



CIVIL ENGINEERING STUDENT'S HANDBOOK

[FOR NEW C.B.C.S. SCHEME]

School of Studies in

Engineering &

Technology

Session: 2021-22



GURU GHASIDAS VISHWAVIDYALAYA

(A CENTRAL UNIVERSITY ESTABLISHED BY THE UNIVERSITY ACT 2009)

BILASPUR (C.G) 495009

Civil Engineering Student's Handbook



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PREFACE

The School of Engineering & Technology under Guru Ghasidas Vishwavidyalaya (now a Central University since 15th Jan., 2009), Bilaspur (C.G.), was set up in the year 1997 with an objective of making available the facilities of quality higher education in the field of Engineering and Technology to the students of, particularly, the Central region of country where the rural and tribal population still remain deprived of such facilities. The School, remaining fully conscious of its objectives and responsibilities, is growing towards the level of a centre of excellence for quality engineering education in the country. Especially, after up-gradation of the University as a Central University, there has been many fold enhancements in infrastructural facilities as well as faculty and staff. Today, the School has well equipped laboratories with latest equipment, a good library, adequate computational facilities and smart E-classrooms needed for ensuring quality in higher education and research. The mission of the School is to create an ambiance in which new ideas, research and scholarship flourish and to engender the leaders and innovators of tomorrow.

The University campus houses faculties like Arts, Science, Social Science, Humanities, Law and Management etc, our students get opportunities of studying varied nature of elective courses from other faculties, and are groomed to work not only with a group of technically trained people but also with persons having knowledge in different domains of education.

The School on an average, admits around 400 students annually for the 4 - year undergraduate B. Tech programme in seven branches. Admissions are made through Joint Entrance Examination (JEE) (main) or the entrance examination conducted as per the directions of MHRD, Govt. of India. Presently, M.Tech. programme is being run by two departments (Mechanical and Chemical Engineering) and the students who are Graduate Aptitude Test in Engineering (GATE) qualified get admitted. To keep pace with new developments and changes in the field of technology, the Institute revises its Undergraduate and Postgraduate Programmes syllabi from time to time. The School follows semester system of teaching (odd- July - December; and even- January – June).

Ours is a student-centric Institution and, therefore, the endeavor is always to ensure that students are offered the quality and value based education and training so as to create not only outstanding scientists and engineers but also good citizens.

This booklet contains comprehensive information on the existing Rules and Regulations governing the B.Tech. Programmes. The students and parents/ guardians are, therefore, advised in their own interest to get fully familiar with the academic system of the School and rules and regulations. Students' attention is particularly drawn to the attendance requirement, regular assessment procedures, conditions of promotion to higher semesters and grading system, etc.

Thank you for your interest in the School of Engineering & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur. We wish all our students a very bright future and successful career.

Dean (SOS, Engg. & Tech.)

HEAD OF THE DEPARTMENT MESSAGE

Four years degree course in Civil Engineering program was started in the year 2008 under the department, with due approval from AICTE with annual intake of 40 seats. The annual intake is then increased to 50 from 2020. The department's primary goal is to focus on imparting the best possible exposure to various fields in civil engineering. The department is committed, for establishing well equipped laboratories, with all the modern amenities & excellent setup. As per AICTE norms, well qualified & experienced faculties are to be multiplied very soon in the department. Academicians from premier institutions & field engineers are to be frequently invited in the department, to interact with students & faculty for regular update with the latest global development. Department will also be engaged in organizing co-curricular activities like seminars, expert talk, aptitude test, quiz, field visits, career counseling etc. in order to provide & develop inter personal skills of the students.

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H.O.D Civil Engineering
Guru Ghasidas Vishwavidyalaya (Central University)
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Phone No. – 07752 -260429

OBJECTIVES OF THE DEPARTMENT:-

- a) To prepare graduates with a solid foundation in technical skills needed to analyze and design civil infrastructure systems.
- b) To make graduates familiar with current and emerging civil engineering and global issues, and have an understanding of ethical and societal responsibilities.
- c) Strengthen the graduates to have necessary qualifications for employment in civil engineering and related professions, for entry into advanced studies, and for assuming eventual leadership roles in their profession.
- d) To develop the technological innovations needed to safeguard, improve, and economize infrastructure and society.

ACHIEVEMENTS OF THE DEPARTMENT









Number of Students Qualified in Various Exams:-






Name of Exam	Year	No. of Students
GATE	2021	08
	2022	07

COURSES OFFERED BY THE DEPARTMENT

Sl. No.	Courses	Annual Intake	Duration of Course (years)
1	B.Tech.	50	4
2	M. Tech.	23	2
3	Ph.D.	25	-

FACULTY MEMBERS OF DEPARTMENT

Name	Photo	Designation	Qualification	Specialization
Prof. Shailendra Kumar		Professor	Ph.D.	Structural Engineering
Dr. M. Chakradhara Rao		Associate Professor	Ph.D.	Structural Engineering
Dr. R.K. Choubey		Associate Professor	Ph.D.	Sustainable concrete materials & Structures
Dr. V. V. S. Surya Kumar Dadi		Associate Professor	Ph.D.	Earthquake Engg. (Structural Dynamics)
Dr. Ashish Kumar Parashar		Assistant Professor	Ph.D.	Water Resources Engineering
Mr. Nikhil Kumar Verma		Assistant Professor	M.Tech.	Construction & Management
Dr. Kundan Meshram		Assistant Professor	Ph.D.	Transportation-Geotechnics Engineering
Ms. Ayushi Nayak		Assistant Professor	M.Tech.	Structural Engineering

Mr. Prakhar Modi		Assistant Professor	M.Tech.	Water Resources Engineering
Ms. Preeti Singh		Assistant Professor	M.Tech.	Structural Engineering
Mr. Rochak Pandey		Assistant Professor	M.Tech.	Construction Technology & Management
Mrs. Sonal Banchhor		Assistant Professor	M.Tech.	Structural Engineering
Mr. Vinod Kumar		Assistant Professor	M.Tech.	Soil Mech.& Foundation Engg.

