for noise pollution													
Prerequisites: CSB231 – NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	1	2	1	-	-	1	-	1	-	-	1	1	2	2

[illegible]

E BOOKS	
1	https://www.coursera.org/learn/global-environmental-management
2	www.academia.edu/.../Ebook Download Air Pollution Control Engineering Full B...
MOOC	
1	https://www.mooc-list.com/tags/air-quality
2	https://www.coursera.org/learn/global-environmental-management

COURSE TITLE	CONCRETE TECHNOLOGY			CREDITS	3
COURSE CODE	CEC4269	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the properties of cement, types of admixtures, mechanical properties of aggregate, mix proportioning of concrete and durability of concrete.
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Course Objective	<ol style="list-style-type: none"> 1. To study about the properties of cement. 2. To get exposure to different types of admixtures. 3. To know about the mechanical properties of aggregates. 4. To understand the concepts of mix proportioning of concrete. 5. To study about the properties and durability of concrete.
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Recognize the properties of cement and its ingredients 2. Use appropriate admixtures in constructions 3. Illustrate the properties of aggregates. 4. Carry out mix design for concrete 5. Illustrate the durability properties of concrete
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Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	1	2	3	2	3	-	-	-	-	2	-	3	-
CO-2	-	-	1	2	3	2	3	-	-	-	-	2	-	3	-
CO-3	1	1	1	2	3	2	3	-	-	-	-	-	-	3	-
CO-4	1	1	1	2	3	2	3	-	-	-	-	2	-	3	-
CO-5	-	-	1	2	3	-	3	-	-	-	-	-	-	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CEMENT		9L
Composition of OPC-Manufacture-Modified Portland Cements-Hydration process of Portland cements-Structure of Hydrated cement Pastes.		CO-1 BTL-2
MODULE 2: ADMIXTURES		9L
Mineral admixtures-Slags-Pozolanas and Fillers-Chemical Admixtures-Solutes Retarders-Air Entraining Agents-Water proofing compounds-Plasticizers and Super Plasticizers.		CO-2 BTL-3
MODULE 3: AGGREGATES		9L
Shape and Mechanical Properties-Absorption and Physical Durability-Chemical stability and packing Characteristics		CO-3 BTL-2
MODULE 4: FRESH CONCRETE		9L
Mix proportioning-IS and ACI codal Methods-Workability-Test -Mixes incorporating Fly-Ash Mixes for High performance concrete-Fibre reinforced concrete.		CO-4 BTL-2
MODULE 5: PROPERTIES AND DURABILITY OF CONCRETE		9L
Interfacial Transition Zone-Fracture Strength-Mechanical Properties-High Strength Concrete-Shrinkage-Creep- Other properties. Basic consideration-Stability of constituents-Chemical Attack-Corrosion of Reinforcing steel.		CO-5 BTL-2
TEXT BOOKS		
1.	Neville, A.M. (2012). <i>Properties of concrete</i> , Longman, 4th edition	
2.	M. S. Shetty. (2006). <i>Concrete Technology</i> , S. Chand &. Company Ltd, New Delhi.	
REFERENCE BOOKS		
1	Metha P.K. and Montreio P.J.M. (2012). <i>Concrete Structure Properties and Materials</i> , Prentice Hall, 2 nd Edition.	
E BOOKS		
1.	https://civilread.com/download-concrete-tehnology/	
MOOC		
1.	https://nptel.ac.in/courses/105102012	

COURSE TITLE		WATER RESOURCES ENGINEERING						CREDITS			3				
COURSE CODE		CEC4270		COURSE CATEGORY		DE		L-T-P-S			3-0-0-0				
Version		1.0		Approval Details		24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3				
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz		Attendance			ESE				
15%		15%		10%		5%		5%			50%				
Course Description		To expose the students with the National water policy and reservoir planning and management.													
Course Objective		The course should enable the students to: 1. Know about the economics of water resources planning and National water policy. 2. Gain knowledge on the analysis of hydrologic data. 3. Know about estimation of water requirement, water budget and development plan. 4. Be familiar with reservoir planning and management. 5. Understand the benefits of cost Analysis and discounting techniques.													
Course Outcome		Upon completion of this course, the students will be able to 1. Describe the various ways of water resource planning for development 2. Analyze the hydrologic data for water resource development 3. Summarize the water requirement for various purposes 4. Analyze reservoir capacity as per requirement 5. Explain the benefit cost analysis for basin planning													
Prerequisites: Mechanics of Fluids															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	1	1	1	-	1	1	-	-	1	1	-	1	2	-
CO-2	-	1	1	1	-	1	-	-	-	1	1	-	1	2	-
CO-3	-	-	1	1	-	1	1	-	-	1	1	-	1	2	-
CO-4	-	1	1	1	-	1	1	-	-	1	1	-	1	2	-
CO-5	-	-	3	1	-	1	1	-	-	1	1	-	1	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: GENERAL	
Water resources survey - Water resources of India and Tamil Nādu - Description of water resources planning - Economics of water resources planning, physical and socio-economic data - National Water Policy - Collection of meteorological and hydrological data for water resources development.	CO-1 BTL-2
MODULE 2: NETWORK DESIGN	
Hydrologic measurements - Analysis of hydrologic data - Hydrologic station network - Station network design - Spatial and temporal characteristics of water resources, constraints for its development like non-reversibility; planning region and horizon.	CO-2 BTL-3
MODULE 3: WATER RESOURCE NEEDS	
Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality - Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.	CO-3 BTL-2
MODULE 4: RESERVOIR PLANNING AND MANAGEMENT	
Reservoir - Single and multipurpose - Multi objective - Fixation of Storage capacity - Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls – Channel improvement. - Case study	CO-4 BTL-3
MODULE 5: ECONOMIC ANALYSIS	
Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques - Computer Applications. Estimation of benefits and costs; Appraisal criteria; social benefit cost analysis. Basin planning; inter-basin transfer of water	CO-5 BTL-3
TEXT BOOKS	
1	Linsley R.K. and Franzini J.B. (2000). <i>Water Resources Engineering</i> , McGraw-Hill Inc.
2	Douglas J.L. and Lee R.R. (2000). <i>Economics of Water Resources Planning</i> , Tata McGraw-Hill Inc.
REFERENCE BOOKS	
1	Chaturvedi M.C. (2007). <i>Water Resources Systems Planning and Management</i> , Tata McGraw-Hill Inc., New Delhi.
2	Duggal, K.N. and Soni, J.P. (2005). <i>Elements of Water Resources Engineering</i> , New Age International Publishers.
E BOOKS	
1	http://www.a-zshiksha.com/forum/viewtopic.php?f=149&t=61486
MOOC	
1	https://www.class-central.com/tag/water%20management

COURSE TITLE		BUILDING SERVICES								CREDITS		3			
COURSE CODE		CEC4271		COURSE CATEGORY			DE			L-T-P-S		3-0-0-0			
Version		1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE			
15%		15%		10%			5%			5%		50%			
Course Description		It describes the machineries, electrical systems, principles of lighting and illumination, refrigeration principles and fire safety aspects in the buildings.													
Course Objective		1. To study about machineries used in the civil engineering field. 2. To acquire knowledge about electrical systems in the buildings. 3. To gain knowledge on the principles of Lighting and Illumination in the buildings. 4. To understand the refrigeration principles and its applications. 5. To create an awareness of the fire safety aspects in the buildings.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the various machineries used in construction. 2. Familiarize with various electrical systems used in buildings. 3. Design the acoustics and illumination in buildings. 4. Explain the air conditioning techniques in buildings. 5. Summarize the fire safety installations in buildings.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	1	-	-	-	-	-	-	1	-	1	1	2	2
CO-2	-	-	1	-	-	-	-	-	-	1	-	1	1	2	2
CO-3	-	1	1	-	-	2	-	-	-	1	-	1	1	2	2
CO-4		-	1	-	-	-	-	-	-	1	-	1	1	2	2
CO-5	-	-	-	-	-	3	-	-	-	1	-	1	1	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: MACHINERIES		9L
Geysar – Room and centralized – Lifts and escalators – special features required for physically challenged – Conveyors – vibrators – concrete mixers – batching plant – generators – hoist.		CO-1 BTL-2
MODULE 2: ELECTRICAL SYSTEMS IN BUILDING9L		
Basics of electricity – Single and three phase supplies, protective devices in electrical installations, earthing for safety, types of earthing, BIS specification, types of wire, wiring system, planning electrical wiring for building, main and distribution boards – Transformers and circuit breakers, layout of substation.		CO-2 BTL-2
MODULE 3: PRINCIPLES OF ILLUMINATION AND ACCOUSTIC DESIGN9L		
Visual tasks – factor affecting visual tasks – modern theory of light and colour – synthesis of high additive and subtractive synthesis of colour – luminous flux – candela – solid angle illumination utilization factor – depreciation factor – design of modern lighting – lighting for stores, offices, schools, hospital and house lighting. Elementary ideal of special features required and minimum level of illumination required for physically handicapped and elderly in building types. Acoustics design auditorium, NRC factors.		CO-3 BTL-3
MODULE 4: REFRIGERATION PRINCIPLES & APPLICATIONS, SOLAR POWER		9L
Thermodynamics – Heat – Temperature, measurements transfer – change of state – sensible heat latent heat of fusion, evaporation, sublimation – saturation temperature – superheated vapour subcooled liquid – pressure temperature relationships for liquids – refrigerants – vapour compression cycle – compressors – evaporators – refrigerant control devices – electrical motors, starters – air handling units – cooling towers – window type and packaged air conditioners – chilled water plant – fan coil systems – water piping – cooling load – air conditioning system for different types of buildings – protection against fire to be caused by A.C system. Solar panel – installation – subsidy.		CO-4 BTL-2
MODULE 5: FIRE SAFETY INSTALLATION		9L
Causes of fire in buildings – safety regulations – NBC – Planning consideration in building, like non-combustible materials, construction of stair case and lift lobbies, fire escape and A.C systems. Special features for physically handicapped and elderly in building types – heat and smoke detectors – Fire alarm system, snorkel ladder – firefighting pumps and water storage – Dry and wet risers – automatic sprinklers.		CO-5 BTL-2
TEXT BOOKS		
1.	Uday Kumar, R. (2007). <i>A Text book of Building Services</i> , Eswar Publication.	
REFERENCE BOOKS		
1.	Ambrose. (2000). <i>Heat pumps and Electric Heating</i> , John and Wiley and Sons, New York.	
2.	National Building Code. (2016).	
E BOOKS		

1.	https://www.safaribooksonline.com/library/view/building-services.../9780415631402/
2.	https://www.whsmith.co.uk/.../ebooks-technology-and-engineering-building-construct..
MOOC	
1.	https://www.mastersportal.eu/studies/46963/building-services-engineering.html
2.	https://about.futurelearn.com/.../free-online-course-backed-by-uk-government-explor...

COURSE TITLE		CONCEPTS IN ENVIRONMENT IMPACT ASSESSMENT								CREDITS			3		
COURSE CODE		CEC4351			COURSE CATEGORY			DE		L-T-P-S			3-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		To introduce the student the basic theory and concepts of various impact assessment procedures to protect the Environment.													
Course Objective		The course should enable the students to: 1. Know about the basics of Environmental Impact Assessment (EIA) and the legal provisional in EIA. 2. Study about the various methodologies in EIA. 3. Understand and assess the impact of various developmental activities on environment. 4. Get knowledge about the environmental management plan to take care of adverse impacts. 5. Study the impact due to highway projects, airport projects and other infrastructure projects.													
Course Outcome		Upon completion of this course, the students will be able to 1. Describe the importance of EIA studies. 2. Apply the various methods for carrying out EIA studies. 3. Apply the various techniques for predicting and assessing the impact. 4. Explain the adverse impacts arising out of developmental projects. 5. Design the EIA reports for various projects													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	-	1	-	-	1	1	1	-	2	-	-	-	2	2
CO-2	-	-	1	-	-	1	1	1	-	2	1	1	-	2	2
CO-3	-	-	1	-	-	1	1	1	-	2	1	1	-	2	2

CO-4	-	-	1	-	-	1	1	1	-	2	1	1	-	2	2
CO-5	-	-	1	-	-	1	1	1	-	2	1	1	-	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION TO ENVIRONMENTAL IMPACT ASSESSMENT															9L
Introduction - definitions and concepts - historical development of EIA - EIA for engineers - environmental impact statement - environmental appraisal - environmental impact factors and areas of consideration.														CO-1 BTL-2	
MODULE 2: : ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY															9L
Measurement of environmental impact - organization, scope and methodologies of EIA - Six generic steps - descriptive checklists - simple interaction matrix -stepped matrix - uniqueness ratio - habitat evaluation system.														CO-2 BTL-2	
MODULE 3: ENVIRONMENTAL IMPACT ASSESSMENT IN INDIA															9L
Public involvement techniques - comprehensive environmental impact study - various project types - EIA Models - EIA Regulations in India.														CO-3 BTL-3	
MODULE 4: ENVIRONMENTAL MANAGEMENT PLAN															9L
Plan for mitigation of adverse impact on environment - options for mitigation of impact on water, air and land, flora and fauna; addressing the issues related to the Project Affected People - ISO 14000.														CO-4 BTL-2	
MODULE 5: CASE STUDIES															9L
EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings - Water Supply and Drainage Projects.														CO-5 BTL-3	
TEXT BOOKS															
1		R. Pannirselvam and S. Karthikeyan. (2005). <i>Environmental Impact Assessment</i> , SPGS Publishers, Chennai.													
2		James T. Maughan. (2013). <i>Environmental Impact Analysis: Process and Methods</i> , CRC Press; 1 edition.													
3		Larry.W. Canter, (2002). <i>Environmental Impact Assessment</i> , MCGRAW HILL, publications.													
REFERENCE BOOKS															
1		Lawrence, D.P. (2003). <i>Environmental Impact Assessment - Practical solutions to recurrent problems</i> , Wiley-Interscience, New Jersey.													
E BOOKS															
1		https://www.scribd.com/.../Environmental-Impact-Assessment-Methodologies-2nd-Edi...													
MOOC															

1	https://www.mooc-list.com/tags/environmental-impacts
2	https://www.coursera.org/browse/...and.../environmental-science-and-sustainability?.

COURSE TITLE		GEO-ENVIRONMENTAL ENGINEERING						CREDITS				3			
COURSE CODE		CEC4352		COURSE CATEGORY			DE		L-T-P-S			3-0-0-0			
Version		1.0		Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		To introduce the student the basic theory and concepts of geotechnical applications in the field of Environmental Engineering.													
Course Objective		The course should enable the students to: 1. Know about the basics of soil problems in Geotech engineering 2. Study about the applications of geotechnical concepts in waste disposal 3. Get the knowledge on Landfill designing 4. Know the knowledge on Landfill designing 5. Attain knowledge on various soil remediation techniques.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the Soil interaction problems associated with Geotech engineering 2. Apply the Geotechnical principles in waste disposal. 3. Design the Landfill and its environmental components. 4. Explain the various components of leachate collection and removal system 5. Design the Explain the various techniques and methodology on Soil Remediation.													
Prerequisites: Environmental Engineering & Geotechnical Engineering															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	-	1	1	-	1	1	1	-	-	-	-	1	2	-
CO-2	-	1	1	1	-	1	1	1	-	-	-	-	1	2	-
CO-3	-	1	1	1	-	1	1	1	-	-	-	-	1	2	-
CO-4	-	-	1	1	-	1	1	1	-	-	-	1	1	2	-
CO-5	-	-	1	1	-	1	1	1	-	-	-	-	1	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related		
MODULE 1: INTRODUCTION TO GEO-ENVIRONMENTAL ENGINEERING		9L
Introduction and Soil-water-environment interaction: Introduction to geo environmental Engineering, Soil-water-environment interaction relating to geotechnical problems, Waste:- source, classification and management of waste, Physical, chemical and geotechnical characterization of municipal solid waste, Impact of waste dump and its remediation		CO-1 BTL-2
MODULE 2: : GEOTECHNICAL APPLICATION OF WASTE DISPOSAL		9L
Geotechnical application of waste and disposal: Geotechnical use of different types such as Thermal power plant waste, MSW, mine waste, industrial waste. Waste disposal facilities, Parameters controlling the selection of site for sanitary and industrial landfill. Site characterization. MoEF guidelines.		CO-2 BTL-3
MODULE 3: LANDFILLS		9L
Landfill Components: Landfill layout and capacity, components of landfill and its functions. Types and functions of liner and cover systems, Compacted clay liner, selection of soil for liner, methodology of construction.		CO-3 BTL-3
MODULE 4: LEACHATE, GAS MANAGEMENT AND GEOSYNTHETICS		9L
Management of Leachate and gas. Various components of leachate collection and removal system and its design. gas disposal/utilization. Closure and post closure monitoring system. Geo synthetics- Geo membranes – geo synthetics clay liners -testing and design aspects.		CO-4 BTL-3
MODULE 5: SOIL REMEDIATION		9L
Investigation of contaminated soil, sampling, assessment Transport of contaminants in saturated soil. Remediation of contaminated soil- in-situ / exit remediation, bio remediation, thermal remediation, pump and treat method, phyto remediation and electro-kinetic Remediation		CO-5 BTL-3
TEXT BOOKS		
1	Donald L. Wise, Debra J. Trantolo, Hilary I. Inyang, Edward J. Cichon. (2000). <i>Remediation Engineering of Contaminated Soils</i> , Marcel Dekker Inc.	
2	Koerner, R.M. (2005). <i>Designing with Geosynthetics</i> . Prentice Hall, New Jersey, Fifth Edition	
3	Dr. G V Rao and Dr. R S Sasidhar. (2009). <i>Solid waste Management and Engineered Landfills</i> , Sai master Geoenvironmental Services Pvt. Ltd. Publication.	
REFERENCE BOOKS		
1	Hari D. Sharma, Krishna R. Reddy. (2004). <i>Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies</i> , John Wiley & Sons Inc.	
E BOOKS		
1	https://www.elsevier.com/books/geoenvironmental-engineering	

MOOC	
1	http://nptel.ac.in/courses/105103025/

COURSE TITLE	GROUND IMPROVEMENT TECHNIQUES			CREDITS	3
COURSE CODE	CEC4353	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course impart knowledge of identification of the problems encountered on site related to soils and educate students with principles and methods.
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Course Objective	<ol style="list-style-type: none"> 1. Learn about different ground improvement techniques. 2. Know suitable dewatering techniques for construction sites 3. Learn to identify the apt ground improvement technique for various types of soils and site conditions. 4. Study to apply the earth reinforcement techniques for retaining walls and slopes. 5. Learn to select the appropriate grouting materials and techniques to strengthen the soil.
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Select suitable ground improvement techniques. 2. Identify suitable dewatering techniques for construction sites 3. Identify the apt ground improvement technique for various types of soils and site conditions. 4. Apply the earth reinforcement techniques for retaining walls and slopes. 5. Select the appropriate grouting materials and techniques to strengthen the soil. Analyse simple and compound bars using direct application of Hooke's Law.
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Prerequisites: Mechanics of Structures I

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	2	3	3	3	3	-	3	-	2	2	3	2	3	-
CO-2	-	2	3	3	3	3	-	-	-	2	2	3	2	3	-
CO-3	-	2	3	3	3	3	-	-	-	2	2	3	2	3	-
CO-4	-	2	3	3	3	3	-	-	-	2	2	3	2	3	-