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INTRODUCTION

Guru Ghasidas Vishwavidyalaya, a Central University established by an Act 2009 of the Parliament, was originally established as State University by an Act of State Legislative Assembly of the then undivided Madhya Pradesh on 16 June 1983. GGV is an active member of the Association of Indian Universities and Association of Commonwealth University. The National Assessment and Accreditation Council (NAAC) has accredited the University as B.

Situated in a socially and economically challenged area, the Vishwavidyalaya is appropriately named to honour the great Satnami Saint Guru Ghasidas (born in 17th century), who championed the cause of the downtrodden and waged a relentless struggle against all forms of social evils and injustice prevailing in the society.

The Vishwavidyalaya is a semi-residential institution. The Vishwavidyalaya covers almost the total spectrum of higher education in 32 departments offering various courses in the areas of Arts, Commerce, Education, Engineering and Technology, Humanities, Life Sciences, Management, Pharmacy, Sciences and Social Sciences. The lush green sprawling campus of the Vishwavidyalaya spread over an area of aprox. 655 acres is located five KM away from the main Bilaspur Town. River Arpa, the lifeline of Bilaspur, runs parallel to the Vishwavidyalaya campus. Bilaspur is a fast Industrializing City, already having a large number of industrial units coming up in the region. The area is the nerve center of trade in iron and steel, coal, aluminium, textiles, foodgrains, 'Kosa' silk, cement, paper, furniture and jewellery and is internationally known for its rice production. The Vishwavidyalaya aims at disseminating and advancing knowledge by providing instructional and research facilities in various branches of learning. It promotes innovation in teaching learning process, interdisciplinary studies & research, establishes linkages with the industries for the promotion of Science & Technology and to educate and train man-power for the development of the country and is committed to the improvement of the social, economic conditions and welfare of the people by improving their intellectual, academic and cultural development.

Bilaspur city is well by road and rail. Being a railway zone, Bilaspur facilitates train travel from any part of the country. Nearest airport is at Raipur, the Capital of Chhattisgarh, at a distance of 120 Kilometers from Bilaspur.

School of Studies in Engineering & Technology:

The School of Studies in Engineering & Technology is a prestigious school of higher learning producing meritorious students with excellent career growth and universal recognition. The students get the best of opportunities in the form of highly advanced courses, eminent faculty members, well-equipped laboratories, library, hostels and immense facilities to excel in research and development. The selection procedure for students at undergraduate and postgraduate is highly stringent so that School of Studies in Engineering & Technology gets the best brains of India. Highly scientific and innovative technology is used for teaching and carrying out research activities. Every year School of Studies in Engineering & Technology is enriched by the laurels brought by the faculty members and the students in the form of research publications, projects, fellowships and industrial exposure.

The School of Studies in Engineering & Technology awards Bachelors and Master's Degrees in various branches of technology. It has been making special efforts to recruit talented faculty on a world-wide basis. Bright students from all over the country by the selection process through

Central Seat Allocation Board (CSAB), Government of India based upon JEE (Mains) merit. The School has about 1600 undergraduate students.

The School has well established Training & Placement Cell which provides the necessary facilities to the students for their placements. The Training & Placement Cell of the School will strive to develop itself as one of the best placement centre in our country.

The School of Studies in Engineering & Technology is poised to reach heights with its quality research, training, collaborations, and projects. It has signed MOUs with some reputed organizations like PWD and JNPL. The faculty is also involved in research and development and has a number of publications to their credit and some are under process. Finally School of Studies in Engineering & Technology produces career ready graduates who are immediately employable.

Department of Civil Engineering

Four years degree course in Civil Engineering program was started in the year 2008 with annual intake of 40 seats under the Institute of Technology which is renamed as School of Studies in Engineering & Technology in 2017. The intake is increased to 50 seats in 2020. Ph.D. Program was also started in the department from session 2012-13. PG program (M.Tech.) is started from 2021 in the department. With a strong emphasis on learning and all round development, the graduates of our department are bound to be the perfect blend of diverse knowledge, technical expertise, and leadership ability. Efforts are being made to provide world class education and an intellectually stimulating environment in an endeavor to develop well rounded individuals with technical and professional competence of the highest degree. Besides education and research the main objective is to contribute largely to nation building and also to make great strides technologically on the international arena. The department is developing fast and would like to come up as a centre of excellence promoting intelligent, hardworking and technically curious minds. Within the span of 12 years, department is on its way to carve a niche for itself among the leading technological institutes of India.

The department has developed state-of-the-art infrastructure including fully equipped laboratories to impart world class education. Extracurricular event is a regular phenomenon to ignite the minds of graduating buds. The department has at present eight numbers of well qualified faculty members and ten more are to be added in due course of time, against the UGC sanctioned posts. From the session 2012-13 department is offering its consultancy & testing services for the external agencies, in addition to the internal consultancy services for the University.

**Proposed Draft of
ORDINANCE No. -12
for
Bachelor of Technology (B.Tech.)
Under Choice Based Credit System
Governing the award for the Degree of Bachelor of Technology (B.Tech.)-4 years (8 Semester)
Degree Course**
(Ordinance prepared as per the provisions given in Statute 28(1) (b) of
The Central Universities Act, 2009)

1.0 TITLE AND COMMENCEMENT

- 1.1 The Ordinance shall be called as Ordinance for four years (Eight Semesters) B.Tech. Degree programme.
- 1.2 The first degree of four years (Eight Semester) programme in Engineering & Technology, hereinafter called 4- year B. Tech degree course, shall be designated as 'Bachelor of Technology' in respective Branches. The conduct of the programme and the performance evaluation of B. Tech. programmes are on the basis of percentage of marks earned as well as credit system.
- 1.3 This ordinance will come into force from the Academic Session commencing after the date of notification issued by the University and shall replace the existing ordinance.

2.0 DEFINITION & KEY WORDS

- 2.1 "*Vishwavidyalaya*" or "*University*" means Guru Ghasidas Vishwavidyalaya (A Central University established by the Central Universities Act, 2009 No. 25 of 2009) located at Koni, Bilaspur, Chhattisgarh.
- 2.2 "*Student*" means one who has been admitted in the four years B.Tech. programme of this University through merit list of Joint Entrance Examination (JEE) (main) or any other procedure decided by Guru Ghasidas Vishwavidyalaya for Admission to B. Tech. degree course time to time.
- 2.3 The candidate shall be eligible for admission on the basis of the "*Academic Year*" means two consecutive (one odd and one even) semesters.
- 2.4 "*Choice Based Credit System (CBCS)*" means a program that provides choice for students to select from the prescribed courses (Basic Science, Humanities, Engineering Science,

Mandatory Courses, Professional Core, Open Elective, Professional Elective, etc.) as per the guidelines issued by UGC / AICTE / regulatory bodies where ever applicable and as approved by the appropriate bodies of the University.

- 2.5 "Course" means "papers" through different modes of delivery and is a component of a programme as detailed out in the respective program structure.
- 2.6 "Credit Point" means the product of grade point and number of credits for a course.
- 2.7 "Credit" means a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture, seminar or tutorial) per week or two hours of practical work/field work/project etc. per week. The number of credits for each course shall be defined in the respective examination scheme.
- 2.8 "Cumulative Grade Point Average (CGPA)" means a measure of overall cumulative performance of a student in all semesters. The CGPA is the ratio of total credit points secured by a student in various courses registered up to the semester concerned and the sum of the total credits points of all the registered courses in those semesters concerned. It is expressed up to two decimal places.
- 2.9 "Grade Point" means a numerical weight allotted to each letter grade on a 10 point scale or as prescribed by the AICTE/ University from time to time.
- 2.10 "Letter Grade" means an index of the performance of students in a course. Grades are denoted by letters O, A+, A, B+, B, C, P, and F.
- 2.11 "Semester Grade Point Average (SGPA)" means a measure of performance of a student in a particular semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the total credits of all courses in that semester. It shall be expressed up to two decimal places.
- 2.12 "Semester" means an academic session spread over 15-18 weeks of teaching work with minimum 90 teaching days. The odd semester may normally be scheduled from July to December and even semester from January to June.
- 2.13 "Grade Card" means a certificate based on the grades earned. Grade card shall be issued to all the students registered for the examination after every semester. The grade card will contain the course details (code, title, number of credits, grade secured) along with SGPA of

the semester and CGPA earned till that semester. The final semester grade card shall also reflect the cumulative total of marks obtained by the student in all semesters out of maximum marks allocated for which the grades of the program were evaluated. However, the final result will be based on the grades/CGPA.

2.14 *"Transcript"* means a certificate issued to all enrolled students in a program after successful completion of the program. It contains the SGPA of all semesters and the CGPA.

2.15 *"Ex-student"* means a student who fails to clear in the supplementary examination all the backlogs of theory, practical / sessional subjects of the odd and even semesters, he/she will not be promoted to the odd semester of the next higher year, and such student shall be treated as ex-student.

2.16 *"Sessional"* means a subject which is practiced by student in a semester for which there is no end semester exam.

3.0 DURATION

The duration of undergraduate (U.G.) degree programmes leading to B. Tech. degree, shall be normally four years and the maximum duration shall be 7 years from the date of initial registration in First year B.Tech. course. If a candidate will not be able to complete the course in the maximum duration of 7 years then he / she will not be eligible to continue the course from that point of time itself and he / she will automatically exit from the program.

4.0 ADMISSION PROCEDURE AND ELIGIBILITY

The minimum qualification for admission to the first year B. Tech. shall be the passing of Higher Secondary School Certificate Examination (10+2) scheme with Physics, Chemistry and Mathematics conducted by Central Board of Secondary Education or any other equivalent examination from recognized Board or University. The candidate shall be eligible for admission on the basis of the merit list of Joint Entrance Examination (JEE) (main) or any other procedure decided by Guru Ghasidas Vishwavidyalaya for Admission to B. Tech. degree course time to time. In general the admission to B. Tech. degree course shall be governed by the rules of MHRD, Government of India (GoI) and Guru Ghasidas Vishwavidyalaya.

The reservations in admission, cancellation of admission and fee refund will be as per MHRD, GoI / GGV norms and notifications issued in this regard from time to time.

5.0 ENROLMENT IN THE UNIVERSITY

Every student admitted to the programme shall be enrolled before appearing in the first semester examination through the procedure prescribed by the competent authority from time to time.

6.0 TYPES OF COURSES

Basic Science, Humanities, Engineering Science, Mandatory Courses, Professional Core, Open Elective, Professional Elective, etc. as per the guidelines issued by AICTE / University where ever applicable and as approved by the appropriate bodies of the University.