CO-5	-	2	3	3	3	3	-	-	-	2	2	3	2	3	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION															(9L)
Role of ground improvement in foundation engineering - methods of ground improvement - Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition															CO-1 BTL-3
MODULE 2 : DRAINAGE AND DEWATERING															(9L)
Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two-dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).															CO-2 BTL-3
MODULE 3: IN-SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS															(9L)
In-situ densification of cohesion less and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloatation - Sand pile compaction - Preloading with sand drains and fabric drains - Stone columns - Lime piles - Installation techniques only - relative merits of various methods and their limitations.															CO-3 BTL-3
MODULE 4: EARTH REINFORCEMENT															(9L))
Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - use of Geotextiles for filtration, drainage and separation in road and other works. Prevention of land sliding and techniques adopted for the same.															CO-4 BTL-3
MODULE 5: GROUT TECHNIQUES															(9L)
Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring - Stabilisation with cement, lime and chemicals - Stabilization of expansive soils.															CO-5 BTL-3
Self-study Topic: Geotechnical Engineering															
TEXT BOOKS															
1	Purushothama Raj, P. (2016). <i>Ground Improvement Techniques</i> , Laxmi Publications.														
2	Nihar Ranjan Patra. (2012). <i>Ground Improvement Techniques</i> , S. Chand Publishers.														
3	Peter Nicholson. (2014). <i>Soil Improvement and ground modification methods</i> , Butterworth Heinemann.														
REFERENCE BOOKS															
1	Robert M. Koerner. (2012). <i>Designing with Geosynthetics</i> , Vol. 1&2, Xlibris; 6 th edition.														
2	Jie Han. (2015). <i>Principles and Practice of Ground Improvement</i> , John Wiley & Sons.														
3	Braja M Das. (2015). <i>Principles of Foundation Engineering</i> , CL Engineering, 8 th edition, 2015.														
E BOOKS															
1	https://books.google.co.in/books/about/Ground_Improvement_Techniques_PB.html														
2	https://www.elsevier.com/.../soil-improvement...ground...methods/.../978-0-12-40807														
MOOC															

1	https://nptel.ac.in/downloads/105108075/
2	www.ncl.ac.uk › ... › Collaboration › Short Courses (CPD) › Course List

COURSE TITLE		EARTHQUAKE ENGINEERING										CREDITS		3	
COURSE CODE		CEC4354			COURSE CATEGORY			DE		L-T-P-S			3-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		This course aims at introducing the phenomena of earthquakes, the process, measurements, and the factors that affects the design of structures in seismic areas.													
Course Objective		1. Understand the causes of earthquake and its characteristics. 2. Understand characteristics of ground motion and its effects on buildings. 3. Understand earthquake design philosophy. 4. Familiarize with the code provisions and the earthquake resistant design methodology.													
Course Outcome		Upon completion of this course, the students will be able to 1. Summarize the causes and effects of earthquake 2. Predict the characteristics of ground motion during earthquake 3. Design earthquake resistant masonry buildings 4. Design earthquake resistant RCC buildings 5. Adopt techniques to reduce vibration in buildings													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	0	0	2	1	2	2	1	2	3	2	1	-
CO-2	2	2	1	1	0	2	2	2	2	1	2	3	2	1	-
CO-3	3	2	3	1	1	1	1	1	1	1	2	3	2	3	-
CO-4	2	1	1	2	1	2	2	1	1	1	2	3	2	3	-
CO-5	3	2	2	2	3	1	1	2	3	1	3	2	1	2	-
MODULE 1: INTRODUCTION TO SEISMOLOGY														(9)	

Earth's Interior and Plate Tectonics - Causes of Earthquakes - Seismic Zoning of India - Earthquake Effects - On ground and soil liquefaction, buildings, structures, power plants, switch, yards, equipment's & other lifeline structures. Secondary Effects- Land and rock slides, liquefaction, fires, tsunamis, floods, release of poisonous gases and radiation.		CO-1 BTL-2
MODULE 2: EARTHQUAKE PHENOMENON (9)		
Focus, epicenter, seismic waves - Measurement of Earthquakes and Measurement parameters-magnitude, intensity, intensity scale and its correlation with ground acceleration - characteristics of strong ground motions and attenuation - earthquake recording instruments Time History Records and Frequency Contents of Ground Motion - Concept of Response Spectrums ofEarthquake - Design Spectrum. Do's and Don'ts for protection of life and property		CO-2 BTL-2
MODULE 3: EARTHQUAKE RESISTANT DESIGN OF MASONARY BUILDINGS (9)		
Structural Systems - Types of Buildings - Causes of damage - Planning Considerations - Philosophy and Principle of Earthquake Resistant Design - Guidelines for Earthquake Resistant Design Earthquake Resistant Masonry Buildings - Design consideration – Guidelines		CO-3 BTL-3
MODULE 4: EARTHQUAKE RESISTANT DESIGN RCC BUILDINGS (9)		
Earthquake Resistant Design of R.C.C. Buildings - Material properties - Lateral load analysis – Capacity based Design and detailing – Rigid Frames – Shear walls.		CO-4 BTL-3
MODULE 5: VIBRATION CONTROL TECHNIQUES (9)		
Vibration Control - Tuned Mass Dampers – Principles and application, Basic Concept of Seismic Base Isolation – various Systems- Case Studies, Important structures.		CO-5 BTL-2
TEXT BOOKS		
1	Duggal S K. (2007). <i>Earthquake Resistant Design of Structures</i> , Oxford University Press.	
2	Pankaj Agarwal and Manish Shrikhande. (2011). <i>Earthquake Resistant Design of Structures</i> . PHI Learning Private Ltd.	
REFERENCE BOOKS		
1	Brebbia C. A. (2011). <i>Earthquake Resistant Engineering Structures</i> , WIT Press.	
2	Bruce A Bolt. (2004). <i>Earthquakes</i> , W H Freeman and Company, New York, 2004.	
E BOOKS		
1	https://civilengineering9714.blogspot.com/2015/01/earthquake-engineering-books-free.html	
2	https://archive.org/details/Earthquake_Engineering_Application_to_Design	
MOOC		
1.	https://edu.epfl.ch/coursebook/en/seismic-engineering-CIVIL-522	

COURSE TITLE		WIND ENGINEERING										CREDITS		3	
COURSE CODE		CEC4355				COURSE CATEGORY			DE			L-T-P-S		3-0-0-0	
Version		1.0				Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE	
15%		15%				10%			5%			5%		50%	
Course Description		This course aims at introducing the phenomena of wind and cyclones, the process, measurements, and the factors that affects the design of structures due to effect of wind.													
Course Objective		1. Understand the basic concepts of wind generation and flow. 2. Understand the response of different type of structures to wind pressure. 3. Understand the code provisions for the safe design of high-rise structures. 4. Design towers and roof trusses to resist wind loads. 5. Familiarize with wind tunnel experiments.													
Course Outcome		Upon completion of this course, the students will be able to 1. Summarize the basic concepts of wind flow and interpret the nature of wind in a locality 2. Predict the response of different type of structures to wind pressure. 3. Summarize the code provisions for the safe design of high-rise structures. 4. Design towers and roof trusses to resist wind forces 5. Demonstrate wind tunnel experiments and determine Aerodynamic coefficients for the given element													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	-	2	1	2	2	1	-	-	-	-	1	1	1	-
CO-2	1	2	2	1	-	1	2	-	-	-	-	1	1	1	-
CO-3	-	1	1	2	-	1	2	-	-	-	-	2	1	1	-
CO-4	2	1	1	2	-	1	2	-	-	-	-	1	1	2	-
CO-5	1	2	3	2	2	2	2	-	-	-	-	2	2	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: INTRODUCTION (9)	
Terminology - Wind Data - Gust factor and its determination - Wind speed variation with height -Shape factor - Aspect ratio - Drag and lift.	CO-1 BTL-2
MODULE 2: EFFECT OF WIND ON STRUCTURES (9)	
Static effect - Dynamic effect - Interference effects (concept only) - Rigid structure - Aero elastic structure (concept only).	CO-2 BTL-2
MODULE 3: EFFECT ON TYPICAL STRUCTURES(9)	
Effect of wind on tall buildings - Low rise buildings - Roof and cladding - Chimneys, towers and bridges	CO-3 BTL-2
MODULE 4: APPLICATION TO DESIGN (9)	
Design forces on multi-storey building, towers and roof trusses	CO-4 BTL-3
MODULE 5: INTRODUCTION TO WIND TUNNEL (9)	
Wind Tunnels -Types of models (Principles only) - Basic considerations –Measurements - Examples of tests and their use	CO-5 BTL-2
TEXT BOOKS	
1	Solari, Giovanni. (2019). <i>Wind Science and Engineering -Origins, Developments, Fundamentals and Advancements</i> , Springer.
2	Ted Stathopoulos & Charalambos C. Baniotopoulos. (2007). <i>Wind Effects on Buildings and Design of Wind-Sensitive Structures</i> , Springer.
3	Tamura, Yukio, Kareem, Ahsan (Eds.). (2013). <i>Advanced Structural Wind Engineering</i> , Springer.
REFERENCE BOOKS	
1	Dr. Kishor Mehta, Dr. Doug Smith & Dr. Scott Norville, Dr. James McDonald. (2003). <i>Wind Loads on Structures</i> , American Society of Civil Engineers.
2	IS875-Part 3-Wind load on structures,2015.
E BOOKS	
1	https://www.amazon.in/WIND-ENERGY-PRACTICE-SIRAJ...ebook/.../B018K2BVF
2	https://web.mit.edu/windenergy/windweek/Presentations/Wind%20Energy%20101.pdf
MOOC	
1.	https://www.coursera.org/learn/wind-energy
2.	https://www.mooc-list.com/tags/wind-energy-engineering

COURSE TITLE		INDUSTRIAL WASTE MANAGEMENT								CREDITS				3	
COURSE CODE		CEC4356		COURSE CATEGORY			DE			L-T-P-S				3-0-0-0	
Version		1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL				BTL-2	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE	
15%		15%			10%			5%			5%			50%	
Course Description		To familiarize the students about characteristics of industrial wastewater, cleaner production, recycling of waste, various types of industrial waste waters, treatment technologies and hazardous wastes management.													
Course Objective		The course should enable the students to: <div><div>1.</div><div>Understand the various types of Industrial waste waters, their characteristics and their effects on the environmental resources.</div><div>2.</div><div>Study and understand the various legislative measures related to prevention and control of industrial wastes.</div><div>3.</div><div>Study and understand the cleaner production, waste audit, recycling and by-product recovery.</div><div>4.</div><div>Know about the waste generated and recycling in selected industries like textiles, tanneries electro plating, Pulp and paper etc.,</div><div>5.</div><div>Study about the waste management techniques.</div></div>													
Course Outcome		Upon completion of this course, the students will be able to <div><div>1.</div><div>Explain about the various types of industrial Wastes and its generation</div><div>2.</div><div>Summarize the various Industrial pollution prevention approach</div><div>3.</div><div>Apply the various treatment technologies to treat the Industrial wastes</div><div>4.</div><div>Explain the methodologies to treat and recycle the Industrial waste water</div><div>5.</div><div>Interpret the Industrial waste Management techniques adopted in various Industries</div></div>													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	-	1	1	-	1	1	1	-	-	-	-	1	2	2

[illegible]

1	Frank Woodard. (2001). <i>Industrial waste treatment Handbook</i> , Butterworth Heinemann, New Delhi.
2	World Bank Group, <i>Pollution Prevention and Abatement Handbook - Towards Cleaner Production</i> , World Bank and UNEP, Washington D.C.
3	Paul L. Bishop. (2000). <i>Pollution Prevention:- Fundamentals and Practice</i> , McGraw-Hill International.
E BOOKS	
1	www.digitalbookindex.org/_search/search010environmenwasterefusea.asp
2	https://books.google.com/books/about/Solid_Waste_Management.html?id..
MOOC	
1	https://www.coursera.org/learn/solid-waste-management
2	https://www.mooc-list.com/tags/waste-management

COURSE TITLE		GREEN AND SMART BUILDINGS										CREDITS		3	
COURSE CODE		CEC4366			COURSE CATEGORY			DE		L-T-P-S			3-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		It describes the concepts of green building, renewable energy sources, automation techniques, actuator techniques and use materials for green systems.													
Course Objective		1. To know the concepts of green building. 2. To understand the renewable energy sources to be adopted in buildings. 3. To acquire knowledge in automation techniques in buildings. 4. To use the actuator techniques for Automation 5. To gain the knowledge of materials usage in green systems.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the concepts of green building. 2. Choose the appropriate renewable energy sources to be adopted in buildings. 3. Explain the automation techniques in buildings. 4. Summarize the Actuator techniques for Automation. 5. Use materials for green systems.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	1	-	-	2	-	-	-	-	-	-	-	2	2
CO-2	-	-	-	-	-	1	1	-	-	-	-	-	-	2	2
CO-3	-	1	-	-	-	-	-	-	-	-	-	-	-	2	2
CO-4	-	-	1	-	-	-	-	-	-	-	-	1	-	2	2
CO-5	-	-	1	-	-	-	-	-	-	-	-	-	-	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: CONCEPT OF GREEN BUILDINGS		9L
Green building initiatives, its origin, characteristics of a green building, green buildings in India, certification of green buildings. Criteria for rating – sustainability. Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; green cement, biodegradable materials, smart materials, engineering evaluation of these materials. Case study.		CO-1 BTL-2
MODULE 2: SOURCES OF ENERGY		9L
Renewable and non-renewable sources of energy; coal, petroleum, nuclear, wind, solar, hydro, geothermal sources; potential of these sources, hazards, pollution; global scenario with reference to demand and supply in India. Energy arises. Carbon Emission: Forecasting, control of carbon emission, air quality and its monitoring carbon foot print; environmental issues, minimizing carbon emission.		CO-2 BTL-2
MODULE 3: INTELLIGENT BUILDINGS		9L
Intelligent buildings-Building Automation-Smart buildings- Building services in high rise buildings-Green Buildings-Energy efficient buildings for various zones-Case studies of residence, office buildings and other buildings in each zone. Case Study.		CO-3 BTL-3
MODULE 4: ACTUATOR TECHNIQUES		9L
Actuator and actuator materials – Piezoelectric and Electro strictive Material – Magneto structure Material – Shape Memory Alloys – Electrorheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.		CO-4 BTL-2
MODULE 5: MATERIALS FOR "GREEN" SYSTEMS		9L
Green materials, including biomaterials, biopolymers, bioplastics, and composites Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Paints, Roofs, Walls, and Cooling. Multifunctional Gas Sensors, Biomimetic Sensors, Optical Interference Sensors Thermo- light-, and stimulus-responsive smart materials.		CO-5 BTL-2
TEXT BOOKS		
1.	Charles J. Kibert. (2012). Sustainable Construction: Green building design and delivery, John Wiley & Sons; 3rd edition	
2.	Yudetson, J. (2007). <i>Green Building A to Z</i> . New Society Publishers.	
REFERENCE BOOKS		
1.	Sinopoli, J. (2016). <i>Advanced Technology for Smart buildings</i> , Artech House Publishers.	
E BOOKS		

1.	https://www.springer.com/in/book/9789811010002
2.	https://www.elsevier.com/books/smart-buildings/casini/978-0-08-100635-1
MOOC	
1.	https://www.mooc-list.com/tags/green-building

COURSE TITLE		PRESTRESSED CONCRETE										CREDITS			3	
COURSE CODE		CEC4367				COURSE CATEGORY			DE			L-T-P-S			3-0-0-0	
Version		1.0				Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL			BTL-3	
ASSESSMENT SCHEME																
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE	
15%		15%				10%			5%			5%			50%	
Course Description		This course describes the design principles of prestressed concrete and the design of prestressed structural elements.														
Course Objective		1. To be familiar with the basic principles of prestressed concrete 2. To be familiar with the design of prestressed concrete elements. 3. To know about the design of prestressed concrete tanks, poles and sleepers. 4. To know about the design of concrete composite members. 5. To throw light on the principles of pre tensioned and post tensioned concrete bridge decks														
Course Outcome		Upon completion of this course, the students will be able to 1. Classify the systems and methods of prestressing. 2. Design the prestressed concrete elements as per the codal provisions. 3. Design prestressed concrete tanks, poles and sleepers. 4. Design the concrete composite members. 5. Demonstrate the principles of pre tensioned and post tensioned concrete bridge decks.														
Prerequisites: Design of Concrete Structures																
CO, PO AND PSO MAPPING																
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	
CO-1	2	2	3	2	1	2	1	1	1	2	2	3	2	3	-	
CO-2	2	2	3	3	1	1	1	2	1	2	3	3	2	3	-	
CO-3	2	2	3	3	1	2	1	2	1	2	3	3	2	3	-	
CO-4	2	2	3	3	1	2	1	2	1	2	3	3	2	3	-	
CO-5	2	2	3	3	1	2	1	2	1	2	3	3	2	3	-	
1: Weakly related, 2: Moderately related and 3: Strongly related																
MODULE 1: INTRODUCTION - THEORY AND BEHAVIOUR (9L)																

Basic concepts - Advantages - Materials required - Systems and methods of prestressing - Analysis of sections - Stress concept - Strength concept - Load balancing concept - Effect of loading on the tensile stresses in tendons - Effect on tendon profile on deflections - Factors influencing deflections - Calculation of deflections - short term and long term deflections - Losses of prestress- Estimation of crack width		CO-1 BTL-2
MODULE 2: DESIGN		(9L)
Flexural strength - Simplified procedures as per codes - strain compatibility method - Basic concepts in selection of cross section for bending - stress distribution in end block, Design of anchorage zone reinforcement - Limit state design criteria - Partial prestressing - Applications.		CO-2 BTL-2
MODULE 3: CIRCULAR PRESTRESSING		(9L)
Design of prestressed concrete tanks - Poles and sleepers		CO-3 BTL-3
MODULE 4: COMPOSITE CONSTRUCTION		(9L)
Analysis for stresses - Estimate for deflections - Flexural and shear strength of composite members.		CO-4 BTL-2
MODULE 5: PRE-STRESSED CONCRETE BRIDGES		(9L)
General aspects - pretension prestressed bridge decks - Post tensioned prestressed bridge decks - Advantages over R.C. bridges - Principles of design only		CO-5 BTL-2
TEXT BOOKS		
1	Krishna Raju N. (2012). <i>Prestressed concrete</i> , Tata McGraw Hill Company, New Delhi.	
2	David A.Sheppard, William R. and Philips, Plant. (2011). <i>Cast precast and prestressed concrete – A design guide</i> , McGraw Hill, New Delhi.	
REFERENCE BOOKS		
1.	Ramaswamy G.S. (2012). <i>Modern prestressed concrete design</i> , Pitman Publishing, New Delhi.	
2	Praveen Nagaraja. (2013). <i>Prestressed Concrete Design</i> , Kindersley India.	
E BOOKS		
1	https://books.google.co.in/books/about/Prestressed_concrete.html?id=O9nNYr...	
2	https://www.pearson.com.au/products/S-Z.../Prestressed%20Concrete...eBook/9781488619038?...	
MOOC		
1	https://nptel.ac.in/courses/105106118/	
2	https://www.iith.ac.in/~prestressed	

COURSE TITLE		DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES										CREDITS		3	
COURSE CODE		CEC4368			COURSE CATEGORY			DE		L-T-P-S			3-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		This course deals with the principles involved in the analysis and design of steel concrete composite structural members.													
Course Objective		1. To understand the concepts of limit state design of steel concrete composite structures. 2. To get exposure in the design concepts of steel concrete composite beams. 3. To familiarize with the design concepts of steel concrete composite columns. 4. To understand the design concepts of steel- concrete composite box girder bridges. 5. To Know about the seismic behaviour of composite structures.													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the concepts of limit state design of steel concrete composite structures. 2. Design steel concrete composite beams 3. Design steel concrete composite trusses and columns. 4. Design steel- concrete composite box girder bridges 5. Illustrate the seismic behaviour of composite structures.													
Prerequisites: Design of Concrete Structures, Design of Steel structures															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	3	3	3	3	-	3	-	-	2	3	3	3	-
CO-2	1	2	3	3	3	3	-	1	-	-	3	3	3	3	-
CO-3	1	2	3	3	3	3	-	1	-	-	3	3	3	3	-
CO-4	1	2	3	3	3	3	-	1	-	-	3	3	3	3	-
CO-5	1	2	2	2	2	2	-	1	-	-	2	2	2	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION (9L)															