7.0 ATTENDANCE AND ELIGIBILITY TO APPEAR IN THE EXAMINATION

A Student shall be required to attend at least 75% of the classes actually held in the semester which may include theory class, seminars, sessionals, practicals, projects, as may be prescribed. Provided that the Dean of the School of Engineering & Technology on the recommendations of the concerned Head of the Department may condone the shortage in attendance of those students who have secured at least 65% attendance. This condonation should not exceed 10% on the following satisfactory grounds.

- (a) Illness / Medical leave of the student certified by the University Medical Officer / Government Doctor.
- (b) Unforeseen miss happening with parents.
- (c) For participating in the extra and co-curricular events with prior approval from the university authority.
- (d) For participating in the sports activity with prior approval from the university authority.
- (e) For attending in interviews with valid proof and prior permission of the concerned head of department.
- (f) Natural calamities.

The application must be supported by such documents as considered to be fit for granting such condonation.

- 7.1. A student who does not satisfy the requirement of attendance as per clause above, he/she will be detained due to shortage of attendance in a particular semester and he/she will have to repeat the same semester taking re-admission as a regular student in the next commencing academic session by paying fee as per the University norms.

8.0 EXTRA ORDINARY LONG ABSENCE

If a student does not participate in the academic activities of the School of Studies of Engineering and Technology of this Vishwavidyalaya for a period exceeding two years for reasons of ill health or medical grounds only, he / she shall neither be permitted to appear in any subsequent examinations nor shall be admitted or promoted to any semester and he / she shall cease to be a student of B. Tech. Degree Course. Here participation in academic activity means attending Lectures, Tutorials, Practicals/Sessionals and such other activities declared as academic activities.

9.0 MEDIUM OF INSTRUCTION/EXAMINATION

Medium of instruction and examination shall be English only.

10.0 EXAMINATION AND EVALUTION

- 10.1 *Practical/ Sessional Work* – The student shall be required to complete the Laboratory / Drawing / Design / Job preparation and other academic work assigned for that semester in the session.
- 10.2 There shall be a full End Semester Examination at the end of each semester consisting of theory papers, practicals/ sessionals.
- 10.3 There shall be one End Semester Examination (ESE) at the end of each semester conducted by Guru Ghasidas Vishwavidyalaya. Only those students, who will satisfy the attendance requirement to be eligible to appear at the End Semester Examination as per clause 7.0, will be permitted to appear in the End Semester Examination. The examination will consist of theory papers, laboratory practical/sessional and viva-voce as per the scheme of examination of that semester. These examinations shall be designated as follows.
- | | |
|-------------------------|--|
| (a). During First year | - I & II sem. B. Tech. Examination |
| (b). During Second year | - III & IV sem. B. Tech Examination |
| (c). During Third year | - V & VI sem. B. Tech. Examination |
| (d). During Fourth year | - VII & VIII sem. B. Tech. Examination |
- 10.4 The semester examination will normally be held in the month of November-December and April – May in every academic session, or as decided by the University from time to time.

10.5 Supplementary examination will be held only once in a year (for both even and odd semesters) normally in the month of June/July or as decided by the University from time to time.

10.6 End Semester Examination time table shall be declared by the Controller of Examination before the commencement of examination.

10.7 Basis of Subject: Evaluation

10.7.1 For passing in a subject (theory / practical/sessional) the performance of the candidate in each semester shall be evaluated subject wise. There shall be continuous assessment throughout the semester by conducting class tests, called as Internal Assessment (I.A.) carrying 30% weightage, and End Semester Examination (E.S.E.) carrying 70% weightage. A student has to secure minimum 35% (24 marks) in the particular theory subject and minimum 40% marks in a particular practical subject to pass that subject in the end semester examination. For each practical/sessional subject 60% weightage will be given to the actual practicals /sessionals performed during the semester I.A. and 40% weightage will be given to the End Semester Examination (ESE).

10.7.2 For evaluation of end semester practical/sessional examination of a subject, there shall be two examiners, one internal examiner who has conducted the practical in that semester and other external examiner to be appointed by the Head of the Department from amongst faculty members of the department concerned.

10.7.3 To allot the marks of Internal Assessment (IA), there shall be two Class Tests (CT) I & II each of 15 marks.

10.7.4 For passing a subject the student is required to fulfill the following conditions:

- (a) Student has to secure minimum 35% (24 marks) in a particular theory subject to pass that subject in the end semester examination.
- (b) Student has to secure minimum 40% marks in a particular practical / sessional subject to pass that subject (practical / sessional) in the end semester examination.
- (c) Must have secured minimum 40% marks (Marks of Internal Assessment + Marks of End Semester Examination) for each theory subject.
- (d) Must have secured minimum 50% marks (Marks of Internal Assessment + Marks of End Semester Examination) for each project/practical/sessional subject.
- (e) Must have scored minimum SGPA of 5.0 in the semester. If a student has cleared all the Theory and Practical/Sessional subjects of one or and both semesters of a year, but has

failed to secure SGPA of 5.0 in the semester or and semesters of a year then he/she will be allowed to re-appear in the supplementary Examination in those subjects in which the student's Grade Points less than 5. If the student fails to secure SGPA of 5.0 even in the supplementary examination, he/she will not be promoted to the odd semester of the next higher year, and such student shall be treated as an ex-student. Other condition of promotion of the ex-student will be applicable as per Clause 11.

- (f) If a student has passed a semester examination in all the subjects as per clause 10.7.4 (a-e), he/she shall not be permitted to reappear in that examination for improvement in grades/division.

10.7.5 Basis of Credits- Credit of a theory or practical/sessional subject is decided by:

$$\text{Credit} = (L + T + P/2).$$

Where: L = Lecture periods per week.