Review of Limit State Design of steel columns and beams - Introduction to steel concrete composite structures - concepts and Theory - Typical shear connectors and interaction with concrete - Tests for strength of shear connections.		CO-1 BTL-2
MODULE 2: DESIGN OF COMPOSITE BEAMS (9L)		
Ultimate behaviour of simply supported and continuous steel - concrete composite beams with solid deck slabs and profiled deck slabs.		CO-2 BTL-3
MODULE 3: DESIGN OF COMPOSITE TRUSSES AND COLUMNS(9L)		
Behavior and design of steel concrete composite Trusses - Shear connection details - Design of Steel concrete columns.		CO-3 BTL-3
MODULE 4: COMPOSITE BOX GIRDER BRIDGES (9L)		
Introduction to behavior of box girder bridges - Design concepts.		CO-4 BTL-2
MODULE 5: GENERAL (9L)		
Introduction to steel concrete sandwich construction - Seismic behavior of composite structures - case studies on steel-concrete composite construction in buildings.		CO-5 BTL-2
TEXT BOOKS		
1	R.P. Johnson. (2012). <i>Composite Structures of Steel and Concrete: Beams, Slabs Columns and Frames for Buildings</i> , Wiley India Pvt Ltd.	
REFERENCE BOOKS		
1.	R.Narayanan. (2019). <i>Steel Concrete Composite Structures</i> , CRC Press, London	
E BOOKS		
1.	https://www.scribd.com/doc/223508021/E-book-(Composite-Structures-of-Steel-and-%20Concrete-Volume-1-Beams-Slabs-Columns-a%20nd-Frames-for-Buildings-R-P-johnson)	
MOOC		
1.	https://www.mooc-list.com/tags/steel-concrete-composite-structures	

COURSE TITLE		REPAIR AND REHABILITATION OF STRUCTURES								CREDITS		3			
COURSE CODE		CEC4369			COURSE CATEGORY			DE		L-T-P-S		3-0-0-0			
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance		ESE			
20%		15%			15%			5%		5%		50%			
Course Description		To familiarize the students about testing methodologies, Repair and rehabilitation of concrete structures with the knowledge of choosing suitable repair methodology to access the existing concrete structures.													
Course Objective		The course should enable the students: 1. To enable the students to learn the theoretical knowledge in about testing methodologies of concrete structures 2. To enable them to select the suitable repair methodologies of concrete technology. 3. To improve the knowledge about the repair and rehabilitation of concrete structures.													
Course Outcome		Upon completion of this course, the students will be able to 1. Assess the distressed structures using non-destructive Engineering testing. 2. Interpret the mechanisms of degradation of concrete structures. 3. Select the suitable repair materials and adopt the appropriate repair techniques. 4. Select suitable strengthening technique for concrete structures. 5. Demonstrate the demolition procedures used for dilapidated structures.													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3

[illegible]

1	M.S. Shetty. (2016). <i>Concrete Technology - Theory and Practice</i> , S. Chand and Company, New Delhi, 7th edition.
2	World Bank Group, <i>Pollution Prevention and Abatement Handbook - Towards Cleaner Production</i> , World Bank and UNEP, Washington D.C.
3	Paul L. Bishop. (2000). <i>Pollution Prevention: Fundamentals and Practice</i> , McGraw-Hill International.
E BOOKS	
1	https://cpwd.gov.in/Units/handbook.pdf
2	https://onlinepubs.trb.org/online%20pubs/shrp/SHRP-S-360.pdf
3	https://books.google.co.in/books/.../Rehabilitation_Of_Concrete_Structures
4	http://www.faadooengineers.com/threads/4209-Basic-Civil-Engineering-Ebook-Lecture-Notes-PDF-Download
MOOC	
1	https://nptel.ac.in/courses/114106035/38
2	https://indianconcreteinstitute.org/repair-and-rehabilitation.html

COURSE TITLE	HEALTH AND SAFETY PRACTICES IN CONSTRUCTION INDUSTRY			CREDITS	3
COURSE CODE	CEB4370	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Introduce the foundations on which appropriate health and safety management systems may be built. Occupational health and safety affects all aspects of work, to assist the professional health and safety practitioner in ensuring that there are satisfactory health and safety standards within the organization.
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Course Objective	<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. make familiar in parameters governing safety in construction 2. Understand the accident occurrences and prevention 3. Know the education and training of safety personnel 4. Familiar with the safety measures in construction 5. Understand the concept of safety act and regulation based on case study
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Select the suitable safety practices in construction. 2. Apply the practices to avoid accidents in construction site. 3. Instruct construction workers to be safe in construction site. 4. Plan the appropriate safety measure to be followed during construction. 5. Recommend rules and regulations related to safety in construction.
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Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	3	-	2	-	2	1	-	-	1	3	-	-	2	2
CO-2	-	3	-	2	2	2	1	-	-	1	3	-	-	2	2
CO-3	-	3	-	2	-	2	1	-	-	1	3	-	-	2	2
CO-4	-	3	-	2	-	2	1	-	-	1	3	-	-	2	2
CO-5	-	3	-	2	-	2	1	-	-	1	3	-	-	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: MEANING AND SCOPE OF SAFETY IN CONSTRUCTION (9 L)	
Basic Philosophy, peculiarities and parameters governing safety in construction such as site planning and layout, safe access, good housekeeping. Safety in using construction machinery. Health and environment management, occupational safety, principles and practices of health and environmental safety management.	CO-1 BTL-2
MODULE 2: ACCIDENT OCCURRENCE AND PREVENTION (9 L)	
Definition of accident, reportable, non-reportable, fatal, non-fatal, workers insurance. Near miss accident, lost time accident, disabling injury. Accidents reportable under the factories act and ESI act. Frequency rate, severity rate, incidence rate. Temporary disablement, permanent disablement. Occupational health hazards, occupational diseases relating to construction works. Theories/models of accident occurrence, principles of accident prevention and financial implications.	CO-2 BTL-2
MODULE 3: EDUCATION AND TRAINING (9 L)	
Need for education training, elements of training cycle, assessment of needs, techniques and strategies of training, design and development of training programs. Safety promotion and safety awards, safety incentives, publicity schemes, caution notices at vantage points, working at heights, in confined space, underground, tunneling operations. Purpose of ventilation, thermal comfort, indices of heat stress, natural ventilation, mechanical ventilation, air conditioning.	CO-3 BTL-3
MODULE 4 : SAFETY MEASURES DURING CONSTRUCTION (9 L)	
Health hazards and safety measures while handling construction materials and equipment, handling cement, lime, steel, glass, paints, varnish, petroleum products, PVC, plastics etc., usage of personal protection gear. Safety precautions, planning and permits while demolishing buildings, during concreting, in underground works and tunneling etc.	CO-4 BTL-3
MODULE 5: CASE STUDIES, ACTS AND RULES REGARDING SAFETY IN CONSTRUCTION (9 L)	
Case studies of recent accidents in construction sites, its reasons and implications. Study of various Acts and rules like Workman compensation act and rules, The Building and other construction workers (Regulation of employment and conditions of service) 1996, 1998, The building and other construction workers welfare Cess Act, 1986 and rules, health measures and welfare schemes.	CO-5 BTL-3
SELF STUDY: The building and other construction workers welfare Cess Act, 1986 and rules, health measures and welfare schemes.	
TEXT BOOKS	
1.	David L. Goetsch. (2017). <i>Construction Safety and the OSHA Standards (What's New in Trades & Technology)</i> , Pearson
2.	John Schaufelberger and Ken-Yu Lin. (2013). <i>Construction Project Safety</i> , RSMeans.
REFERENCE BOOKS	
1.	Richard J. Coble, Jimmie Hinze and Theo C. Haupt. (2000). <i>Construction Safety and Health Management</i> , Prentice Hall Inc.

2.	Dan Petersen. (2001). <i>Safety Management: A Human Approach</i> , American Society of Safety Engineers.
3.	John Ridley. (2003). <i>Safety at Work</i> , Elsevier Ltd.
4.	Charles D. Reese and James Vernon Eidson. (2006). <i>Handbook of OSHA Construction Safety and Health</i> , Second Edition, CRC Press.
5.	David V. MacCollum. (2007). <i>Construction Safety Engineering Principles : Designing and Managing Safer Job Sites</i> , McGraw Hill Education
6.	Employee's Compensation (Amendment) Act, 2017
E BOOKS	
1.	https://manybooks.org/download/aramco_construction_safety_manual.pdf
MOOC	
1.	https://alison.com/course/HSA-5
2.	https://www.coursera.org/learn/construction-project-%20management/lecture/Yn8K8/safety-%20health-and-environment-management-systems

COURSE TITLE	PAVEMENT DESIGN AND ENGINEERING			CREDITS	3
COURSE CODE	CEC4371	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This elective course provides students with in-depth knowledge on how to design pavements for highways. A useful course for those who prepare to join highway engineering related government jobs.
Course Objective	<ol style="list-style-type: none"> 1. To explain how stresses are distributed under different loading patterns 2. To train how to design flexible pavements 3. To train how to design rigid pavements 4. To introduce how road pavements should be maintained 5. To teach how to strengthen the soil beneath a pavement
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Demonstrate the stress distribution in rigid and flexible pavements 2. Design flexible pavements 3. Design rigid pavements 4. Apply appropriate maintenance operation on pavements 5. Apply appropriate stabilization techniques for pavements

Prerequisites: Transportation Engineering -I

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	1	1	1	1	1	2	1	1	1	1	1	3	3	-
CO-2	3	3	3	1	2	2	1	2	1	1	1	1	3	3	-
CO-3	3	3	3	1	2	2	1	2	1	1	1	1	3	3	-
CO-4	3	2	1	1	3	3	1	1	1	1	1	1	3	3	-
CO-5	3	2	1	1	3	3	1	1	1	1	1	1	3	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM (9L)	
Introduction - Pavement as layered structure - Pavement types - rigid and flexible -Stress and Deflections in pavements under repeated loading.	CO-1 BTL-3
MODULE 2: DESIGN OF FLEXIBLE PAVEMENTS (9L)	
Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per latest IRC guidelines - Design and specification of rural roads.	CO-2 BTL-3
MODULE 3: DESIGN OF RIGID PAVEMENTS (9L)	
Cement concrete pavements - Modified Westergaurd approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.	CO-3 BTL-3
MODULE 4: PERFORMANCE EVALUATION AND MAINTENANCE (9L)	
Pavement Evaluation, Condition and evaluation surveys (Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index, Pavement maintenance. [IRC Recommendations Only]	CO-4 BTL-3
MODULE 5:STABILIZATION OF PAVEMENTS (9L)	
Stabilization with special reference to highway pavements - Choice of stabilisers -Testing and field control -stabilization for rural roads in India -use of Geo-synthetics (geo-textiles & geo-grids) in roads.	CO-5 BTL-3
TEXT BOOKS	
1	Kadiyali, L.R. (2000). <i>Principles and Practice of Highway Engineering</i> , Khanna tech. New Delhi.
2	<i>Design and Specification of Rural Roads (Manual)</i> , Ministry of rural roads, Government of India, New Delhi, 2001
3	C.E.G. Justo and S.K. Khanna. (2014). <i>Highway Engineering</i> , Nem Chand and Brothers.
REFERENCE BOOKS	
1.	<i>Guidelines for the Design of Flexible Pavements</i> , IRC:37 - 2001, The Indian roads Congress, New Delhi.
2.	<i>Guidelines for the Design of Rigid Pavements for Highways</i> , IRC:58-1998, The Indian Roads Congress, New Delhi.
E BOOKS	
1.	https://www.worldcat.org/title/pavement-design-and-materials/oclc/804863070
MOOC	
1.	https://www.mooc-list.com/tags/highway-engineering

COURSE TITLE	TRAFFIC ENGINEERING AND MANAGEMENT			CREDITS	3
COURSE CODE	CEC4451	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This elective course provides students with basic understanding of how to engineer and manage traffic streams and thereby reduce traffic congestion in our roads and junctions. It also covers traffic signals that are used to distribute delays across road users.
Course Objective	<ol style="list-style-type: none"> 1. To introduce about the characteristics of three major components of travel demand: road supply, traffic flows and land use. 2. To teach how to perform traffic surveys. 3. To train how to design traffic signals. 4. To train how to design traffic intersections. 5. To introduce the procedures of traffic management and forecasting.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Demonstrate the road, traffic and land use characteristics. 2. Classify the different components of traffic surveys. 3. Design traffic signals and their coordination. 4. Design the traffic intersections. 5. Illustrate the procedures involved in traffic management and traffic forecasting.

Prerequisites: Transportation Engineering -I

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	1	1	1	1	1	1	1	1	1	2	2	2
CO-2	3	3	2	1	3	1	1	1	2	1	1	1	2	2	2
CO-3	3	3	3	1	3	2	1	1	1	1	1	1	2	2	2
CO-4	2	3	3	1	1	2	1	1	2	1	1	1	2	2	2
CO-5	3	3	2	1	1	3	2	1	1	1	1	1	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related		
MODULE 1: INTRODUCTION (9L)		
Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering - Road, Traffic and Land Use Characteristics.		CO-1 BTL-3
MODULE 2: TRAFFIC SURVEYS AND ANALYSIS (9L)		
Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services - Problems.		CO-2 BTL-3
MODULE 3: TRAFFIC CONTROL (9L)		
Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design.		CO-3 BTL-3
MODULE 4: GEOMETRIC DESIGN OF INTERSECTIONS (9L)		
Conflicts at Intersections, Classification of Intersections at Grade. - Channelized and Un channelized Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Channelization and Rotary design (Problems), Grade Separators.		CO-4 BTL-3
MODULE 5: TRAFFIC MANAGEMENT (9L)		
Traffic Management - Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS).		CO-5 BTL-3
TEXT BOOKS		
1.	SK Khanna, CEG Justo, A Veeraragavan. (2015). <i>Highway Engineering</i> , Nem Chand & Brothers.	
2.	Kadiyali L R. (2011). <i>Traffic Engineering and Transport Planning</i> , Khanna publishers.	
REFERENCE BOOKS		
1.	Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.	
2.	Guidelines of Ministry of Road Transport and Highways, Government of India.	
3.	Yang, Xiaoguang. (2017). <i>Traffic Design</i> , S.K Kataria & Sons.	
E BOOKS		
1.	http://nptel.ac.in/downloads/105101008/	
2.	https://books.google.com/books/about/Traffic_Engineering_and_Management.html?	
MOOC		
1.	https://ocw.mit.edu/courses/transportation-courses/	

COURSE TITLE		BRIDGE STRUCTURE								CREDITS			3		
COURSE CODE		CEC4453		COURSE CATEGORY			DE			L-T-P-S			3-0-0-0		
Version		1.0		Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL			BTL-4		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE	
15%		15%			10%			5%			5%			50%	
Course Description		This course aims to introduce thebasic theory and concepts of design of steel, reinforced concrete, and prestressed concrete bridge as per IRC loading conditions													
Course Objective		1. Understand the design concepts of steel highway bridges. 2. Design Pratt type truss girder highway bridges and plate girder railway bridges. 3. Understand design concepts of reinforced concrete slab bridges. 4. Understand design of reinforced concrete girder bridges. 5. Understand design techniques involved in prestressed concrete bridges.													
Course Outcome		Upon completion of this course, the students will be able to 1. Classify the types of bridges and evaluate the loads acting on the bridges based on the IRC method. 2. Design solid slab bridges and T-beam bridges based on IRC Loading. 3. Design Girder bridges with and without articulation. 4. Design Pre-Stressed Concrete bridges 5. Design bearings for slab and girder bridges													
Prerequisites:Design of Concrete Structures															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	1	1	1	-	2	1	-	-	-	-	1	1	1	-
CO-2	-	2	1	1	-	1	2	-	-	-	1	1	1	3	-
CO-3	-	1	2	2	2	1	-	-	-	-	-	2	1	3	-
CO-4	-	1	1	2	2	1	-	-	-	-	2	1	1	3	-
CO-5	-	1	3	2	2	2	2	-	-	-	2	2	2	3	-
MODULE 1: INTRODUCTION (9)															

History of Bridges - Introduction to bridge engineering, classification and components of bridges, layout, planning. Structural forms of bridge decks, beam and slab decks, cellular decks. Standard specification for bridges, IRC loadings for road bridges, Loadings for Railway Bridges; Railroad data. Pre-design considerations; Railroad vs. Highway bridges.		CO-1 BTL-2
MODULE 2: RC SLAB (9)		
Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading.		CO-2 BTL-4
MODULE 3: GIRDER BRIDGES(9)		
Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges -Deck slab - Main girder - Design of cantilever - Design of articulation.		CO-3 BTL-4
MODULE 4: PRESTRESSED BRIDGES (9)		
Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section-Maximum and minimum pre-stressing forces - Eccentricity - Live load and dead load shear forces- cable zone in girder - Check for stresses at various sections Check for diagonal tension - Diaphragms - End block - Short term and long term deflection.		CO-4 BTL-4
MODULE 5: BEARINGS FOR BRIDGES (9)		
Importance of bearings; Bearings for slab bridges; Bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.		CO-5 BTL-3
TEXT BOOKS		
1	Johnson Victor D. (2010). <i>Essentials of Bridge Engineering"</i> , Oxford and IBH Publishing Co., New Delhi.	
2	M. K. Pant. (2016). <i>Bridge Engineering</i> , S.K Kataria & Sons.	
3	N. Krishna Raju. (2012). <i>Design of Bridges</i> , Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	
REFERENCE BOOKS		
1	Ponnuswamy S. (2017). <i>Bridge Engineering</i> , Tata McGraw-Hill, New Delhi.	
2	IRC Codes – IRC: 5, IRC: 6, IRC: 18, IRC: 27, IRC: 45, IRC: 78, IRC: 83	
E BOOKS		
1	https://books.google.com/books/about/Design_of_Bridge_Structures.html/	
2	https://www.elsevier.com/books/accelerated-bridge-construction/.../978-0-12-407224-	
MOOC		
1.	https://www.mooc-list.com/course/art-structural-engineering-bridges-edx	
2.	https://onlinecourses.nptel.ac.in/noc17_ce24/preview	

COURSE TITLE		STORAGE STRUCTURES										CREDITS		3	
COURSE CODE		CEC4454			COURSE CATEGORY			DE				L-T-P-S		3-0-0-0	
Version		1.0			Approval Details			24th ACM - 30.5.2018				LEARNING LEVEL		BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz				Attendance		ESE	
15%		15%			10%			5%				5%		50%	
Course Description		To introduce the student to basic theory and concepts of storage structures design and steel and concrete tanks, bunkers and silos.													
Course Objective		1. To understand the principle involved in the design of steel water tanks. 2. To be familiar with the design of concrete water tanks. 3. To be acquainted with the basic design concepts of steel bunkers and silos. 4. Understand the design concepts of steel bunkers and silos. 5. Understand the principles of circular prestressing.													
Course Outcome		Upon completion of this course, the students will be able to 1. Design the steel water tanks such as pressed water tank and water tanks with hemispherical bottom. 2. Design concrete water tanks like elevated rectangular water tank,circular tank and underground tanks. 3. Apply the design concepts in the design of steel bunkers and silos. 4. Design concrete bunkers and silos. 5. Design prestressed concrete circular water tanks													
Prerequisites: Design of Steel Structures,Design of Concrete Structures															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-
CO-2	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-
CO-3	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-
CO-4	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-
CO-5	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1: STEEL WATER TANKS (9L)	
Design of rectangular riveted steel water tank - Tee covers - Plates - Stays - Longitudinal and transverse beams - Design of staging - Base plates - Foundation and anchor bolts - Design of pressed steel water tank - Design of stays - Joints - Design of hemispherical bottom water tank - side plates - Bottom plates - joints - Ring girder - Design of staging and foundation.	CO-1 BTL-2
MODULE 2: CONCRETE WATER TANKS (9L)	
Design of Circular tanks - Hinged and fixed at the base - IS method of calculating shear forces and moments - Hoop tension - Design of intze tank - Dome - Ring girders - Conical dome - Staging - Bracings - Raft foundation - Design of rectangular tanks - Approximate methods and IS methods -Design of underground tanks - Design of base slab and side wall - Check for uplift.	CO-2 BTL-2
MODULE 3: STEEL BUNKERS AND SILOS (9L)	
Design of square bunker - Jansen's and Airy's theories - IS Codal provisions - Design of side plates - Stiffeners - Hooper - Longitudinal beams - Design of cylindrical silo - Side plates - Ring girder - stiffeners.	CO-3 BTL-3
MODULE 4: CONCRETE BUNKERS AND SILOS(9L)	
Design of square bunker - Side Walls - Hopper bottom - Top and bottom edge beams - Design of cylindrical silo - Wall portion - Design of conical hopper - Ring beam at junction.	CO-4 BTL-3
MODULE 5: PRESTRESSED CONCRETE WATER TANKS (9L)	
Principles of circular prestressing - Design of prestressed concrete circular water tanks.	CO-5 BTL-3
TEXT BOOKS	
1	Rajagopalan K., Storage Structures, Routledge, 2004
2	N. Krishna Raju. (2013). Advanced Reinforced Concrete Design (IS: 456-2000), CBS Publishers.
REFERENCE BOOKS	
1.	Subramanian,N. (2013). Design of Reinforced Concrete Structures, Oxford University Press, New Delhi.
2.	IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards,New Delhi, 2000
3	SP16, IS 456:2000 "Design Aids for Reinforced Concrete to Bureau of Indian Standards
4	Sinha, S.N. (2014). Reinforced Concrete Design, Publishing Tata McGraw Hill Company Ltd., New Delhi. Third Edition.
5	Punmia B.C, Ashok Kumar Jain, ArunK.Jain. (2012). R.C.C. Designs Reinforced Concrete Structures, Laxmi Publications Pvt. Ltd., New Delhi.

E BOOKS	
1.	https://app-u.pulsetip.com/assessing_loads_on_silos_and_other_bulk_storage_structures.pdf
MOOC	
1.	https://arvengtraining.com/en/all-courses/api-650-design-of-storage-tanks-course-online/

COURSE TITLE	TALL STRUCTURES										CREDITS		3		
COURSE CODE	CEC4455			COURSE CATEGORY			DE			L-T-P-S		3-0-0-0			
Version	1.0			Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL		BTL-4			
ASSESSMENT SCHEME															
First Periodical Assessment	Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE			
15%	15%			10%			5%			5%		50%			
Course Description	This course aims to introduce the elements and systems with planning, analysis and design involved in tall structures.														
Course Objective	1. Understand the various aspects of planning of tall buildings. 2. Identify different types of loads considered in the analysis of tall structures. 3. Understand the stability analysis of various structural systems. 4. Introduce various structural systems used for the construction of tall buildings. 5. Understand the concepts of approximate analysis of Structural system														
Course Outcome	Upon completion of this course, the students will be able to 1. Identify the various structural systems used in the constructionof tall structures. 2. Analyze tall structures using computer-based methods and approximate methods of analysis. 3. Design high-rise buildings with various structural configuration. 4. Analyse framed and shear wall structures based on approximate method of analysis 5. Analyse High Rise buildings with Suspension system and Deep Beam system.														
Prerequisites:Structural Analysis															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	2	2	1	2	1	-	-	-	2	1	2	1	-
CO-2	-	1	2	2	2	1	-	-	-	-	-	3	1	1	-
CO-3	-	1	2	2	2	1	-	-	-	-	-	2	1	1	-
CO-4	2	2	1	1	1	2	-	-	-	-	2	1	1	2	-
CO-5	-	1	3	3	1	2	2	2	-	-	2	2	2	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION (9)															

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High-Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading -Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.		CO-1 BTL-2
MODULE 2: THE VERTICAL STRUCTURE PLANE (9)		
Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing-Composite Floor Systems the High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel - Frame Systems - Multi-storey Box Systems.		CO-2 BTL-3
MODULE 3: COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD (9)		
The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response		CO-3 BTL-3
MODULE 4: APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS (9)		
Approximate Analysis of Bearing Wall Buildings the Cross Wall Structure - The Long Wall Structure the Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings- Lateral Deformation of Rigid Frame Buildings the Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.		CO-4 BTL-4
MODULE 5: OTHER HIGH-RISE BUILDING STRUCTURE (9)		
Deep Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings – SpaceFrame Applied to High Rise Buildings - Capsule Architecture – Case Studies		CO-5 BTL-3
TEXT BOOKS		
1	Bungale S. Taranath. (2011). <i>Structural Analysis and Design of Tall Buildings: Steel and Composite</i> , Construction, CRC Press.	
2	Bryan Stafford Smith & Alex Coull. (2011). <i>Tall Building Structures: Analysis and Design</i> , Wiley India.	
REFERENCE BOOKS		
1	Vicente Lopes Junior, Valder Steffen Jr. & Marcelo Amorim Savi. (2016). <i>Dynamics of Smart Systemsand Structures: Concepts and Applications</i> . Springer.	
2	David Parker, Antony Wood. (2013). <i>The Tall Buildings Reference Book</i> , Routelege.	
E BOOKS		
1	https://www.accessengineeringlibrary.com/.../tall-and-supertall-buildings-planning	
MOOC		

1.	https://www.mooc-list.com/course/art-structural-engineering-bridges-edx
2.	https://scholarship-positions.com/blog/structural-engineering-online-course/201601/

COURSE TITLE		INDUSTRIAL STRUCTURES								CREDITS				3	
COURSE CODE		CEC4456			COURSE CATEGORY			DE		L-T-P-S				3-0-0-0	
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL				BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance				ESE	
15%		15%			10%			5%		5%				50%	
Course Description		To introduce the student to basic theory and concepts of storage structures design and steel and concrete tanks, bunkers and silos.													
Course Objective		1. Familiarize with planning and layout of buildings and its components. 2. Know about the functional requirements of industries. 3. Understand the design concepts of steel storage structures. 4. Understand the design concepts of concrete storage structures. 5. Study the general principles of prefabrication and the functional requirements for Precast concrete units.													
Course Outcome		Upon completion of this course, the students will be able to 1. Narrate the general requirements for industries like cement, chemical and steel plants. 2. Explain the functional requirements such as lighting, ventilation and fire safety of industries. 3. Design the steel storage structures like bunkers and silos. 4. Design the concrete storage structures like bunkers and silos. 5. Explain the functional requirements of Precast concrete units.													
Prerequisites: Design of Steel structures															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	2	2	2	2	2	-	2	-	-	2	2	2	2	-
CO-2	-	2	2	2	2	2	-	-	-	-	2	2	2	2	-
CO-3	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-
CO-4	-	2	3	3	3	3	-	-	-	-	-	3	3	3	-
CO-5	-	2	3	3	3	3	-	-	-	-	3	3	3	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related		
MODULE 1: PLANNING (9L)		
Classification of Industries and Industrial structures - General requirements for industries like cement, chemical and steel plants - Planning and layout of buildings and components.		CO-1 BTL-2
MODULE 2: FUNCTIONAL REQUIREMENT (9L)		
Lighting - Ventilation - Accounts - Fire safety - Guidelines from factories act.		CO-2 BTL-2
MODULE 3: STEEL STRUCTURES (9L)		
Industrial roofs - Crane girders - Mill buildings - Design of Bunkers and Silos		CO-3 BTL-3
MODULE 4: DESIGN OF R.C. STRUCTURE (9L)		
Silos and bunkers - Chimneys - Principles of folded plates and shell roofs		CO-4 BTL-3
MODULE 5: PREFABRICATION (9)		
Principles of prefabrication - Pre stressed precast roof trusses- Functional requirements for Precast concrete units..		CO-5 BTL-2
TEXT BOOKS		
1.	P.Dayaratnam. (2008). <i>Design of Steel Structure</i> , Chand and Company.	
2.	N. Subramanian. (2013). <i>Design of Reinforced Concrete Structures</i> , Oxford.	
REFERENCE BOOKS		
1.	Wai KwongLau. 2010). <i>Building Construction with Precast Concrete Structural Elements</i> , LAP Lambert Academic Publishing.	
2.	Andreas Achilles & et al. (2015). <i>Basics Building Construction</i> , Birkhauser, 2015	
3.	Punmia B.C, Ashok Kumar Jain, ArunK.Jain. (2012). <i>R.C.C. Designs Reinforced Concrete Structures</i> , Laxmi Publications Pvt. Ltd., New Delhi.	
E BOOKS		
1.	https://chi.proficom.nl/stability_analysis_and_design_of_structures.pd	
MOOC		
1.	https://www.mooc-list.com/tags/industrial-organization	

COURSE TITLE		PRE-FABRICATED STRUCTURES										CREDITS			3	
COURSE CODE		CEC4457			COURSE CATEGORY			DE				L-T-P-S			3-0-0-1	
Version		1.0			Approval Details			24th ACM - 30.5.2018				LEARNING LEVEL			BTL-3	
ASSESSMENT SCHEME																
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz				Attendance			ESE	
15%		15%			10%			5%				5%			50%	
Course Description		This course introduces modular construction, industrialised construction and design of prefabricated elements and construction methods														
Course Objective		1. Acquire knowledge on principles and standardization of prefabrication system. 2. Learn about the various components of prefabrication system. 3. Understand the principles involved in prefabrication system. 4. Acquire information on different types of joints involved in structural connections 5. Learn to model components to resist earthquakes and cyclones.														
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the principles and standardization of prefabrication system. 2. Explain the various components of prefabrication system. 3. Demonstrate the principle involved in prefabrication system. 4. Elaborate different types of joints involved in structural connections 5. Model prefabrication components to resist earthquakes and cyclones.														
Prerequisites: Mechanics of Structures I																
CO, PO AND PSO MAPPING																
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3	
CO-1	-	2	3	3	3	3	-	3	-	-	2	3	2	3	-	
CO-2	-	2	3	3	3	3	-	-	-	-	2	3	2	3	-	
CO-3	-	2	3	3	3	3	-	-	-	-	2	3	2	3	-	
CO-4	-	2	3	3	3	3	-	-	-	-	2	3	2	3	-	
CO-5	-	2	3	3	3	3	-	-	-	-	2	3	2	3	-	
1: Weakly related, 2: Moderately related and 3: Strongly related																

MODULE 1: INTRODUCTION (8L+1T)	
Need for prefabrication - Principles - Materials - Modular coordination - Standardization - Systems - Production - Transportation - Erection.	CO-1 BTL-3
MODULE 2 : PREFABRICATED COMPONENTS (8L+1T)	
Behaviour of structural components - large panel constructions - Construction of roof and floor slabs - Wall panels - Columns - Shear walls	CO-2 BTL-3
MODULE 3: DESIGN PRINCIPLES (8L+1T)	
Disuniting of structures- Design of cross section based on efficiency of material used - Problems design because of joint flexibility - Allowance for joint deformation.	CO-3 BTL-3
MODULE 4: JOINT IN STRUCTURES (8L+1T)	
Joints for different structural connections - Dimensions and detailing - Design of expansion joints	CO-4 BTL-3
MODULE 5: DESIGN FOR ABNORMAL LOADS (8L+1T)	
Progressive collapse - Code provisions - Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.	CO-5 BTL-3
<i>Self-study Topic: Progressive collapse.</i>	
TEXT BOOKS	
1	Kim S. Elliott. (2019). <i>Precast Concrete Structures</i> , CRC Press
REFERENCE BOOKS	
1	Koncz T. (2012). <i>Manual of precast concrete construction</i> , Vols. I, II and III, Bauverlag, GMBH,
2	Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag,
E BOOKS	
1	https://rtvacademy.org/a14e5/design-principles-of-prefabricated-structures.pdf
2	https://personal.cityu.edu.hk/~bswmwong/photo lib/pdf/prefabricated.pdf
3	https://books.google.com/books/about/Prefabricated Structures
MOOC	
1	www.tatainteractive.com/.../Designing MOOCs-A White Paper on ID for MOOCs

COURSE TITLE	BASICS OF DYNAMICS AND ASEISMIC DESIGN			CREDITS	3
COURSE CODE	CEC4458	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course introduces the phenomena of earthquakes, the process, measurements and the factors that affect the design of structures in seismic areas. Rudiments of theory of vibrations, dynamic forces caused by earthquakes and codal provisions are covered.
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Course Objective	<ol style="list-style-type: none"> 1. Acquire knowledge to analyze structures with single degree of freedom for dynamic loading conditions. 2. Learn about computing natural frequencies and mode shapes of structures under dynamic loading. 3. Understand the causes of earthquake and the damage on the structures caused by earthquake 4. Learn to assess the response of the structure displacement, for earthquake loading 5. Acquire knowledge to adopt appropriate vibration control techniques
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Analyze the structures with single degree of freedom for dynamic loading conditions. 2. Find out the natural frequencies and the mode shapes of structures under dynamic loading 3. Describe the causes of earthquake and the damage on the structures caused by earthquake 4. Find out the response of the structure displacement, for earthquake loading 5. Design earthquake resistant structures and adopt appropriate vibration control techniques
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Prerequisites: Design of Concrete Structures, Design of Steel Structures

CO, PO AND PSO MAPPING

CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	1	2	3	3	3	3	-	3	-	1	2	3	2	3	-
CO-2	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
CO-3	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
CO-4	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-
CO-5	1	2	3	3	3	3	-	-	-	1	2	3	2	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related		
MODULE 1: THEORY OF VIBRATIONS (9L+1T)		
Concept of inertia and damping - Types of Damping - Difference between static forces and dynamic excitation - Degrees of freedom - SDOF idealization - Equations of motion of SDOF system for mass as well as base excitation - Free vibration of SDOF system - Response to harmonic excitation - Impulse and response to unit impulse - Duhamel integral.		CO-1 BTL-3
MODULE 2 : MULTIPLE DEGREE OF FREEDOM SYSTEM (9L+1T)		
Two degree of freedom system - Normal modes of vibration - Natural frequencies - Mode shapes - Introduction to MDOF systems - Decoupling of equations of motion - Concept of mode superposition (No derivations).		CO-2 BTL-3
MODULE 3: ELEMENTS OF SEISMOLOGY (9L+1T)		
Causes of Earthquake - Geological faults - Tectonic plate theory - Elastic rebound - Epicentre - Hypocentre - Primary, shear and Raleigh waves - Seismogram - Magnitude and intensity of earthquakes - Magnitude and Intensity scales - Spectral Acceleration - Information on some disastrous earthquakes		CO-3 BTL-3
MODULE 4: RESPONSE OF STRUCTURES TO EARTHQUAKE (9L+1T)		
Response and design spectra - Design earthquake - concept of peak acceleration - Site specific response spectrum - Effect of soil properties and damping - Liquefaction of soils - Importance of ductility - Methods of introducing ductility into RC structures.		CO-4 BTL-3
MODULE 5: DESIGN METHODOLOGY (9L+1T)		
IS 1893, IS 13920 and IS 4326 - Codal provisions - Design as per the codes - Base isolation techniques - Vibration control measures - Important points in mitigating effects of earthquake on structures		CO-5 BTL-3
Self-study Topic: Tectonic plate theory		
TEXT BOOKS		
1	Mario Paz,William Leigh. (2012). <i>Structural Dynamics Theory and Computation</i> , Springer.	
2	MadhujitMukhopdhyay. (2006). <i>Structural Dynamics, Vibrations and Systems</i> , Anne Books India.	
3	Pankaj Agarwal. (2007). <i>Earthquake Resistant Design of Structures</i> , Prentice Hall of India.	
REFERENCE BOOKS		
1	S.R. Damodarasamy, S.Kavitha. (2009). <i>Basics of Structural dynamics and Aseismic Design</i> , PHI Learning Private Limited.	
2	Clough R.W. and Penzien, J. (2006). <i>Dynamics of Structures</i> , McGraw-Hill.	
3	Anil K.Chopra. (2009). <i>Dynamics of Structures Theory and Applications to Earthquake Engineering</i> . Pearson Education.	
E BOOKS		
1	https://link.springer.com/book/10.1007/978-1-4615-7918-2	
2	http://www.uap-bd.edu/ce/anam/Anam_files/Structural%20Dynamics%20and%20Earthquake%20%20%20%20Engineering.pdf	
MOOC		

1

<https://www.mooc-list.com/tags/dynamics>

NON-DEPARTMENT ELECTIVES

COURSE TITLE		SOLID WASTE MANAGEMENT								CREDITS			2				
COURSE CODE		CED251			COURSE CATEGORY			NE			L-T-P-S			2-0-0-0			
Version		1.0			Approval Details			24th ACM - 30.5.2018			LEARNING LEVEL			BTL-3			
ASSESSMENT SCHEME																	
First Periodical Assessment		Second Periodical Assessment				Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance			ESE		
15%		15%				10%			5%			5%			50%		
Course Description		To make the students learn about the various types of solid waste and hazardous waste produced, the collection, transportation methods, the treatment and disposal methods.															
Course Objective		<div>1. To get familiarize about the sources and types of solid waste, collection, storage, transport and handling methods</div> <div>2. To know about the sources and types of hazardous waste, collection, storage, transport and handling methods.</div> <div>3. To become familiar separation and processing techniques.</div> <div>4. To know about various methods of disposal of solid waste.</div> <div>5. To be Aware of solid waste legislations.</div>															
Course Outcome		<div>Upon completion of this course, the students will be able to</div> <div>1. Explain various sources, characterization methods, collection types, storage and handling of municipal solid waste.</div> <div>2. Explain various hazardous wastes, collection, safe transportation, storage and handling.</div> <div>3. Demonstrate the methods of materials and energy recovery from solid wastes.</div> <div>4. Suggest scientific disposal methods for solid waste.</div> <div>5. Describe legislations associated with solid waste management in India.</div>															
Prerequisites:																	
CO, PO AND PSO MAPPING																	
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3		
CO- 1	-	-	3	1	1	3	3	3	2	2	2	-	-	2	2		
CO- 2	-	-	3	1	1	3	3	3	2	2	2	-	-	2	2		

2	https://www.mooc-list.com/tags/solid-waste-management
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COURSE TITLE		AIR AND NOISE POLLUTION CONTROL							CREDITS			2			
COURSE CODE		CED4291			COURSE CATEGORY			NE		L-T-P-S			2-0-0-0		
Version		1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-2		
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE		
15%		15%			10%			5%		5%			50%		
Course Description		To familiarize the students about characteristics, types, source and treatment technologies of various air pollutants.													
Course Objective		The course should enable the students to: 1. Understand the various types of Meteorological parameters. 2. Study and understand the various types of air pollutants 3. Study and understand the air models. 4. Know about the various control technologies in air pollution 5. Study about the source and effects of noise pollution													
Course Outcome		Upon completion of this course, the students will be able to 1. Explain the various types of Meteorological parameters 2. Summarize the various sources and effects of Air pollutants 3. Apply air models in air quality management 4. Describe the various control technologies adopted in air pollution management studies. 5. Summarize the sources and the effects of Noise pollution													
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	1	1	1	-	-	-	1	-	1	2	-	-	1	2	-
CO-2	1	1	1	-	-	-	1	-	1	2	-	-	1	2	-
CO-3	1	1	1	-	2	-	1	-	1	2	-	-	1	2	-
CO-4	1	1	1	-	-	-	1	-	1	2	-	-	1	2	-
CO-5	1	1	1	-	-	-	1	-	1	2	-	-	1	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE1: BASIC METEOROLOGICAL PROCESSES (6L)	
Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate –Adiabatic lapse rate – Environmental lapse rate- Atmospheric stability and turbulence – General Atmospheric Circulation	CO-1 BTL-2
MODULE 2: SOURCES AND EFFECTS OF AIR POLLUTANTS (6L)	
Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming- ozone layer depletion, Industrial accidents, air pollution index.	CO-2 BTL-2
MODULE 3: AIR QUALITY MODELLING AND MANAGEMENT (6L)	
Types of Plumes, Flow Regimes of a Plume, Plume Rise, Introduction to dispersion models, Air quality standards – Air quality monitoring - Zoning – Town planning regulation of new industries – Legislation and enforcement	CO-3 BTL-2
MODULE 4: TECHNOLOGY FOR AIR POLLUTION CONTROL (6L)	
Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries, case studies.	CO-4 BTL-2
MODULE 5: NOISE POLLUTION (6L)	
Sources of noise pollution – Effects – Assessment - Standards – Control methods Prevention, Industrial noise pollution control, case studies, study experiments	CO-5 BTL-2
TEXT BOOKS	
1	Anjaneyulu, D. (2002). <i>Air Pollution and Control Technologies</i> , Allied Publishers, Mumbai.
2	Rao, C.S. (2006). <i>Environmental Pollution Control Engineering</i> , New Age International, New Delhi.
3	Rao M.N., and Rao H. V. N. (2001). <i>Air Pollution Control</i> , Tata-McGraw-Hill, New Delhi.
REFERENCE BOOKS	
1	W.L. Heumann. (2000). <i>Industrial Air Pollution Control Systems</i> , McGraw-Hill, New York.
2	Mahajan S.P. (2005). <i>Pollution Control in Process Industries</i> , Tata McGraw-Hill Publishing Company, New Delhi.
3	Peavy S.W., Rowe D.R. and Tchobanoglous G (2013). <i>Environmental Engineering</i> , McGraw Hill, New Delhi.