T = Tutorial period per week.

P = Practical/Sessional periods per week.

Credit in a subject will be an integer, not in a fractional number. If a credit in a subject turns out in fraction, it will be taken as next integer number.

10.7.6 For Theory Subjects-For the assessment of performance of students in a semester, continuous evaluation system will be followed with two components: Internal Assessment (IA), carrying 30% weightage and End Semester Examination (ESE), carrying 70% weightage. There will be two class tests each of 15 Marks, in each theory subject in a semester forming the part of Internal Assessment (IA).

10.7.7 For Projects/Practical/ Sessional Subjects- Evaluation of project/practical/sessional during the semester will carry 60% weightage for Internal Assessment (IA) and the End Semester Examination (ESE) will carry 40% weightage. The internal assessment will carry equal weightage of attendance (20% weightage), practical records (20% weightage) and internal viva = voice examination (20% weightage). The marks for attendance shall be awarded in project/practical/sessional subject as per the following Table.

Percentage of attendance	65 - ≤ 75	> 75 - ≤ 80	>80- ≤ 85	>85- ≤ 90	>90- ≤ 95	>95- ≤ 100
Percent weightage of Marks	10	12	14	16	18	20

10.7.8 **Grading System-** Percentage as well as absolute grading system will be followed, in every subject, theory or practical/sessional. A student will be awarded a Letter Grade, based on his combined performance of Internal Assessment (IA) and End Semester Examination (ESE). These grades will be described by letters indicating a qualitative assessment of the student's performance through a number equivalent called "Grade Point" (GP) as given below. The following is the Grade Point pattern. Grade 'F' indicates not clearing (passing) of the subject.

Letter Grade (LG)	O	A+	A	B+	B	C	P	F	Ab
Grade Point	10	9	8	7	6	5	4	0	0

The Letter Grades are O (Outstanding), A+ (Excellent), A (Very Good), B+ (Good), B (Above Average), C (Average), P (Pass), F (Fail) and Ab (Absent in end semester examination). Grades will be awarded for every theory and practical/sessional subject separately.

10.7.9 Absolute Grading System

- (a) The Absolute Grading System as explained below will be adopted for theory and project/practical/sessional subjects.

GRADE	Percentage of Mark: Obtained	
	THEORY	PRACTICAL/SESSIONAL/PROJECT
O (Outstanding)	$>90 - \leq 100$	$>90 - \leq 100$
A+ (Excellent)	$>80 - \leq 90$	$>80 - \leq 90$
A (Very Good)	$>70 - \leq 80$	$>70 - \leq 80$
B+ (Good)	$>60 - \leq 70$	$>60 - \leq 70$
B (Above Average)	$>50 - \leq 60$	$>55 - \leq 60$
C (Average)	$>40 - \leq 50$	$>50 - \leq 55$
P (Pass)	$=40$	$=50$
F (Fail)	$00 - <40$	$0 - <50$

- (b) 01 Grace Mark shall be given only once at the time of award of the degree to improve the Grade in overall result.

10.7.10 Semester Grade Point Average (SGPA)- Performance of a student in i^{th} semester is expressed by $[SGPA]_i$, which is a weighed average of course grade points obtained by a student in the semester, and is expressed by

$$[SGPA] = \frac{[C_1G_1 + C_2G_2 + \dots]}{[C_1 + C_2 + \dots]} = \frac{[\sum C_jG_j]}{[\sum C_j]} = \frac{N_i}{D_i}$$

Where C_j stands for Credit and G_j stands for Grade points corresponding to j^{th} subject in a semester. SGPA_s will be calculated up to two places of decimal without rounding off. SGPA will be calculated only when a student clears a semester without failing in any subject, theory or practical/sessional/project.

10.7.11 Cumulative Grade Point Average (CGPA)- This is a weighed average of course grade points obtained by a student for all the courses taken, since his / her admission. Thus, CGPA in the i^{th} semester with " $i \geq 2$ " will be calculated as follows:

$$[CGPA] = \frac{\sum_{i=1}^{i=1} N_i}{\sum_{i=1}^{i=1} D_i}$$

If a student repeats a course or is declared fail in a subject, then only the grade points earned in the attempt when he / she cleared the course (subject) are counted towards CGPA. CGPA will be calculated in every semester along with SGPA, so that a student knows his / her latest CGPA.

11 PROMOTION TO NEXT YEAR AND SEMESTER

11.1 Those students who have cleared all the registered theory, practical/sessional subjects prescribed for the B.Tech. first year shall be promoted to the B.Tech. second year. Those students who have cleared all the registered theory, practical/sessional subjects prescribed for the B.Tech. second year shall be promoted to the B.Tech. third year. Those students who have cleared all the registered theory, practical/sessional subjects prescribed for the B.Tech. third year shall be promoted to the B.Tech. fourth year.

- 11.2 Supplementary examinations will be held only once in a year (for both even and odd semesters) normally in the month of July after declaration of results of even semester examination of the incumbent session, or as decided by the University time to time.
- 11.3 Those students who would have backlogs in registered theory and/ or practical/ sessional subjects in the odd and or even semesters of any academic year will be allowed to appear in the supplementary examinations of the same year.
- 11.4 Those B.Tech. students who are allowed to appear the supplementary examination (of odd or even or both semester), may be allowed to attend the classes provisionally of the next higher odd semester of the next year. However, such provisionally permitted students will get their regular admission only after passing in all their backlog papers in supplementary examination, if eligible otherwise. The percentage of attendance shall be counted from the date of commencement of the semester classes.
- 11.5 If a student fails to clear in the supplementary examination all the backlogs of theory, practical/sessional subjects of the odd and even semesters, he/she will not be promoted to the odd semester of the next higher year, and such student shall be treated as ex-student.
- 11.6 Ex-students, {as per clause 10.7.4(e)}, shall be required to clear their backlog papers (theory and or practical/sessional subjects), in the end semester examination of the corresponding semesters (odd and even) and supplementary examination to be conducted next year (in the following academic session). Such ex-students will be required to deposit the examination fees only.
- 11.7 If a student fails to appear in the internal assessment / sessional of a semester due to unforeseen incident, a makeup test/examination may be conducted, if required, strictly on the recommendation of the concerned Head of the Department, and approval of the Dean (Engineering & Technology).