COURSE TITLE		SUSTAINABLE ENGINEERING PRACTICES						CREDITS			2				
COURSE CODE		CSA401		COURSE CATEGORY			NE		L-T-P-S			2-0-0-0			
Version		1.0		Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE			
15%		15%		10%			5%		5%			50%			
Course Description		To develop knowledge in sustainability in the field of green buildings, transportation, renewable energies, water management and application of sustainable materials in various fields.													
Course Objective		1. To obtain knowledge about sustainable buildings and transportation 2. To understand about various renewable energies 3. To gain knowledge about water management techniques 4. To acquire knowledge about waste management techniques 5. To explore various sustainable materials													
Course Outcome		Upon completion of this course, the students will be able to 1. Narrate the sustainable buildings and transportation. 2. Explain various renewable energies. 3. Demonstrate various water management techniques. 4. Explain sustainable waste management methods 5. Explain various sustainable materials.													
Prerequisites:															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	3	2	1	2	3	3	-	-	-	2	-	2	2
CO-2	-	-	3	2	1	2	3	3	-	-	-	2	-	2	2
CO-3	-	-	3	2	1	2	3	3	-	-	-	2	-	2	2
CO-4	-	-	3	2	1	2	3	3	-	-	-	2	-	2	2
CO-5	-	-	3	2	1	2	3	3	-	-	-	2	-	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: SUSTAINABLE INFRASTRUCTURE												(6L+6L=12)			

Green buildings - public transport network - smart cities – transportation – planning, design and construction.		CO-1 BTL-2
MODULE 2: SUSTAINABLE ENERGY (6L)		
Renewable energy – wind, solar, biomass, geothermal, hydro power, ocean energy.		CO-2 BTL-2
MODULE 3: SUSTAINABLE WATER MANAGEMENT (6L)		
Water resources – water supply – water treatment – agriculture – water privatization – recycling of waste water – minimizing water use practices in urban areas		CO-3 BTL-2
MODULE 4: SUSTAINABLE WASTE MANAGEMENT (6L)		
Carbon sequestration – waste to energy technology – avoidance of marine litter, electronic waste disposal – reuse-recycle-recover concepts.		CO-4 BTL-2
MODULE 5: SUSTAINABLE MATERIALS (6L)		
Carbon sequestration – waste to energy technology – avoidance of marine litter, electronic waste disposal – reuse-recycle-recover concepts.		CO-5 BTL-2
REFERENCE BOOKS		
1.	Isabel C Escobar & Andrea Schafer. (2009). <i>Sustainable science and engineering (Vol.2: sustainable water for future)</i> , Elsevier Publications, 1st Edition.	
2.	Ni-Bin Chang, Ana Pires. (2015). <i>Sustainable solid waste management: a system engineering approach</i> , Wiley Publishers.	
3.	Francis D.K. Ching, Lan M Shapiro. (2014). <i>Green Building Illustrated</i> , Wiley Publishers.	
4.	Alan McKinnon, Michael Browne, Maja Piecyk, Anthony Whiteing. (2015). <i>Green Logistics</i> , 3 rd edition, KoganPage.	

COURSE TITLE			ENVIRONMENTAL IMPACT ASSESSMENT FOR ENGINEERING PROJECTS								CREDITS			2	
COURSE CODE			CED4382			COURSE CATEGORY			NE		L-T-P-S			2-0-0-0	
Version			1.0			Approval Details			24th ACM - 30.5.2018		LEARNING LEVEL			BTL-2	
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance			ESE	
15%			15%			10%			5%		5%			50%	
Course Description			This course describes the basic concepts off Environmental impact Assessment, methodology, and environmental audit.												
Course Objective			<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the various types of EIA. 2. Study and EIA assessment 3. Study the importance of public participation and mathematical modelling 4. Know about the various EIA case studies 5. Study about the source and effects of noise pollution 												
Course Outcome			<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the various types of EIA assessment 2. Apply the EIA assessment methodology 3. Describe the public participation and Environmental modeling in EIA assessment 4. Summarize the EIA procedure for various Industries 5. Explain the Environmental auditing and EIA standards 												
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	-	1	1	1	-	-	1	1	1	2	1	2	-	2	2
CO-2	-	1	1	1	-	-	1	1	1	2	1	2	-	2	2
CO-3	-	1	1	1	2	-	1	1	1	2	1	2	-	2	2
CO-4	-	1	1	1	-	-	1	1	1	2	1	2	-	2	2
CO-5	-	1	1	1	-	-	1	1	1	2	1	2	-	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1: INTRODUCTION TO ENVIRONMENTAL IMPACT ASSESSMENT (6L)	
Introduction - definitions and concepts - historical development of EIA - EIA for engineers - environmental impact statement - environmental appraisal - environmental impact factors and areas of consideration	CO-1 BTL-2
MODULE 2: : ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY (6L)	
Measurement of environmental impact - organization, scope and methodologies of EIA - Six generic steps - descriptive checklists - simple interaction matrix -stepped matrix - uniqueness ratio - habitat evaluation system.	CO-2 BTL-2
MODULE 3: ENVIRONMENTAL IMPACT ASSESSMENT IN INDIA (6L)	
Public involvement techniques - comprehensive environmental impact study - EIA Models – Environmental and social consideration in International cooperation-EIA Regulations in India.	CO-3 BTL-2
MODULE 4: : ENVIRONMENTAL IMPACT ASSESSMENT FOR INDUSTRIES (6L)	
EIA for Hydropower Projects and other projects - Case studies from hydropower projects - hazardous industries – mining industries.	CO-4 BTL-2
MODULE 5: ENVIRONMENTAL AUDIT (6L)	
Environmental audit: Definitions and concepts -methodologies and regulations - Introduction to ISO and ISO 14000 -Environmental management systems in local government.	CO-5 BTL-2
TEXT BOOKS	
1	R. Therivel, John Glasson, Andrew Chadwick. (2005). <i>Introduction to Environmental Impact Assessment (Natural and Built Environment)</i> , Routledge.
2	R. Welford. (2005). <i>Corporate Environmental Management - Systems and Strategies</i> , Universities Press.
3	G. Burke, B. R. Singh and L. Theodore. (2000). <i>Handbook of Environmental Management and Technology</i> , 2nd Ed., John Wiley & Sons.
REFERENCE BOOKS	
1	C. H. Eccleston. (2000). <i>Environment Impact Statements: A Comprehensive Guide to Project and Strategic Planning</i> , John Wiley & Sons.
2	L. W. Canter. (2000). <i>Environmental Impact Assessment</i> , 2nd Ed., McGraw-Hill.
3	R. Welford. (2005). <i>Corporate Environmental Management - Systems and Strategies</i> , Universities Press.

COURSE TITLE	PROJECT SAFETY MANAGEMENT			CREDITS	2
COURSE CODE	CED4391	COURSE CATEGORY	NE	L-T-P-S	2-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Introduce the foundations on which appropriate health and safety management systems may be built. Occupational health and safety affect all aspects of work, to assist the professional health and safety practitioner in ensuring that there are satisfactory health and safety standards within the organization.
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Course Objective	<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. Understand the accident occurrences and prevention 2. Know the education and training of safety programme 3. make familiar in parameters governing safety in construction 4. Familiar with the safety measures in construction 5. Understand the concept of safety act and regulation based on case study
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Identify the causes of construction accidents. 2. Conduct various safety programs. 3. Maintain contract records on construction safety. 4. Design various aspects for safety in Construction. 5. Adopt and quote acts and regulations in Construction Safety.
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Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	3	-	2	-	2	1	2	-	2	3	-	-	2	2
CO-2	-	3	-	2	2	2	1	2	-	2	3	-	-	2	2
CO-3	-	3	-	2	-	2	1	2	-	2	3	-	-	2	2
CO-4	-	3	-	2	-	2	1	2	-	2	3	-	-	2	2
CO-5	-	3	-	2	-	2	1	2	-	2	3	-	-	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CONSTRUCTION ACCIDENTS(9 L)		
Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications		CO-1 BTL-2
MODULE 2: SAFETY PROGRAMMES (9 L)		
Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job- Site Safety Assessment – Safety Meetings – Safety Incentives		CO-2 BTL-2
MODULE 3: CONTRACTUAL OBLIGATIONS (9 L)		
Safety in Construction Contracts – Substance Abuse – Safety Record Keeping.		CO-3 BTL-3
MODULE 4: DESIGNING FOR SAFETY (9 L)		
Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle managers – Top Management Practices, Company Activities and Safety – Safety Personnel –Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation		CO-4 BTL-3
MODULE 5: SAFETY IN CONSTRUCTION (9 L)		
Case studies of recent accidents in construction sites, its reasons and implications. Study of various Acts and rules like Workman compensation act and rules, The Building and other construction workers (Regulation of employment and conditions of service) 1996, 1998, The building and other construction workers welfare Cess Act, 1986 and rules, health measures and welfare schemes.		CO-5 BTL-3
SELF STUDY: The building and other construction workers welfare Cess Act, 1986 and rules, health measures and welfare schemes.		
TEXT BOOKS		
1.	David L. Goetsch. (2017). <i>Construction Safety and the OSHA Standards (What's New in Trades & Technology)</i> , McGraw-Hill Education	
2.	John Schaufelberger and Ken-Yu Lin. (2013). <i>Construction Project Safety</i> . RS Means.	
REFERENCE BOOKS		
1.	Richard J. Coble, Jimmie Hinze and Theo C.Haupt. (2000). <i>Construction Safety and Health Management</i> , Prentice Hall Inc.	
2.	Dan Petersen. (2001). <i>Safety Management: A Human Approach</i> , American Society of Safety Engineers.	
3.	John Ridley. (2003). <i>Safety at Work</i> , Elsevier Ltd.	
4.	Charles D. Reese and James Vernon Eidson. (2006). <i>Handbook of OSHA Construction Safety and Health</i> , Second Edition, CRC Press.	
5.	David V. MacCollum. (2007). <i>Construction Safety Engineering Principles (McGraw-Hill Construction Series): Designing and Managing Safer Job Sites</i> , McGraw Hill Education.	
6.	Employee's Compensation (Amendment) Act, 2017	
E BOOKS		

1.	https://manyebbooks.org/download/aramco_construction_safety_manual.pdf
2	https://www.oshatrain.org/pdf/constructionplan.pdf
MOOC	
1.	https://alison.com/course/HSA-5
2	https://www.coursera.org/learn/construction-project-%20management/lecture/Yn8K8/safety-%20health-and-environment-management-systems

COURSE TITLE	INTRODUCTION TO OCEANOGRAPHY			CREDITS	2
COURSE CODE	CED4392	COURSE CATEGORY	NE	L-T-P-S	2-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course investigates the broad-scale features and dynamics of the Earth's oceans. Specific topics include seafloor spreading, marine sediments, salinity, biogeochemical cycles, ocean structure, currents, waves, tides, primary production, marine ecology, global warming,
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Course Objective	<ol style="list-style-type: none"> 1. Learn to Identify the major features of ocean basins and chemical and physical characteristics of sea water. 2. Acquire information on oceans circulation and influence, formation and behavior of waves 3. Learn the formation of tides and identify factors that affect the tidal cycle 4. Learn about the general characteristics of life in water 5. Learn about possible solutions to the environmental issues of the Oceans
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Identify the major features of ocean basins and identify the chemical and physical characteristics of sea water. 2. Explain how oceans circulate and influence each other and the formation and behavior of waves 3. Explain the formation of tides and identify factors that affect the tidal cycle 4. Describe the general characteristics of life in the water 5. Identify and consider possible solutions to the environmental issues of the Oceans
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Prerequisites: *Nil*

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	1	2	2	1	2	1	1	2	2	2	3	-
CO-2	1	2	2	1	2	1	1	2	2	1	2	1	2	3	-
CO-3	1	2	2	1	1	2	1	3	3	1	1	2	2	3	-
CO-4	1	2	1	1	1	2	1	2	2	1	2	1	2	3	-
CO-5	1	2	1	2	2	1	1	2	2	1	2	2	2	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: PHYSICAL OCEANOGRAPHY (6L)	
Marine Provinces - Plate Tectonics - Marine Sediments - Physical Properties of Water - Chemistry of seawater	CO-1 BTL-3
MODULE 2 : SURFACE OF THE OCEAN (6L)	
Types and generation of Waves - generation of tides - currents, storm surge - Tsunami propagation	CO-2 BTL-3
MODULE 3: OCEAN CIRCULATION (6L)	
Horizontal and vertical circulation - Earth heat budget - Air-sea interaction - temperature changes - sea level rise	CO-3 BTL-3
MODULE 4: LIFE IN THE OCEAN (8L+1T)	
Biogeochemistry of Life - various species available in the ocean - Fish catch in India - problems due to marine litter and oil spill	CO-4 BTL-3
MODULE 5: TRANSPORT IN THE OCEAN (6L)	
Various surface and subsurface transports, types of vehicles, ocean boundaries, Exclusive economic zone	CO-5 BTL-3
<i>Self-study Topic: Fish catch in India.</i>	
TEXT BOOKS	
1	Trujillo A. P., Thurman H. V. (2015). <i>Essential of Oceanography</i> , Pearson Education India.
2	Stewart R. H. (2009). <i>Introduction to Physical Oceanography</i> , Orange Grove Books.
REFERENCE BOOKS	
1	Knaus J.A. (2005). <i>Introduction to Physical Oceanography</i> , Waveland Pr. Inc.
E BOOKS	
1	https://open.umn.edu/opentextbooks/textbooks/732
2	https://www.scribd.com/document/95291539/eBook-Introduction-to-Physical-oceanography-Robert-H-stewart-2005-Book
MOOC	
1	https://www.edx.org/course/our-global-ocean-an-introduction-course

COURSE TITLE	INTELLIGENT TRANSPORTATION SYSTEMS			CREDITS	2
COURSE CODE	CEC4481	COURSE CATEGORY	NE	L-T-P-S	2-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This elective course introduces on how to apply information technology to solve transport and traffic problems. The course includes multidisciplinary approach in dealing with traffic congestion and traffic incidents. It is a multi-branch course, where students from various branches of engineering and technology can join, interact and learn better.
Course Objective	<ol style="list-style-type: none"> 1. To introduce the fundamentals of intelligent transportation systems. 2. To apply basic theories involved in traffic flow descriptions to solve traffic issues. 3. To introduce a variety of user services such as electronic toll collection, railway crossing warning etc. 4. To explain how important is ITS applications, especially the standards involved. 5. To understand devising of new ITS systems based on systems approach.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the basics of intelligent transportation systems. 2. Apply traffic theories to solve traffic flow problems. 3. Explain various types of user services. 4. Explain the importance of ITS applications and standards. 5. Apply the concepts of ITS architecture and planning in devising new ITS systems.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	1	2	2	2	1	1	1	1	2	3	-
CO-2	3	3	1	1	2	2	2	2	1	1	2	1	2	3	-
CO-3	2	1	1	2	3	3	2	3	3	2	2	2	2	3	-
CO-4	2	1	2	1	3	3	2	2	1	1	2	1	2	3	-
CO-5	2	1	2	1	2	1	2	2	1	1	1	1	2	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO INTELLIGENT TRANSPORTATION SYSTEMS (9L)

A short history and perspectives on the future – ITS Organizational issues – Regionalism – Transportation Information Infrastructure – Transportation operations – Deployment – Competitive Region.		CO-1 BTL-3
MODULE 2: FUNDAMENTALS OF TRAFFIC FLOW AND CONTROL (9L)		
Traffic Flow Elements - Flow-Density Relationships - Fundamental Diagram of Traffic Flow – Traffic Models - Alternative Traffic Flow Models – Shock waves – Traffic Signalization Principles – Signal Co-ordination – Traffic Simulation Models		CO-2 BTL-3
MODULE 3: USER SERVICES (9L)		
Travel and Traffic Management – Pre-trip/Enroute travel Information – Route Guidance – Ride matching and Reservation – Traffic control – Emissions testing and mitigation - Highway rail intersection. Public transportation operations – Public transportation management – personalized public transit – Electronic payment – Commercial vehicles operations – Emergency management.		CO-3 BTL-3
MODULE 4: APPLICATION AND STANDARDS (9L)		
Freeway and Incident Management Systems (FIMS) – Objectives – Functions – Ramp Control – Information Dissemination – Advanced Arterial Traffic Control Systems – Adaptive traffic control algorithms – Transit Operation Software – Transit Information Systems. ITS Standards application areas – NTCIP – Standards Testing.		CO-4 BTL-3
MODULE 5: ARCHITECTURE AND PLANNING (9L)		
Regional and Project ITS Architecture – Operation Concepts – National ITS Architecture – User Services and User Service Requirements – Logical Architecture – Physical Architecture – Architecture development tool. Transportation planning and ITS – Market Package based Planning process – Traceability based ITS planning process – Integration of ITS into Transportation Planning.		CO-5 BTL-3
TEXT BOOKS		
1.	Mashrur A. Chowdhury, and Adel Sadek. (2003). <i>Fundamentals of Intelligent Transportation Systems Planning</i> , Artech House, Inc.	
2.	Sussman, Joseph. (2010). <i>Perspectives on Intelligent Transportation Systems (ITS)</i> , Springer.	
REFERENCE BOOKS		
1.	Ipolito Meneguette, Rodolfo, Eduardo De Grande, Robson, Ferreira Loureiro, and Antonio Alfredo. (2001). <i>Intelligent Transport System in Smart Cities</i> , Springer.	
E BOOKS		
1.	Transactions on Intelligent Transportation Systems, IEEE.	
MOOC		
1.	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-212j-an-introduction-to-intelligent-transportation-systems-spring-2005/	

COURSE TITLE	INTRODUCTION TO ROAD SAFETY AND MANAGEMENT			CREDITS	2
COURSE CODE	CED4482	COURSE CATEGORY	NE	L-T-P-S	2-0-0-0
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This elective course covers important elements of road safety. It provides a basic understanding of fundamental factors that leads to traffic incidents. It also covers ways to prevent it via policies and regulations.
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Course Objective	<ol style="list-style-type: none"> 1. To explain how important is road safety from different perspectives. 2. To introduce the ways of improving road safety. 3. To explain the rules and challenges involved in implementing aspects. 4. To introduce about health safety and environment management systems. 5. To explain macroscopic elements like policy and regulations.
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the importance of road safety. 2. Explain the way of achieving road safety. 3. Apply the rules involved in implementing road safety. 4. Explain the entities involved in health safety and environment management systems. 5. Explain the policy and regulations related to road safety.
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Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	1	2	2	2	1	1	1	1	2	3	-
CO-2	3	2	1	1	2	2	2	2	1	1	2	1	2	3	-
CO-3	2	1	1	2	2	2	2	2	1	1	1	2	2	3	-
CO-4	2	1	2	1	2	2	2	2	1	1	2	1	2	3	-
CO-5	3	1	2	1	2	1	2	2	1	1	1	1	2	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION (6L)

How roads evolved, materials used, divisional control, Problems faced by the drivers in the past/present road and driving environment, Driving License and its requirements, Causes of Road Traffic Crashes and Violations, IRC, National Highways.		CO-1 BTL-3
MODULE 2: ROAD SAFETY (6L)		
Traffic regulation systems and Road signal safety systems, Introduction to Defensive Driving, Safe vehicle driving, Basics of Accident statistics and analysis, Intelligent Transport systems, Traffic Control Devices.		CO-2 BTL-3
MODULE 3: CODE OF CONDUCT ON ROAD (6L)		
Lane Discipline, Overtaking sight distance, Speeds, Acceleration/Deceleration, U-Turns, Stopping/ Parking, Driver Signals, Night Driving, Mirrors, Moving Off, Tailgating, Fastag, Vehicle breakdown, Role of IRTE, Noise levels.		CO-3 BTL-3
MODULE 4: HEALTH SAFETY AND ENVIRONMENT MANAGEMENT SYSTEMS (6L)		
Employee Health Care Plan, Safety Management Structure, Safety Analysis and Risk Assessment, Factors Affecting Driver Behaviour: Health, Hygiene, Stress, Fatigue, Hours of Driving, Drunken Driving, Drugs and Medicines, Emergency Contact on Highways.		CO-4 BTL-3
MODULE 5:POLICY AND LEGISLATIONS IN ROAD SAFETY AND MANAGEMENT (6L)		
The Rules of the Road Regulations & the Right of Way, Futuristic Roads, Policies related to road violations and management, Awareness campaigns – Public and Private, road safety week.		CO-5 BTL-3
TEXT BOOKS		
1.	Prabha Shastri Ranade. (2009). <i>Road Safety Management: Issues and Perspectives</i> , SBS Publishers.	
2.	Geetam Tiwari, Dinesh Mohan. (2016). <i>Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer</i> , CRC Press.	
REFERENCE BOOKS		
1.	B.S. Dhillon. (2011). <i>Transportation Systems Reliability and Safety</i> , CRC Press.	

COURSE TITLE	STANDARDS AND PRACTICES IN CIVIL ENGINEERING			CREDITS	2
COURSE CODE	CED4483	COURSE CATEGORY	NE	L-T-P-S	2-0-0-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Introduce the flow of standard and practices in civil engineering in respect of type of building, construction materials, estimation, specification and maintenance of building.
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Course Objective	<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. Understand the basic concepts of building construction. 2. Attains adequate knowledge in construction material. 3. Understand the methods of estimation and rate analysis. 4. Familiar with the specification of item of works. 5. Impart knowledge of maintenance of buildings.
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Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Illustrate the Building Construction norms and plan approval formalities. 2. Choose building materials based on the requirements 3. Estimate the material quantities and cost in building construction. 4. Adopt various construction specifications appropriately. 5. Suggest maintenance measures for various structures.
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Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	2	-	2	-	1	2	2	-	3	-
CO-2	-	-	-	-	-	2	-	2	-	1	2	2	-	3	-
CO-3	2	-	-	-	-	2	1	2	-	1	3	2	-	3	-
CO-4	-	-	-	-	-	2	-	2	-	1	2	2	-	3	-
CO-5	-	-	-	-	-	2	-	2	-	1	2	2	-	3	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: BUILDING CONSTRUCTION (6L)	
Introduction – History of Civil Engineering – Units of measurements – Types of buildings – Load bearing – Framed – Area Calculation – Conversion of units – Floor Space index – Undivided share of land – Plan approval – Authority – Procedure.	CO-1 BTL-2
MODULE 2: CONSTRUCTION MATERIALS (6L)	
Construction materials – Stones – Bricks – Lime – Cement – Aggregates – Timber and other building materials – Standards and testing of materials.	CO-2 BTL-2
MODULE 3: ESTIMATION (6L)	
Estimation – Types of estimate – Methods of estimate – Detailed estimate – Schedule of rates – Analysis of rates – Plinth area rates – Cost index	CO-3 BTL-3
MODULE 4: CONSTRUCTION SPECIFICATION (6L)	
Construction specification – Earth work – Brick work – Plain cement concrete – Reinforced cement concrete – Plastering – Flooring.	CO-4 BTL-3
MODULE 5: MAINTENANCE OF BUILDINGS (6L)	
Maintenance of buildings – Types of maintenance – Yard stick of maintenance - Repairs and Rehabilitation of structures.	CO-5 BTL-3
SELF STUDY: Construction materials, specification.	
TEXT BOOKS	
1.	Rangwala. (2016). <i>Engineering Materials</i> , Charotar Publishing house Pvt. Ltd.
2	Dutta. B.N. (2016). <i>Estimating and Costing in Civil Engineering</i> , UBS Publishers & Distributors Pvt. Ltd.
3	P. C. Varghese. (2015). <i>Building materials</i> , prentice hall of India.
REFERENCE BOOKS	
1.	M. S. Shetty. (2006). <i>Concrete Technology</i> , S. Chand & Company.
2.	CPWD, "CPWD Specification", Government of India, New Delhi, 2016.
3.	CPWD, "Delhi Schedule of rates", Government of India, New Delhi, 2016
4.	CPWD, "CPWD Analysis of Rates", Government of India, New Delhi, 2016.
E BOOKS	
1.	http://www.uou.ac.in/sites/default/files/slm/Introduction-cyber-security.pdf
MOOC	
1.	https://alison.com/course/HSA-5
2	https://www.coursera.org/learn/construction-cost-estimating
3	http://www.billingengineer.com/quantity-surveying-blog.html
4	https://ww2.rics.org/en-in/events/e-learning/distance-learning/quantity-surveying-foundation-programme/

CURRICULUM

HONOURS

Construction Project Management & Cost Estimation

Course-1: CEH4361 Construction Planning & Cost Estimation

SL. NO	COURSE CODE	NAME OF THE COURSE	TOTAL LEARNING HOURS	CREDIT
1	CEH4361	Construction Planning & Cost Estimation	45	3
2	CEH4376	Project Management & Scheduling	45	3
3	CEH4377	Infrastructure Project Management	45	3
4	CEH4462	Project management for managers	45	3
		Total Credits	180	12

Course-2: CEH4376 Project Management & Scheduling

Modules	Module Name	Offering University	Learning Hours	Credit
I	Initiating and Planning Projects	University of California, Irvine	7	3
II	Construction Cost Estimating	Columbia University	9	
III	Procurement, Project Cash Flow &Cost Control		12	
IV	Construction Finance & Financial Plans for Development Projects	Columbia University	11	
V	Project Finance and PPP		6	
Total			45	3

Course-3: CEH4377 Infrastructure Project Management

Modules	Module Name	Offering University	Learning Hours	Credit
I	Scope & WBS	Rice University	9	3
II	Project Time Management		12	
III	Urban Infrastructure Management	École Polytechnique Fédérale de Lausanne	9	
IV	Project Risk & Quality Management	Rice University	9	
V	Human Resources & Procurement Management		6	
Total			45	3

Course-4: CEH4462 Project management for Managers

Modules	Module Name	Offering University	Learning Hours	Credit
I	Project Management & Selection	IIT Roorkee	9	3.0
II	Capital Budgeting& Risk Management		9	
III	Project Team Building & Time Management		9	
IV	Probability Model in Networks &Crashing of Networks		9	
V	Project Cost Management & Quality Management		9	
Total			45	3.0

MINORS**Geographical Information System**

SL. NO	COURSE CODE	NAME OF THE COURSE	TOTAL LEARNING HOURS	CREDIT
1	CEM4276	Fundamentals of GIS(CEM4276)	60	4
2	CEM4361	GIS Data Acquisition, Automation, and Applications (CEM4361)	45	3
3	CEM4376	Remote Sensing and GIS (CEM4376)	30	2
Total			135	9

Course-1: CEM4276 Fundamentals of GIS

Modules	Module Name	Offering University	Learning Hours	Credit
I	Introduction to Geographic Information Systems	Coursera University of California, Davis	9	
II	ArcGIS Basics & Making Maps		14	
III	Retrieving and Sharing Data		9	
IV	Data Models & Vector Data		14	

Modules	Module Name	Offering University	Learning Hours	Credit
I	Construction Industry Project Delivery	Columbia University	8	3
II	Health, Safety & Technology Trends in Construction		8	
III	Project Planning		8	
IV	Construction Scheduling	Columbia University	11	
V	Technology Applications for Scheduling		10	
Total			45	3
V	Storage Formats& Creating Web Maps		14	
Total			60	4

Course-2: CEM4361 GIS Data Acquisition, Automation, and Applications

Modules	Module Name	Offering University	Learning Hours	Credit
I	Overview, Imagery and Raster Calculator	Coursera University of California, Davis	7	3
II	Model Builder and digital Elevation Models		11	
III	Spatial Analyst		9	
IV	GIS File, Geocoding & Map Design Principles	Coursera University of Toronto	8	
V	Mapping Quantitative & Project		10	
Total			45	3

Course-3: CEM4376 Remote Sensing and GIS

Modules	Module Name	Offering University	Learning Hours	Credit
I	Remote Sensing & Satellite Image Corrections	SWAYAM IIT Guwahati	8	2
II	Digital Image Processing, Thermal and Microwave		11	
III	Imaging Spectroscopy & Application		11	
Total			30	2

HONOURS

COURSE TITLE	Course I - CONSTRUCTION PLANNING & COST ESTIMATION			CREDITS	3
COURSE CODE	CEH4361	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	The Construction Management specialization is curated for professionals in the construction and civil engineering industry looking to advance their careers. Through this specialization, students will gain comprehensive industry knowledge along with the latest trends and development within the industry. This 5-coursespecialization will cover the major facets of construction management including project initiation and planning, scheduling techniques and procedures, cost estimating and control, and construction project financials. After students complete this specialization, they will have gained significant skills and tools to stay relevant and ahead of the curve in the world of construction management.
Course Objective	<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. Know the role and responsibilities of a project manager 2. Gain knowledge about quantity measurement and cost estimation of a construction project. 3. Know about the importance of cost controlling and how to monitor project cash flow in a construction project 4. Know about the financial plans to be considered in a construction project 5. Learn about real estate finance and real estate project lifecycle.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Perform a project assessment based on the business requirements. 2. Estimate the quantity of materials required for a construction project and execute cost estimation. 3. Apply cost control measures in a construction project. 4. Develop financial plans for a construction project. 5. Analyse the risks in the public private partnership projects.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO 11	PO12	PSO1	PSO 2	PSO 3
CO-1	-	-	-	-	-	2	-	2	2	-	3	3	-	1	3
CO-2	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3

CO-3	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3
CO-4	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3
CO-5	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INITIATING AND PLANNING PROJECTS (7)															
Project Management Overview Project Management Project Planning - What is a Project? - Stakeholders- Scope Matters- Authority vs. Influence														CO-1 BTL-2	
MODULE 2 CONSTRUCTION COST ESTIMATING (9)															
Quantity Estimate Construction Cost Estimating and Cost Control Overview-Understanding Design in the Construction Industry-Introduction to the Types of Cost Estimates Overview of the Types of Cost Estimates, Cost Indices, Cost, Capacity Factor, Cost Estimates Quiz, Cost Estimates Work Problem. Quantity Take-Off and Measurement Measurement, Masonry, Glass Curtain Wall, Facade / Wall Finishes / Measurement Overview, Cut and Fill Process and Equipment, Cut and Fill Takeoff, Cut and Fill Software, Introduction to Deep Foundations, Concrete Foundation and Concrete Properties, Concrete Formwork, Concrete Takeoff: Parking Lot Example, Concrete Takeoff: Skyscraper Example, Quantifying rebar Walkthrough, History of Structural Steel, Steel Sections in Design, Structural Steel Takeoff Example Pricing Cost of Materials and Formwork- Concrete Material: Reinforcing Steel and Concrete Money Component- Productivity Component and Examples- Estimating Equipment Costs- 1 practice Exercise-Pricing Building the Estimate Estimate Classification, Methods and Formats - Design Estimate project -Schematic Design Estimate Demo - Schematic Design: A Deeper Dive -Building and Finalizing the Estimate -Checks and Due Diligence -1 practice exercise -Building the Estimate. Cost Estimation in Practice Cost Estimating in General Practice -Tips in Cost Estimating and Cost Management-Roles and Responsibilities of Cost Managers -1 practice exercise -Cost Estimation.														CO-2 BTL-3	
MODULE 3: PROCUREMENT, PROJECT CASH FLOW & COST CONTROL (12)															
Procurement General Procurement: Pre-Bid Estimate and Bid Documentation -Bid Stage, Bid Returns and Levelling -1 practice exercise Procurement Post Contract and Cost Estimation within a Project Cost Reporting Overview -Cost Reporting Examples-Change Orders and Communication Construction Cost Control Methods What is Cost Control -Defining Methods of Cost Control -1 practice exercise Cost Control Earned Value Method (EVM) Defining EVM- EVM Parameters -Performance Examples - EVM Favourable Performance -Calculating EVM -2 practice exercises Earned Value Method- Work Problem EVM. Close Out Period \ Close Out Punch List Review - Close Out Activities - 1 practice exercise -Close Out Period Project Cash Flow \ Cash Flow Method -Accrual Method -Contractor Cash Flow- Charting Cash Flow -Calculating Billing -Payment Cycle - Payment Cycle Drivers -Payment Cycle Delays -Schedule of Value -Accelerating Revenue -Front Loading -Delaying Expenses -1 practice Exercise-Project Cash Flow. Technology Trends in Cost Estimating and Cost Control \ 5D Estimating Systems (BIM) -Estimating Software in Action -Workflows -Implementation Perspective -Next Steps. Program Cost Estimating Period (1) Program Cost Control -Defining the Cost of a Capital Program -Useful Tools for Cost Control- 1 practice exercise - Cost Control for Large Programs.														CO-3 BTL-3	

Lean in Cost Control (2) Money and Estimate in Capital Project Delivery - Benchmarking and Normalization Process - Lean Design: Value - Lean in Cost Control - Lean Set Based Design - 1 practice exercise- Lean in Cost Control.		
MODULE 4 : CONSTRUCTION FINANCE & FINANCIAL PLANS FOR DEVELOPMENT PROJECTS (11)		
Introduction Construction Finance Course Introduction The Mathematics of Money Mathematics of Money - Project Evaluation -Computing Interest / Simple Interest Calculations -Compound Interest Calculations -Simple vs. Compound Interest Rate Example / Nominal and Effective Rate -Nominal Interest Rate Example and Minimum Attractive Rate of Return -Present and Future Value of Money -Future Value of a Uniform Series -Uniform Series -Uniform Series: A deeper dive -Equations for Uniform Series -Net Present Value (NPV) Example -Internal Rate of Return (IRR) Example -Mathematics Of Money -Case Study: Mathematics of Money Real Estate Finance for Development Projects Introduction to Financing Development Projects -Feasibility Study Example -- Project Parameters -Development Costs -"Comps" based Property Sale, Tax, Gain and Return -"Cap Rate" based Sale, Tax Gain and Return -Preview of "Discounted Cash Flow" Methods for Gain and Return-Framework for "Discounted Cash Flow" (DCF) Analysis "Net Present Value" DCF Method for Project Evaluation -Net Present Value (NPV) Examples -"Internal Rate of Return" (IRR) Method for Project Evaluation -NPV and IRR Analysis with Excel -Changing and Comparing Compounding Periods. 2 practice exercises Real Estate Finance Development Projects - Feasibility Study: Estimating The Sales Price Financial Plans for Development Projects Introduction to Financial Plans for Development Projects- Debt Financing of Real Estate Projects-Construction Loan Example -Net Comprehensive Cash Flows for Sponsor and Lender -DCF Project Evaluation for Sponsor and Lender. - Introduction to Decision Tree Analysis -Decision Tree Example - Overview -Solving the Example in Excel -Analysis of the Tree Results -Decision Tree Example with Time Value of Cash-Analysis of the Tree Results with Time Value Considered 1 practice exercise Designing and Building Commercial Real Estate		CO-4 BTL-3
MODULE 5: PROJECT FINANCE AND PPP (6)		
Project Finance Global Project Finance Overview and by Sector -Stakeholders in Project Finance -Stakeholder Roles -Principles of Project Financing -Risk and Risk Allocation -Categories of Risk Allocation -Sponsor Perspectives - Structuring and Documentation -Completion Risks / Government Perspectives-Contract Parties -Contracts and Agreements 1 practice exercise Project Finance Risk In Project Finance Project Parties, Timeline, and Finance -Borrowing Vs Partnering Case Study: Revenue generating case -Case Study: Developer land swap case / Identifying and Allocating Risk 1 practice exercise- Risk in Project Finance Public - Private Partnerships Public Private Partnerships (P3) Concept and Key Elements -Project Types -Drivers, Value and Typical Structures of P3-Responsibilities and Risk Transfer in various P3 structures -Pursuits through full project lifecycle and P3 Success Factors -Benefits of P3 Getting on Board with P3: Case Studies -A Deeper Dive into P3 Case Studies 1 practice exercise- Public Private Partnerships Lean in Construction Financing Identifying Risk -Waste Concept in Lean-Mitigating Risk through Lean Project Delivery Systems -How to Access Probability and Mitigate 1 practice exercise- Lean in Construction Finance		CO-5 BTL-4
TEXT BOOKS		
1.	Hans Ottosson. (2013). <i>Practical project management _ for building and construction</i> , CRC Press.	
2.	Gregory K. Mislick, Daniel A. Nussbaum. (2015). <i>Cost Estimation_ Methods and Tools</i> , Wiley.	
3.	M. A. Mian. (2011). <i>Project Economics and Decision Analysis</i> , Volume 1_ Deterministic Models, PennWell Corp.	
4.	Sengupta. (2002). <i>Construction Management</i> , Tata McGraw Hill.	
5.	J.L. Sharma. (2002). <i>Construction Management and accounts</i> . Satya Publications.	
6.	D. Lal . (2017). <i>Construction Management and P.W.D. Accounts</i> , S.K. Kataria& Sons.	

REFERENCE BOOKS	
1.	Kumar NeerajJha. (2016) <i>Construction Project Management -Theory and Practice</i> , Pearson Publications, 2 nd edition.
2.	Jimmie Hinze. (2015). <i>Construction Contracts</i> , McGraw hill education
3.	Martin Brook. (2004). <i>Estimating and Tendering for Construction Work</i> , Elsevier.
4.	Lukas Klee. (2015). <i>International Construction Contract Law</i> , Wiley.
5.	<i>The Construction Specifications Institute - Construction Contract Administration Practice Guidem</i> , John Wiley & Sons, 2011
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://www.coursera.org/learn/initiating-planning
2.	https://www.coursera.org/learn/construction-cost-estimating
3.	https://www.coursera.org/learn/construction-finance

COURSE TITLE	Course II - CONSTRUCTION PROJECT MANAGEMENT & SCHEDULING			CREDITS	3
COURSE CODE	CEH4376	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%
Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.					
Course Description	The Construction Management specialization is curated for professionals in the construction and civil engineering industry looking to advance their careers. Through this specialization, students will gain comprehensive industry knowledge along with the latest trends and development within the industry. This 5-coursespecialization will cover the major facets of construction management including project initiation and planning, scheduling techniques and procedures, cost estimating and control, and construction project financials. After students complete this specialization, they will have gained significant skills and tools to stay relevant and ahead of the curve in the world of construction management. Discover the key project scheduling techniques and procedures including; how to create a network diagram, how to define the importance of the critical path in a project network, and defining project activities float- discover the relationships connecting construction activities-describe the differences between calendar dates and work dates and teach how to deal with uncertainty in construction projects.				
Course Objective	The course should enable the students to 1. Know about the Project Management, Construction Management and the various Project Delivery methods. 2. Gain knowledge on Sustainable Development in construction, Health and Safety in Construction Processes and the application of Building Information Management in the construction projects. 3. Learn how to build a project organization and the importance of project planning and scheduling 4. Know about the Scheduling techniques such as Critical Path Method and Program Evaluation Review technique. 5. Gain knowledge on Linear Construction Operations, Line of Balance, MS project and Primavera software.				
Course Outcome	Upon completion of this course, the students will be able to 1. Apply the various Project Delivery methods in the construction projects. 2. Introduce the Health and Safety Processes in Construction and apply Building Information Management in the construction projects. 3. Apply project planning and scheduling concepts in the construction projects. 4. Apply the Scheduling techniques such as Critical Path Method and Program Evaluation Review technique in the construction projects. 5. Compute the latest dates by which each construction activities can be performed without increasing the cost of the projects.				
Prerequisites: Nil					
CO, PO AND PSO MAPPING					

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	-	3
CO2	-	-	2	2	1	2	1	2	-	-	3	3	2	-	3
CO3	2	3	1	2	2	-	-	-	-	-	2	3	3	1	3
CO4	2	3	1	2	2	-	-	-	-	-	2	3	3	1	3
CO5	2	3	1	2	2	-	-	-	-	-	2	3	3	1	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CONSTRUCTION INDUSTRY & PROJECT DELIVERY (8)

Course Overview

Introduction to The Course Part 1 -Introduction to The Course Part 2

Construction Industry Overview

Introduction to the Engineering and Construction Industry-Construction Projects and Industry Characteristics- Challenges and Opportunities in the Construction Industry- Program Project and Construction Management Introduction-Construction Management and Project Management- Program Management and Summary- Construction vs Manufacturing Industry Basics- Compare and Contrast the Construction and Manufacturing Industries-The Future of the Construction Industry- Introduction to the EAC Life Cycle- The Cost of Change in the EAC Lifecycle- Key EAC Lifecycle Questions -1 practice exercise-Quiz on Construction Industry Overview.