12 AWARD OF CLASS OR DIVISION

- 12.1 The class/division awarded to a student with B. Tech. Degree shall be determined by the student's CGPA after clearing all the subjects of all the eight semesters, as given below:

- First Division with Distinction or Honours : $7.5 \leq \text{CGPA} \leq 10.0$
- First Division : $6.5 \leq \text{CGPA} < 7.5$
- Second Division : $5.0 \leq \text{CGPA} < 6.5$

12.2 Division shall be awarded to a student only after clearing all the eight semesters successfully, and having earned at least total credit of 160 for the award of B.Tech. degree. It shall be based on the integrated performance of the candidate for all the eight semesters as per clause 10.3.

12.3 No student shall be declared to have passed the final B.Tech. course unless he/she has fully passed all the eight semesters. The results of the eighth semester of those students, who have not passed examination in any previous semester, will be withheld. Such students shall be deemed to have passed the final B.Tech. examination in the year in which they pass / clear all the subjects of all the eight semesters, within the limit of the prescribed period of the whole course.

13 TRANSCRIPT

Based on the Letter grades, grade points and SGPA and CGPA, the Vishwavidyalaya shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

14 CONVERSION OF CGPA / SGPA IN PERCENTAGE

There is no equivalence between the CGPA/SGPA scale and percentage. However notionally,

$$\text{Percentage of particular semester} = (\text{SGPA}) \times 10$$

$$\text{Percentage of B.Tech. Degree} = (\text{CGPA}) \times 10$$

15 RANKING

Only such candidates who complete successfully all courses in the programme in single attempt shall be considered for declaration of ranks, medals etc declared and notified by the university, if any.

16 DISCIPLINE

- Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the Institute.
- Any act of indiscipline of a student reported to the concerned Head / Dean (Engineering & Technology), will be investigated and necessary action will be taken as per university rules from time to time.

- Ragging of any dimension is a criminal and non-bailable offence in our country. The current State and Central legislations provide for stringent punishment, including imprisonment. Once the involvement of a student is established in ragging, the offending student will be dismissed from the University and will not be admitted into any other Institution. Avenues also exist for collective punishment, if individuals can not be identified in this inhuman act. Every senior student, along with the parent, shall give an undertaking every year in this regard and this should be submitted at the time of admission / registration.

17 REGISTRATION REQUIREMENTS

- Every student is required to be present and register at the commencement of each semester on the day(s) fixed for and notified in the Academic Calendar from time to time.
- Late registration will be permitted with a fine as decided from time to time up to three weeks from the date of commencement of each semester as notified in the Academic Calendar from time to time. If the student does not register in the specified time he / she has to be registered in the next year in the same semester.
- Percentage attendance for all students will be counted from the date of commencement of the semester, irrespective of his/her date of registration. However, in case of first year first semester, attendance will be counted from date of admission into the School or date of commencement of class work, whichever is later.
- Minimum 4 weeks Industrial training/Internship in during summer break is compulsory after end semester examination of sixth semester. The student has to submit the industrial training / Internship report to the concerned department at the time of registration in the seventh semester and required to defend his/her industrial training/internship during seventh semester in the department.
- If a student finds his/her academic/course load heavy in any semester, or for any other valid reason, he/she may drop courses within 15 instructional days from the commencement of the semester with the recommendation of his/her Head of Department and approval of the Dean, Engineering & Technology.
- The curriculum for any semester, except for the final semester will normally carry credits between 21 to 29.
- Minimum number of credits that a student can register in any given semester (excepting for final semester) is 15. Maximum number of credits that can be registered in a semester is 29.

However, in the final semester, a student may earn less than 15 credits if it is sufficient for him/her to fulfill the requirements for the award of the degree.

- A student who has successfully secured *CGPA* equal and more than 7.0 in his/her First Year courses, can be registered for non credit courses in other departments of the university for his/her higher semesters of study. The registration in non credit courses will be done after recommendation of Head of the Department and approval of the Dean, Engineering & Technology followed by the same of the Head of the Department concerned of the non credit course offered in. The student has to attend the classes of the non credit courses in addition to the fulfilling the requirements of registered regular subjects in his/her department prescribed by the Head of Department. For non credit courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of *SGPA/CGPA*.

18 TRANSFER OF CREDITS

With due approval the courses studied through on line / off line like Massive Open online Courses (MOOCs) through National Programme on Technology Enhanced Learning (NPTEL) under Study Webs of Active –Learning for Young Aspiring Minds (SWYAM) in Indian/ Foreign University/Institutions by the students during their study period at GGV Bilaspur (C.G.) may count towards the credit requirements for the award of B.Tech. degree. The credit transferred will reduce the number of courses to be registered by the student at GGV. The guidelines for such transfer of credits are as follows.