Project Delivery

Project Development Cycle Part 1-Project Development Cycle Part 2-Contract Types-Project Delivery Methods-Contracting Strategy Assessment-CM at Risk and CM as Agency-Alliance Contracting and Public Private Partnerships-Types of Surety Bonds-Purchasing a Surety Bond-Terminating a Surety Bond-Surety Loss Data-1 practice Exercise-Quiz on project delivery.

Lean Project Delivery

Project Delivery and the Theory of Lean-Lean Design and Delivery-Lean Design: Flow-1 practice exercise-Lean construction.

CO-1
BTL-2

MODULE 2: HEALTH, SAFETY & TECHNOLOGY TRENDS IN CONSTRUCTION (8)

Sustainability in the Construction Industry

Sustainability in Construction Industry-Safety in Construction Industry -Community Involvement in a Construction Project-Rating Systems for Construction Projects-The Envision Rating System-1 practice Exercise-Sustainability in construction.

Environment, Health and Safety of Construction Processes

Environmental, Health and Safety Practices-Barriers to Learning and Change-Safety Performance Models-Safety, Health and Environment Management Systems-Making EHS Work for You-1 practice exercise-EHS.

Building Information Modelling and Technology Trends in Construction

Technology Trends: Defining BIM-The Role of CM and Design Management-Technology and The Role of CM-Technology and The Role of Facility Management-Virtual Reality in Construction Management-1 practice Exercise-Technology trends in construction.

International View of Construction Projects

International Development and Project Risk-Cost Risks: Construction Projects-Cost Risks: Operations- ESPIRIT: A Framework for Understanding Risk-1 practice exercise-International development.

CO-2
BTL-3

MODULE 3: PROJECT PLANNING (8)

<p>Role of a Construction Manager</p> <p>Being an Effective Project Manager-The Project Organizational Chart-Methods of Contracting-Potential Project Risks-Logistics and Planning-Bidding and Levelling Sheets-Change Order and Claim Management-1 practice exercise-Role of a project manager.</p> <p>Introduction to Project Planning</p> <p>Project Planning and Scheduling-The Project Planning Process-Work Breakdown Structure-Standard and Project Coding Part-Project Coding- Estimating Activity Duration Part 1-Estimating Activity Duration Part 2- Determining Job Logic-Activity Relationships- 2 practice exercises-Estimating Duration Work Problem- Quiz on Introduction to Project Planning.</p>	<p>CO-3 BTL-3</p>
MODULE 4 :CONSTRUCTION SCHEDULING	
<p>Introduction to Construction Scheduling</p> <p>Construction Scheduling Course Overview.</p> <p>Bar (Gantt) Charts</p> <p>Introducing Bar (Gantt) Charts-Using Bar (Gantt) Charts-Advantages and Disadvantages of Using Bar (Gantt) Charts-1 practice Exercise-Quiz on Gantt Chart.</p> <p>Activity Precedence Diagrams</p> <p>Introduction to Activity Precedence Diagrams-Recommendations for Building AON Diagrams-Examples of Activity Precedence (AON) Diagrams.</p> <p>Types of Construction Activity Relationships</p> <p>Activities in a Construction Project-Types of Relationships between Construction Activities-Start to Start Relationships-Finish to Finish Relationships-Multiple Relationships-1 practice Exercise-Quiz on Activity Relationships.</p> <p>Forward and Backward Pass Calculations</p> <p>Forward Pass Calculations- Backward Pass Calculations-Example 1: Activity on Node Diagram- Example 2: A ON and Forward/Backward Pass Calculations- 1 practice Exercise-Quiz on Activity Precedence Diagrams, Activity Relationships and Forward/Backward Passes.</p> <p>Critical Path</p> <p>Introduction to Critical Path-Critical Path in a Project Schedule-Determining the Number of Critical Paths in a Project-Imposing Lag Durations in Critical Path-Determining Critical Path in a Start to Start Relationship-Determining Critical Path in a Finish to Finish Relationship-1 practice Exercise-Critical Path Method.</p> <p>Activity Floats</p> <p>Types of Floats in a Construction Project-Activity Floats-Determining Total Float and Free Float-Introduction to the Interfering Float-Independent Float.</p> <p>Understanding Work Dates and Calendar Dates</p> <p>Understanding Work Days and Calendar Days-The Relationship between Calendar Days and Work Days-Charting Work Dates and Calendar Dates-1 practice Exercise-Quiz on Floats and Work Calendar days.</p> <p>Activity on Arrow</p> <p>Introduction to Activity on Arrow-Drawing an Activity on Arrow Diagram-Numbering Nodes on a Diagram-Practice Drawing Activity on Arrow Diagrams-Advanced Activity Diagrams-Adding a Key to an Activity on Arrow Diagram-Backward Pass Calculations-Determining the Duration of a Project-2 practice Exercises-Quiz on Activity on Arrow-Activity Diagram and Critical Path.</p>	<p>CO-4 BTL-3</p>

Program Evaluation & Review Technique (PERT) and Range Estimating		
Program Evaluation and Review Technique-Probability of Completing a Project: Normal Distribution-PERT Probability Example-PERT Example on Completing a Project-PERT Calculations: Critical Activities-Appling PERT: Range Estimating.		
MODULE 5: TECHNOLOGY APPLICATIONS FOR SCHEDULING (10)		
The Role of the Scheduler in Construction Management The Role of the Scheduler in Construction Projects-Ensuring a Project Stays on Track-Keeping Accurate Records of Project Progress-1 practice Exercise-Quiz on PERT and Role of Scheduler- Linear Construction Operations and Line of Balance Linear Construction Overview and Examples-Line of Balance (LOB)-LOB Diagram-LOB Example: Develop a Schedule-Visualizing LOB-2 practice Exercises-Quiz on Line of Balance-Line of Balance Diagram. Technology Applications for Scheduling Technology Applications: Getting Started-Software Applications Overview-MS Project Scheduling Overview-MS Project: A Deeper Dive-Primavera P6 Overview-Primavera P6Critical Path-Primavera P6: Gantt Chart-Primavera P6 Importing Activities and Running Schedule-Schedule Analysis and Applications-Schedule Application: CustomToolsBuilding Information Management (BIM) Tools-Integration of the Model and ScheduleTools-1 practice Exercise-Quiz on Technology Applications. Scheduling for Large Programs Scheduling for Large Programs Risk Allocation and Planning Risk Allocation and Planning for Scheduling Overview-Risk Allocation: Defining Success-Risk Allocation Analysis-Sample Risk Profiles-Risk Assessment-Risk Allocation: Schedule and Concluding Remarks. Lean Design in Construction Scheduling Lean: Time and Schedule-Lean: Flow-Lean Design and Lean Scheduling-Lean Scheduling and Planning-1 practice exercise-Quiz on Large programs, Risk and Lean.		CO-5 BTL-4
TEXT BOOKS		
1.	Hans Ottosson. (2012). Practical project management for building and construction, CRC Press.	
2.	Hans Sommer. (2010). <i>Project Management for Building Construction_</i> , Springer-Verlag Berlin Heidelberg.	
3.	Sengupta. (2002). <i>Construction Management</i> , Tata McGraw Hill	
4.	Andrew Baldwin, David Bordoli. (2014). <i>Handbook for Construction Planning and Scheduling</i> , Wiley.	
5.	B C Punmia and K K Khandelwal . (2015). <i>Project Planning and Control</i> , Lakshmi Publications pvt Ltd.	
REFERENCE BOOKS		
1.	<i>Code of Practice for Project Management for Construction and Development</i> , Third edition-The Chartered Institute of Building (2002)	
2.	Gary R. Heerkens. (2001). <i>Project Management</i> , McGraw-Hill.	
3.	Paul E Harris. (2006). <i>Planning & Scheduling Using Primavera Version 5.0 for Engineering & Construction</i> , Eastwood Harris Pty Ltd.	
4.	Prof. Dr. Klaus Neumann, Dr. Christoph Schwindt, Dr. Jürgen Zimmermann (auth.). (2012). <i>Project Scheduling with Time Windows and Scarce Resources_ Temporal and Res</i> , Lecture Notes in Economics and Mathematical Systems.	
E BOOKS		

1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://www.coursera.org/learn/construction-project-management
2.	https://www.coursera.org/learn/construction-scheduling

COURSE TITLE		Course III- INFRASTRUCTURE PROJECT MANAGEMENT						CREDITS		3					
COURSE CODE		CEH4377		COURSE CATEGORY		HONOURS		L-T-P-S		3-0-0-1					
Version		1.0		Approval Details		33 ACM, 15.12.2021		LEARNING LEVEL		BTL-3					
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignment/ Project		Surprise Test / Quiz		Attendance		ESE					
15%		15%		10%		5%		5%		50%					
Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.															
Course Description		Scope, time, and cost management are at the heart of successful project management. This course will give you the tools to develop a project scope, schedule and budget and then status them to predict project performance. This course will provide you with the basic principles of urban infrastructure management that are fundamental for building prosperous cities that are sustainable, resilient and efficient. Many Project Managers focus only on the scope, schedule and budget. However, a successful project requires that you. This course will focus on the key support functions-manage risk, control the quality of the deliverables, engage and manage people and procure goods and services.													
Course Objective		The course should enable the students to <ol style="list-style-type: none">1. Create a Project Scope Statement and to identify ways to control the scope of the project.2. Develop Critical Path Schedule and review types of cost estimates and review budgets.3. Focus on sustainability, resilience and efficiency of urban infrastructures.4. Know about the risks involved in a construction project5. Know about Risk Management Plan and Project Resource Management plan.													
Course Outcome		Upon the completion of the course, the students will be able to <ol style="list-style-type: none">1. Create a Project Scope Statement and to identify the ways to control the scope of the project.2. Perform a cost and schedule analysis.3. Manage urban infrastructure system, Manage Urban Energy Systems and Manage urban transportation system4. Perform a Qualitative Risk Analysis5. Execute Risk Management Plan and Project Resource Management plan.													
6. Prerequisites: Nil															
7. CO, PO AND PSO MAPPING															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	1	-

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

1: Weakly related, 2: Moderately related and 3: Strongly related

(9)

CO-1
BTL-2

Introduction and Objectives- What is a WBS?- Work Packages- Steps for Creating a WBS- Case WBS- Kaz and Tom's Weekly Conclusions -Assignment Overview- **2 readings**- Recommended Readings -Example WBS and Dictionary - Electric Car Case.

(12)

CO-2
BTL-3

Introduction and Objectives- Monitoring Our Project- Calculating Earned Value 1- Calculating Earned Value 2- Creating a Forecast- Kaz and Tom Weekly Overview- Assignment Overview- 2 Readings-Recommended Readings- Example Calculations for Earned Value - Electric Car Case

MODULE 3 : URBAN INFRASTRUCTURE MANAGEMENT(9)

CO-3
BTL-3

Introduction to urban transportation systems-Managing the urban transportation system-

CarPostal- Broader challenges and new opportunities- Conclusion of the MUI MOOC-2 practice exercises - What did I learn in Block - Short answer assignment	
MODULE 4 : PROJECT RISK & QUALITY MANAGEMENT (9)	
Introduction (1) Course Icon Legend- Pre-Course Survey -Specialization Assignments -Peer Review Guidelines - Discussion Forum Guidelines -Accessibility and Accommodations Statement -General Course Information- Using, Editing, and Submitting Documents in this Course Project Risk Management(4) Introduction and Objectives- Risk Management Processes -Identifying Risks- Developing a Risk Management Plan- Analyze and Prioritize Risks -Develop Risk Responses Quality Assurance Plan (4) Introduction and Objectives -What is Quality Management? -Quality Management Plan -Cost of Quality- Tools for Assessing Quality- Control Quality.	CO-4 BTL-3
MODULE 5 HUMAN RESOURCES & PROCUREMENT MANAGEMENT (6)	
Human Resources ManagementPlan (3) Introduction and Objectives -Project Resource Management-Plan Resource Management - Estimate Activity Resources- Acquire Resources- Develop Team -Manage Team- Control Resources Project Procurement Management (2) Introduction and Objectives- Project Procurement Management -Project Procurement Plan - Contract Types- Executing Procurement Final Exam (1)	CO-5 BTL-4
TEXT BOOKS	
1.	A Guide to the Project Management Body of Knowledge (<i>PMBOK® Guide</i>) – Sixth Edition,2017 Project Management Institute
2.	Project Management Gary R. Heerkens, PMP,McGraw-Hill,2002
3.	Policy Guidance for Investment in Clean Energy Infrastructure Expanding Access to Clean Energy for Green Growth and Development
4.	El-Reedy, Mohamed Abdallah - Concrete and steel construction _ quality control and assurance (2013, CRC Press)

REFERENCE BOOKS	
1.	Kumar NeerajJha. (2016). Construction Project Management -Theory and Practice, Pearson publications, 2 nd edition.
2.	Anthony G. Bigio and Bharat Dahiya . (2004). <i>Urban Environment and Infrastructure Toward Livable Cities</i> , The International Bank for Reconstruction and Development/THE WORLD BANK
3.	Urizar M., Halim E.-S.A.. (2015). <i>Construction Supervision QC + HSE Management in Practice_ Quality Control, OHS, and Environmental Performance Reference Guide</i> .
4.	Ariaratnam, Samuel T. Rojas, Eddy M. (2009). <i>Building a Sustainable Future</i> , Construction Research Congress 2009 American Society of Civil Engineers.
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20management
MOOC	
1.	https://www.coursera.org/learn/scope-time-management-cost
2.	https://www.coursera.org/learn/managing-urban-infrastructures-1
3.	https://www.coursera.org/learn/project-risk-quality-management

COURSE TITLE		Course IV- PROJECT FORMULATION AND CONTRACT REGULATIONS (Batch I)						CREDITS		3					
COURSE CODE		CEH4461		COURSE CATEGORY			HONOURS			L-T-P-S		3-0-0-0			
Version		1.0		Approval Details			33 ACM, 15.12.2021			LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE			
15%		15%		10%			5%			5%		50%			
Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.															
Course Description		Project formulation and cost is an essential skill-set for many projects and in many contexts in our lives. Project investment appraisal Management is an ideal starting point if you need to manage projects. Contract laws the standard contract document and bidding process is the essential tool to execute project without any dispute and the processes of arbitration is also need for the project managers. It is essential to know more about the EPC, PPP, Infrastructure projects.													
Course Objective		The course should enable the students to 1. Introduce Project Identification and financing of project. 2. Know about project investment appraisal. 3. Know about the standard contract document and the bidding process 4. Provides details about dispute, claim and arbitration. 5. Discusses the EPC.PPP and concession agreement.													
Course Outcome		Upon completion of this course, the students will be able to 1. Identify project financing and costing and apply the principles of cash flow, time value of money and cost of capital in project 2. Identify the different aspects of project appraisal and examine the various methods of investment appraisal. 3. Distinguish the different elements and procedures in the preparation of contracts and NCB document. 4. Analyse the Potential contractual problems and the arbitration procedure 5. Compare the characteristics of various infrastructure projects, models and regulatory bodies.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO1	PSO2	PS O3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	2	3
CO2	-	-	2	2	1	2	1	2	-	-	3	3	2	2	3
CO3	-	-	-	2	2	2	-	2	1	2	2	3	1	2	3

[illegible]

2.	Lukas Klee. (2015). <i>International Construction Contract Law</i> , Wiley & Sons.
3.	Arbitration and Conciliation Code, 1996.
4.	Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects ", 6th Edition, McGraw Hill, 2000.
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://nptel.ac.in/courses/110/107/110107081/#

COURSE TITLE	Course IV - PROJECT MANAGEMENT FOR MANAGERS										CREDITS	3			
COURSE CODE	CEH4462			COURSE CATEGORY			HONOURS			L-T-P-S		3-0-0-0			
Version	1.0			Approval Details			33 ACM, 15.12.2021			LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz			Attendance		ESE		
15%		15%			10%			5%			5%		50%		
Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.															
Course Description		Project management is an essential skill-set for many careers and in many contexts in our lives. Project Management is an ideal starting point if you need to manage projects at work or at home, while not necessarily being a formally trained project manager. It is also suitable if you are considering undertaking a project in the near future and are seeking to learn and apply essential project management knowledge and skills.													
Course Objective		The course should enable the students to <ol style="list-style-type: none">1. Introduce Project Management, ConstructionManagement and types of organisations.2. Know about capital budgeting, risk management and technical analysis of projects.3. Know about the project team and time management4. Provides details about probability models in network and crashing of network.5. Discusses the project cost management, control and quality management.													
Course Outcome		Upon completion of this course, the students will be able to <ol style="list-style-type: none">1. Perform a project assessment market demand analysis, financial analysis and project appraisal.2. Execute capital budgeting and potential risk analysis.3. Develop project time management scheme using CPM and PERT.4. Create probability models in network and crashing of net work5. Estimate the project cost and apply quality control measures with respective to procurement process.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	2	3
CO2	-	-	2	2	1	2	1	2	-	-	3	3	2	2	3
CO3	2	3	1	2	2	-	-	-	-	-	2	3	3	2	3
CO4	2	3	1	2	2	-	-	-	-	-	2	3	3	2	3
CO5	2	3	1	2	2	-	-	-	-	-	2	3	3	2	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: PROJECT MANAGEMENT & SELECTION (9)															
Introduction of Project Management-Project Success-Types of Structure Organizations-Project Management Office-Stakeholders Management-Types of Projects and Project Life Cycle-Project Life Cycle Phases & Project Appraisal-Methods of Project Selection- I-Methods of Project Selection- II-Methods of Project Selection (MCDM -I)-Methods of															
CO-1 BTL-2															

Project Selection (MCDM-II)-Methods of Project Selection (MCDM-III)-Market and Demand Analysis - I-Market and Demand Analysis - II-Financial Analysis	
MODULE 2: CAPITAL BUDGETING& RISK MANAGEMENT (9)	
Capital Budgeting Techniques - I-Capital Budgeting Techniques - II-Financing of Projects-Risk Management - I-Risk Management - II-Risk Management (Control & Documentation)-Stand Alone Risk Analysis- I-Stand Alone Risk Analysis-II-Hillier Model-Simulation Analysis-Decision Tree Analysis- I-Decision Tree Analysis- II-Abandonment Analysis-Technical Analysis-Product Mix and Plant Capacity Analysis.	CO-2 BTL-3
MODULE 3:PROJECT TEAM BUILDING & TIME MANAGEMENT (9)	
Project Team Building, Conflict and Negotiation-HRM Issues and time Management-Project Time Management-Introduction-Project Time Management (Project Scheduling)-Project time Management- Numbering of Nodes-Project Time Management- PERT Networks-Project Time Management- CPM-Project Time Management- Laddering in PERT/CPM-Probability Models in Networks- I-Probability Model in Networks- II-	CO-3 BTL-3
MODULE 4: PROBABILITY MODEL IN NETWORKS&CRASHING OF NETWORKS(9)	
Probability Model in Networks- III-Probability Model in Networks- IV-Simulation of Networks- I-Simulation of Networks- II-Slacks & Floats- I- Slacks & Floats- II-Time and Cost Relationship-Crashing of Networks- I-Crashing of Networks II-Crashing of networks- III (Free Float Method)	CO-4 BTL-3
MODULE 5: PROJECT COST MANAGEMENT &QUALITY MANAGEMENT (9)	
Crashing of Networks- IV-Introduction to Project Cost Management-Cost Control (Tools and Techniques)-Cost Estimation-Introduction to Quality Management-Cost of Quality-57 Quality Management (Source of variability and Six Sigma)-Quality Management (Six Sigma Tools) Procurement Management- I-Procurement Management- II and Project Termination	CO-5 BTL-4
TEXT BOOKS	
1.	Roderick A. Munro and Govindarajan Ramu and Daniel J. Zrymiak. (2001). <i>The certified six sigma Green Belt Handbook</i> , ASQ Quality Press and Infotech Standards India Pvt. Ltd.
2.	T. M. Kubiak and Donald W. Benbow. (2011). <i>The Certified Six Sigma Black Belt Handbook</i> , Pearson Publication.
3.	Mitra, Amitava. (2002). <i>Fundamentals of Quality Control and Improvement</i> , Wiley India Pvt Ltd.
4.	Montgomery, D C. (2011). <i>Statistical Quality Control: A modern introduction</i> , Wiley.
REFERENCE BOOKS	
1.	Forrest W. Breyfogle. (2011). <i>Implementing Six Sigma</i> , John Wiley & Sons, INC.
2.	Evans, J R and W M Lindsay. (2012). <i>An Introduction to Six Sigma and Process Improvement</i> , CENGAGE Learning.
3.	Howard S. Gitlow and David M. Levine. (2001). <i>Six Sigma for Green Belts and Champions</i> , Pearson Education, Inc.
4.	Montgomery, D C. (2001). <i>Design and Analysis of Experiments</i> , Wiley
E BOOKS	