- On successful completion of the courses opted by students under SWYAM, the credits earned by them shall be included in their Grade card.
- Credits transferred will not be used for *SGPA/CGPA* computations except SWYAM. However, credits transferred will be considered for overall credits requirements of the programme.
- Students can earn credits only from other department of the University (GGV) / IISC/IITs/NITs/Central Universities and other Indian and Foreign Institutions/Universities with which GGV has an MOU (and that MOU must have specific clauses for provisions of credit transfer by students).
- Credit transfer can only be considered for the courses at same level (i.e., UG, PG, etc.).

- The credits / grades indicated in the grade sheet obtained from the university in which the student has completed the courses should be used by the student as part of his/her transcripts.

19 INTERPRETATION OF REGULATION

In case of any dispute in the matter of interpretation of this Ordinance, the decision of the Vice-Chancellor of the University shall be final and binding on the students.

20 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council of the University has the right to propose any modifications or amendments to the Executive Council for final decision of the above regulations and further actions from time to time.

- 21 Matters not covered in this Ordinance shall be governed by the relevant ordinance of the University.

Scheme & Syllabus

**I- SEM. & II-SEM.
(B.Tech.-1stYear)**

**SCHEME OF EXAMINATION B.Tech – I Year (1st Sem.), Common to All Branches, Course – A,
w.e.f. Session: 2020-21**

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1.	MA201TBS01	Mathematics-I	3	1	-	30	70	100	4
2.	CY201TBS02	Chemistry	3	1	-	30	70	100	4
3.	CE201TES01	Engineering Mechanics	3	1	-	30	70	100	4
4.	CS201TES02	Computer Programming	3	0	-	30	70	100	3
5.	CM201TES03	Basic Civil & Mechanical Engineering	3	0	-	30	70	100	3
6.	LW201TMC01	Indian Constitution	2	0	-	-	-	-	-
TOTAL			17	3	-	150	350	500	18
Practicals									
1.	CY201PBS01	Chemistry Lab	-	-	2	30	20	50	1
2.	CE201PES01	Engineering Mechanics Lab	-	-	2	30	20	50	1
3.	CS201PES02	Computer Programming Lab	-	-	2	30	20	50	1
TOTAL			-	-	6	90	60	150	3
GRAND TOTAL			17	3	6	240	410	650	21

**SCHEME OF EXAMINATION B.Tech – I Year (2nd Sem.), Common to All Branches, Course – B,
w.e.f. Session: 2020-21**

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1.	MA202TBS03	Mathematics-II	3	1	-	30	70	100	4
2.	PH202TBS04	Physics	3	1	-	30	70	100	4
3.	EC202TES04	Basic Electrical & Electronics Engineering	3	1	-	30	70	100	4
4.	IT202TES05	Introduction To Information Technologies	2	0	-	30	70	100	2
5.	EN202THS01	English Communication	3	0	-	30	70	100	3
TOTAL			14	3	-	150	350	500	17
Practicals									
1.	PH202PBS02	Physics Lab	-	-	2	30	20	50	1
2.	ME202PES03	Engineering Graphics	1	-	3	30	20	50	3
3.	ME202PES04	Workshop Technology & Practices	1	-	2	30	20	50	2
4.	EC202PES05	BEE Lab	-	-	2	30	20	50	1
TOTAL			2	-	9	120	80	200	7
GRAND TOTAL			16	3	9	270	430	700	24

L:LECTURE, T:TUTORIAL, P:PRACTICAL, IA : INTERNAL ASSESSMENT, ESE:END SEMESTER EXAMINATION

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	MA201TBS01	L	T	P	CT-I	CT-II	TOTAL	70	100	04
<i>Subject:</i>	MATHEMATICS-I	3	1	-	15	15	30			

Course Content

Calculus (Single Variable)

Unit 1: Calculus:

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

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

Unit 2: Sequences and series:

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

Unit-3: (A): Multi variable Calculus (Differentiation): Limit, continuity and partial derivatives, directional Derivatives, total Derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

(B): Multivariable Calculus (Integration)

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

Unit – 4 (A): Matrices (in case vector spaces is not to be taught)

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

(B) Matrices (in case vector spaces is to be taught)

Matrices, vectors: addition and scalar multiplication, matrix multiplication; linear systems of Equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Unit-5 (A): Vector spaces

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

(B) Vector spaces

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbasis. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.
8. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CY201TBS02	L	T	P	CT-I	CT-II	TOTAL	70	100	04
<i>Subject:</i>	CHEMISTRY	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this Course is to:

To make aware and enrich the students about the basic concept and understanding of chemical concepts of basic Chemistry and spectroscopic techniques.

Course Content:

UNIT-1: I Concept of Quantum Energy and Spectroscopy: Quantization of Energy, Regions of spectrum. Electronic Spectroscopy: Electronic Transition, Woodward Fieser rules for calculating λ max of conjugated dienes & α , β -unsaturated carbonyl compound, various shifts in λ max and intensities. Infra-Red Spectroscopy: Conditions for Infra-Red Spectroscopy, Molecular vibrations & factors affecting Infra-Red frequencies.

UNIT-2: Chemical Bonding in Molecules: Introduction of chemical bonding, VSEPER Theory, V. B. Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions.

UNIT-3: Concept of Chirality, Enantiomers, Diastereomers, Meso-compounds and Racemic mixtures. Conformation of Acyclic hydrocarbons (Ethane, Propane & n-Butane) and cyclic hydrocarbon (Cyclohexane), Plane of symmetry, Centre of symmetry, Absolute and Relative Configuration (R & S, D & L and E & Z).

UNIT-4: Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules, kinetic vs thermodynamic control of reactions.

UNIT-5: Strategy for Synthesis of Organic Compounds: Reaction intermediates: Stability of Free Radicle, Carbocation and Carbanion. Introduction to reaction involving Addition, Elimination, Substitution and Ring opening and Cyclization.