1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://nptel.ac.in/courses/110/107/110107081/#

MINORS

COURSE TITLE		Course I - FUNDAMENTALS OF GIS								CREDITS		4			
COURSE CODE		CEM4276		COURSE CATEGORY				MINORS		L-T-P-S		4-0-0-0			
Version		1.0		Approval Details				33 ACM, 15.12.2021		LEARNING LEVEL		BTL-3			
ASSESSMENT SCHEME															
First Periodical Assessment		Second Periodical Assessment		Seminar/ Assignments/ Project				Surprise Test / Quiz		Attendance		ESE			
15%		15%		10%				5%		5%		50%			
Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.															
Course Description		Explore the world of spatial analysis and cartography with geographic information systems (GIS). In-depth with common data types (such as raster and vector data), structures, quality and storage													
Course Objective		The course should enable the students to 1. Develop the skills needed to use GIS software in a professional setting. 2. Learn how GIS grew from paper maps to the globally integrated electronic software packages of today. Explore data using ArcMap. 3. Learn the foundational concepts of GIS, how to analyse data, and draw the first map 4. Learn about data models and formats, including a full understanding of vector data and raster concepts. 5. Learn common data storage mechanisms within GIS, including geo data bases and shape files.													
Course Outcome		Upon completion of this course, the students will be able to 1. Perform a project assessment using information from previous projects and lessons 2. Symbolize data and create an eye-catching final product. Learn to store, organize and analyze spatial data, using cartography techniques to communicate results in maps, and collaborate with peers in GIS and GIS-dependent fields 3. Create a professional-quality GIS portfolio piece using a combination of data identification and collection, analytical map development, and spatial analysis techniques. 4. Create a vector data model by using vector attribute tables, writing query strings, defining queries, and adding and calculating fields 5. Use digital elevation models and creating slope and distance analysis products. Bring maps and data to the Internet and create web maps quickly with ArcGIS Online.													
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO1	PSO2	PSO 3
CO1	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-

CO2	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO3	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO4	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO5	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (9)															
Introduction (GIS) Course Mechanics - Module 1 Overview - Why GIS is Awesome - What is GIS? - A First Look at Using Desktop GIS - GIS Terminology to Know - Tour of ArcMap - Data Representation in GIS - Desktop GIS Software Packages - Getting Help with GIS - Relevant Skills for the GIS Analyst - ArcGIS Desktop Licensing and Authorization - ArcGIS Desktop Installation Instructions - How Assignments Work in this Course - Module 1 Summary - Glossary of Terms - Resources and Help for GIS - ArcGIS Installation for Desktop - Troubleshooting ArcGIS Installation Problems - Assignment 1: Introduction to ArcMap (Part 1) - Extra Practice: Getting to Know ArcGIS - Lesson 1 Quiz - Lesson 2 Quiz														CO-1 BTL-2	
MODULE2: ArcGIS BASICS & MAKING MAPS (14)															
ArcGIS Basics Module 2 Overview - Using ArcMap to Explore Data - Viewing and Changing Layer Properties - Using Feature Classes and Attribute Tables - Select By Attribute and Calculate Geometry - Select by Location - An Introduction to Projections - Analyzing Data with Geoprocessing Tools - Setting Environment Variables - Assessing Spatial Relationships with the Spatial Join Tool - Assignment 2 Overview - Module 2 Summary -Assignment 2: Introduction to ArcMap (Part 2)- Extra Practice: Maps, Geoprocessing, and Projections -Lesson 3 Quiz - Lesson 4 Quiz. Making Maps with Common Datasets Module 3 Overview -Finding Common Datasets - Using Layout View to Make Maps - Core Map Elements - Symbolology: Changing How Your Data Looks - Symbolology Examples - Setting Up Symbolology in ArcGIS - Labeling Map Features - Making Map Books Assignment 3 Overview - Module 3 Summary-Assignment 3: Laying Out and Exporting Maps - Extra Practice: Maps, Maps, Maps! - Lesson 5 Quiz - Lesson 6 Quiz.														CO-2 BTL-3	
MODULE 3: RETRIEVING AND SHARING DATA (9)															
Retrieving and Sharing Data Module 4 Overview - Using Metadata to Document Data Products - Sharing Data: Making and Using Map Packages - Sharing Maps: Uploading Packages to ArcGIS Online - Sharing Data: Creating Layer Files and Layer Packages - Choosing a Data Format 8m Joins and Relates - Troubleshooting ArcGIS - Module 4 Summary - Assignment 4 (Peer Review) Overview - Course Summary - Extra Practice: Make your own data - Electoral Politics Assignment Instructions - Lesson 7 Quiz - Lesson 8 Quiz - Coursera and UC Davis Honor Code Acknowledgement - Electoral Politics Results Quiz.														CO-3 BTL-3	
MODULE 4 : DATA MODELS & VECTOR DATA (14)															
Course Overview & Data Models and Formats Course Overview - Course Mechanics - Module 1 Overview - Vector Data Concepts - Vector Data in Action - Raster Data Concepts - Raster’s in Action - Scale and Implications - Managing Data in the Catalog Window - Data Design: Attribute Types - Using Vector Attribute Tables - Data Design: Joins and Relates - Data Design: Separating Data, Part 1 - Data Design: Separating Data, Part 2 - Module 1 Summary - Getting Started in this Course - Getting a license - Tutorial Assignment 1: Data Structures and Personal Geo data bases - Extra Practice for Lessons 1 and 2 - Lesson 1 Quiz: Raster’s and Vectors - Lesson 2 Quiz: Data Design Creating and Working with Vector Data Module 2 Overview - Working with Geoprocessing Tools - Intersect Tool - Writing Query Strings - Writing Query Strings: Boolean Operators - Adding and Calculating Fields - Interactive Selection - Using and Configuring Selections in ArcGIS - Editing Existing Data - Data Design: Creating New Feature Classes - Basic Digitizing - Workflow: Preparing Data - Workflow: Making Point Data from Coordinates - Module 2 Summary - Tutorial Assignment 2: Editing Data - Extra Practice for Lessons 3 and 4 - Lesson 3 Quiz: Processing and Geoprocessing - Lesson 4 Quiz: Creating and Editing Data .														CO-4 BTL-3	
MODULE 5:STORAGE FORMATS& CREATING WEB MAPS (14)															
Storage Formats and Working with Rasters Module 3 Overview – Geo data base Features and Design - File Geo data bases - Personal Geo data bases – Shape files - Workflow: Percent Overlap - Supplemental: Intro to SQLite Databases - Overview of Spatial Analyst – Geo														CO-5 BTL-4	

referencing Rasters - Raster Calculator - Workflow: Zonal Statistics as Table - Workflow: Managing Data with Zonal Statistics and Join Field - Module 3 Summary - Tutorial Assignment 3: A Suitability Analysis: Spatial Analyst, Raster Data, and DEMs - Extra Practice for Lessons 5 and 6 -Lesson 5 Quiz: Data Storage - Lesson 6 Quiz: Creating Raster Data.	
Data Quality and Creating Web Maps Overview - Assessing Data Quality and Uncertainty - Data Quality, Part 2: Measurement and Representation - Topology - Loading Layers in ArcGIS Online - Applying Symbolology in ArcGIS Online - Map Annotations and Scaling in ArcGIS Online - Saving and Sharing Maps with ArcGIS Online - Module 4 Summary - Course Summary - Short Tutorial: Exporting Shapefiles and Uploading them to Web Maps - Extra Practice for Lessons 7 and 8 - Lesson 7 Quiz: Uncertainty and Quality - Lesson 8 Quiz: ArcGIS Online - Moving Valmeyer Final Quiz.	
TEXT BOOKS	
1.	Wise, Stephen. (2014). <i>GIS fundamentals</i> , CRC Press.
2.	Paul Bolstad. (2016). <i>GIS Fundamentals_ A First Text on Geographic Information Systems</i> , XanEdu.
3.	Hu, Fei_ Huang, Qunying_ Jiang, Yongyao_ Li, Zhenlong_ Liu, Kai_ Sun, Min_ Xia, Jizhe_ Yang, Chaowei Phil_ Yu, Manzhu. (2017). <i>Introduction to GIS programming and fundamentals with Python and ArcGIS</i> .
4.	Michele Campagna. (2005). <i>GIS for Sustainable Development</i> , CRC Press.
REFERENCE BOOKS	
1.	Alias Abdul-Rahman, MorakotPilouk. (2007). <i>Spatial data modeling for 3D GIS</i> , Springer.
2.	Shashi Shekhar, Shashi Shekhar, Hui Xiong. (2007). <i>Encyclopedia of GIS</i> , Springer.
3.	Lena Sanders . (2007). <i>GIS- Models in spatial analysis</i> , Geographical Information Systems Series ISTE
4.	Alias Abdul-Rahman, MorakotPilouk. (2007). <i>Spatial data modeling for 3D GIS</i> , Springer.
5.	U.M. Shamsi. (2005). <i>GIS applications for water, wastewater, and stormwater systems</i> , Taylor & Francis.
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://www.coursera.org/learn/gis
2.	https://www.coursera.org/learn/gis-data

COURSE TITLE			COURSE II - GIS DATA ACQUISITION, AUTOMATION AND APPLICATION							CREDITS			3		
COURSE CODE			CEM4361			COURSE CATEGORY		MINORS			L-T-P-S			3-0-0-1	
Version			1.0			Approval Details		33 ACM, 06.02.2021			LEARNING LEVEL			BTL-3	
ASSESSMENT SCHEME															
First Periodical Assessment			Second Periodical Assessment			Seminar/ Assignment/ Project		Surprise Test / Quiz			Attendance			ESE	
15%			15%			10%		5%			5%			50%	
Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.															
Course Description			Geographic Information System (GIS) Imagery Analysis Spatial Analysis satellite imagery Gis Applications Focuses on the basic building blocks of GIS data, so that you know what types of GIS files exist, and the implications of choosing one type over another. How to take non-GIS data, such as a list of addresses, and convert it into "mappable" data using geocoding.												
Course Objective			The course should enable the students to 1. Learn all about remotely sensed and satellite imagery, and be introduced to the electromagnetic spectrum 2. Develop a large processing workflow in Model Builder.Use products derived from digital elevation models 3. Practice with tools to support image analysis using Raster Calculation and Spatial Analyst 4. Learn remote sensing and satellite imagery, starting out with an introduction to remotely sensed data and the electromagnetic spectrum 5. Learn how to use some basic tools to support image analysis usingRaster Calculator and Spatial Analyst.												
Course Outcome			Upon completion of this course, the students will be able to 1. Find and download satellite imagery online and use it for two common types of analysis: NDVI and trained classification. 2. Build own models, and undertake building a large processing workflow together in Model Builder that uses parameters, preconditions, variables, and a set of tools 3. Collect and Manage Data for Workflows. 4. Evaluate a data set preparing data by merging and clipping files as needed 5. Create project, find own data and create own quantitative map- Create choropleth maps in ArcMap-Data classification for mapping.												
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3

CO1	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO2	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO3	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO4	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO 5	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: COURSE OVERVIEW, IMAGERY, AND RASTER CALCULATOR (7)															
Course Overview, Imagery, and Raster Calculator Course Overview- Course Mechanics -Remote Sensing Basics -Characteristics of Remotely Sensed Data -Modes of Acquisition -Acquisition Platforms -Acquiring Imagery and Terrain Data -Working with Imagery in ArcMap -Normalized Difference Vegetation Index (NDVI) Classifying Imagery and Derived Products														CO-1 BTL-2	
MODULE 2: MODEL BUILDER ANDDIGITAL ELEVATION MODELS (11)															
Model Builder and Other Overview -What is Model Builder -Creating Toolboxes and Tools with Model Builder -Setting Up a Larger Model -Using Interface Tools as Geoprocessing Tools in Model Builder- Feature Layers and Selections in Models Branching, Preconditions, and Viewing Progress Interactively -Polishing Models for Reuse -Advanced Models and Exporting Models to Python -Geocoding and Reverse Geocoding -Time Enabled Data Digital Elevation Models and Common Algorithms Overview -Contours –Hill shade –Viewshed- Cut Fill -Vector-Based Suitability Analysis -Fuzzy Suitability Analysis - Watershed Processing -Processing DEMs into Streamlines														CO-2 BTL-3	
MODULE 3: SPATIAL ANALYST (8)															
Spatial Analyst and where to go from here Overview -Region Group -Focal Statistics and the Swiss Hill shade -Reclassify- Point Density -Online and Connected Applications -Collecting and Managing Data for Your Workflows- Additional Desktop GIS Topics Programming GIS Software, Server-Side GIS, and Cartography -Other GIS Tools & Plugins, and Joining Communities -Course Summary														CO-3 BTL-3	
MODULE 4: GIS FILE, GEOCODING & MAP DESIGN PRINCIPLES (9)															
GIS File Types, Data Models, and Topology Introduction to topology -Topology and data formats –Shapefile: simple, with no topology -Coverage: Complex, but has topology -Comparison of shape file, coverage, and geo database -Building basic topology – Georelational and object-relational vector data models Finding data and preparing it for your project Evaluating data using metadata - Data dictionary -The importance of metadata - Viewing and editing metadata in ArcMap - Downloading and using GIS data. Geocoding addresses and postal codes What is geocoding- Geocoding in ArcGIS Online -Geocoding postal codes -Geocoding postal codes in ArcMap -Postal codes and census data -Canadian census units -Ecological fallacy -Geocoding Street addresses -Geocoding Street addresses in ArcMap Map Design Principles Developing a critical eye - The map design process -Controls on map design, part 1 -Controls on map design, part 2 - Controls on map design, part 3 -Design principles -Visual hierarchy Figure-ground relationship- Contrast -Legibility - Visual Balance-Map elements -Creating a map layout in ArcMap. Basic map design in ArcMap 13mExporting a map as an image in ArcMap 1mTypography 8mCreating and customizing labels in ArcMap 9m															
MODULE 5: MAPPING QUANTITATIVE&PROJECT (11)															
Mapping Quantitative Data Colour models: HSV -Colour models: CMYK -Choropleth maps -Creating choropleth maps in ArcMap-Data classification for mapping -Data classification methods for mapping -Mean vs. median –Zero values on your map -Joining tables - Working with tables in ArcMap -Field calculations in tables. Quantitative Map Types Dot maps -Creating dot density maps in ArcMap -Proportional symbol maps -Graduated symbol maps -Creating proportional and graduated symbol maps in ArcMap -Contour maps -Flow maps -Multivariate maps. Project: Getting Data and Making Your Own Map														CO-5 BTL-3	

TEXT BOOKS	
1.	Wise, Stephen. (2014). GIS fundamentals-CRC Press.
2.	Paul Bolstad. (2016). <i>GIS Fundamentals_ A First Text on Geographic Information System</i> , XanEdu.
3.	Hu, Fei Huang, Qunying Jiang, Yongyao Li, Zhenlong Liu, Kai Sun, Min Xia, Jizhe Yang, Chaowei Phil_Yu, Manzhu. (2017). <i>Introduction to GIS programming and fundamentals with Python and ArcGIS</i> .
4.	Michele Campagna. (2005). <i>GIS for Sustainable Development</i> , CRC Press.
REFERENCE BOOKS	
1.	Alias Abdul-Rahman, MorakotPilouk. (2007). <i>Spatial data modeling for 3D GIS</i> , Springer
2.	Shashi Shekhar, Hui Xiong. (2007). <i>Encyclopedia of GIS</i> , Springer.
3.	Lena Sanders. (2007). <i>Models in spatial analysis</i> , Geographical Information Systems Series ISTE-GIS
4.	Alias Abdul-Rahman, MorakotPilouk. (2007). <i>Spatial data modeling for 3D GIS</i> , Springer.
5.	U.M. Shamsi. (2005). <i>GIS applications for water, wastewater, and stormwater systems</i> , Taylor & Francis.
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC- COURSERA	
1.	https://www.coursera.org/learn/gis-applications
2.	https://www.coursera.org/learn/gis-data-acquisition-map-design

COURSE TITLE	Course III -REMOTE SENSING AND GIS			CREDITS	2
COURSE CODE	CEM4376	COURSE CATEGORY	MINORS	L-T-P-S	4-0-0-0
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	This course will introduce the students to the state-of-the-art concepts and practices of remote sensing and GIS. It starts with the fundamentals of remote sensing and GIS and subsequently advanced methods will be covered. This course is designed to give comprehensive understanding on the application of remote sensing and GIS in solving the research problems. Upon completion, the participants should be able to use remote sensing (Satellite images and Field data) and GIS in their future research work.
Course Objective	The course should enable the students to <ol style="list-style-type: none"> 1. Understand the application of remote sensing and GIS in solving the research problems 2. Learn Digital Image Processing 3. Understand the concepts of Imaging spectroscopy
Course Outcome	Upon completion of this course, the students will be able to <ol style="list-style-type: none"> 1. Identify the error corrections in satellite images 2. Process images using complex algorithms to manipulate data. 3. Detect and identify minerals, terrestrial vegetation, man-made materials and backgrounds using hyperspectral remote sensing

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO2	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO3	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO4	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-
CO5	3	2	1	2	3	2	1	1	2	-	-	3	2	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: REMOTE SENSING & SATELLITE IMAGE CORRECTIONS (8)

Overview and Introduction -Basics of Remote Sensing-Error corrections in satellite image. I, Error,Error Identification and Correction - III	CO-1 BTL-2
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MODULE2: DIGITAL IMAGE PROCESSING, THERMAL AND MICROWAVE (11)

Digital Image Processing-I, II, III, IV - Image Classification-I, Photogrammetry - Thermal Remote Sensing - Microwave Remote Sensing	CO-2 BTL-3
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MODULE 3: IMAGING SPECTROSCOPY & APPLICATION (11)		
Hyperspectral Remote Sensing – I, II, III, IV, V- GIS-I - GIS-I -Applications of Remote Sensing GIS-I&GIS-I		CO-3 BTL-3
TEXT BOOKS		
1.	Lillesand, T.M. and Kiefer, R.W. (1987). <i>Remote sensing and Image Interpretation</i> , John Wiley.	
2.	Jensen, J. R. (2012). <i>Introductory digital image processing a remote sensing perspective</i> , Prentice Hall series in geographic information science.	
3.	Schowenger dt, R. A. (2007). <i>Remote Sensing: Models and Methods for Image Processing</i> , Academic Press.	
4.	Campbell, J.B. (1996). <i>Introduction to Remote Sensing</i> , Taylor & Francis, London.	
5	Joseph, G. (2003). <i>Fundamentals of Remote Sensing</i> , University press.	
6	Cracknell, P. and Hayes, L. (2007). <i>Introduction to remote sensing</i> , Routledge	
REFERENCE BOOKS		
1.	Gupta, R. P. (2005). <i>Remote Sensing Geology</i> , Springer.	
2.	Van-dr-Meer, F., De Jong, S. (2006). <i>Imaging spectrometry: Basic principles and prospective applications</i> , The Netherlands: Springer Publishers	
3.	Rencz, A.N. (2008). <i>Remote Sensing for the Earth Sciences</i> , Manual of Remote Sensing, ASPRS.	
4.	De-Jong, Steven, M., Van der Meer, F.D. (2004). <i>Remote Sensing Image Analysis: Including the Spatial Domain: Including the Spatial Domain</i> , Springer.	
5.	Claudia, K., Stefan, D. (2014). <i>Quantitative Remote Sensing in Thermal Infrared</i> , Springer.	
6.	Jensen, J.R. (2003). <i>Remote Sensing of the Environment an Earth Resource Perspective</i> , Pearson Education, Delhi.	
E BOOKS		
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management	
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20 management	
SWAYAM/NPTEL		
1.	https://onlinecourses.nptel.ac.in/noc21_ce61/preview	