Textbooks/References:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.
3. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
4. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
5. A textbook of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
6. Applied Chemistry by H.D. Gesser, Springer Publishers
7. Textbook of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM
8. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
9. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006.
10. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
11. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

Course Outcomes- At the end of the course the students will be able to: understand and solve the practical problems of their higher Engineering classes on the basis of understanding of Chemistry developed in their B. Tech. I sem classes.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE201TES01							70	100	04
<i>Subject:</i>	ENGINEERING MECHANICS	3	1	-	15	15	30			

Course Learning Objectives:

To learn about

- The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reactions and calculation of Centroid
- The Concept of moment of inertia of plane figures, Laws and applications of friction
- The Analysis of the truss and determination of axial forces by Method of Joints
- Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions

Course Content:

UNIT- 1: Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems

UNIT-2: Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies.

Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; Simple Trusses; Zero force members.

UNIT 3: Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections.

UNIT-4: Virtual Work and Energy Method-Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency.

Review of particle dynamics- Rectilinear motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT-5: Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;

Textbooks/References:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
4. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
5. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
6. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications
7. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
8. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Course Outcomes- On successful completion of teaching-learning and evaluation activities, a student would be able to

- Identify and analyze the problems by applying the fundamental principles of engineering mechanics and to proceed to research, design and development of the mechanical systems.
- Construct free body diagrams and use appropriate equilibrium equations, Calculate unknown forces in a plane by resolution of force and equilibrium equations
- Locate Centroid of composite figures and determine moment of plane figures
- Analyze the systems with friction
- Determine the axial forces in the members of determinate truss.
- Calculation of acceleration, velocity and displacement and forces
- Calculation of angular displacement, velocity and angular acceleration of rotational bodies

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CS201TES02	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	COMPUTER PROGRAMMING	3	-	-	15	15	30			

Course Learning Objectives:

- To understand the basic of Idea of Algorithm.
- To understand the programing concept of Arithmetic expressions and Basic Algorithms
- To learn the Functions and Structure of array.

Course Content:

UNIT-1: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT-2: Arithmetic expressions and precedence

Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching Iteration and loops, Arrays (1-D, 2-D), Character arrays and strings

UNIT-3: Basic Algorithms

Searching, concept of binary search etc, Basic Sorting Algorithms Bubble sort etc, Finding roots of equations, introduction of Algorithm complexity

UNIT-4: Function

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference binary search etc.

Recursion functions Recursion, as a different way of solving problems. Example programs, such as, Finding Factorial, Fibonacci series, etc.

UNIT -5: Structure

Structures, Defining structures and Array of Structures Pointers Idea of pointers, defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Textbooks/References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India

Course Outcomes- At the end of the course students will be able to

- Develop the algorithm and programmers for various applications using Arithmetic expressions, arrays, pointers and Functions.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CM201TES03							70	100	03
<i>Subject:</i>	BASIC CIVIL & MECHANICAL ENGINEERING	3	-	-	15	15	30			

Course Learning Objectives:

- To study the properties and uses of basic civil engineering materials.
- To study the importance of NBC, IS Codes (materials), types of buildings and foundations, basic requirements of foundations.
- To study the basic types of surveys, linear and angular measurements, and GPS measurements
- To familiarize with the fundamentals of heat and work interactions, heat transfer mechanisms and energy conversion processes.
- To provide exposure to various engineering materials and processes of manufacturing.
- To impart basic knowledge of the interdisciplinary nature of engineering systems.

UNIT 1: Civil Engineering Materials: Properties & Uses of Stones, Bricks, Cement, Aggregates, Steel, Concrete-quality of good concrete, strength, curing and grade of concrete, standard tests on concrete. IS Codes and classification

UNIT 2: National Building Code (NBC), Salient features, Classification of Building as per NBC(India), Site selection for buildings - Components of building, Foundations-Introduction, Types of Foundations & its Suitability, Basic requirements and purpose of foundation on different soils.
Brief description about: Brick & stone masonry, Plastering, Lintels; Doors & Windows, Beams & columns, Formwork, Roofs.

UNIT 3: Surveying: Objects, uses, Basic principle, Classification, Plans & Maps, Scales, Units of measurement, Conventional symbols, Different survey equipment.

Measurements – Linear & Angular, levelling, Determination of Area & Volume, Introduction to Triangulation and GPS

UNIT 4: Materials and Manufacturing

Introduction to engineering materials – metals, alloys, composites, smart

materials, phase-change materials; Introduction to various processes of manufacturing – conventional machine tools – lathe and its types, shaping, milling and related operations – turning, threading, knurling, etc., unconventional methods.

UNIT 5: Automobile and Refrigeration and Air conditioning

Theoretical thermodynamic cycles and working principle of Petrol and Diesel Engines – Hybrid and Electric Vehicle - Turbines, Pumps, Compressors. Principle of vapour compression and absorption refrigeration system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Introduction to renewable energy utilization and technology.

Textbooks/References:

1. Punmia, B.C, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, Lakshmi Publishers, 2012.
2. Satheesh Gopi, Basic Civil Engineering, Pearson Publishers, 2009.
3. Rangwala, S.C, Building materials, Charotar Publishing House, Pvt. Limited, Edition 27, 2009.
4. Palanichamy, M.S, Basic Civil Engineering, Tata McGraw Hill, 2000.
5. Elements of Workshop Technology Vol. 1 – S.K. Hajra Choudhary, A.K. Hajra Choudhary – Media promoters & Publishers Pvt. Ltd.
6. Basic Automobile Engineering – R.B. Gupta, Satya Prakashan.
7. Shanmugam, G and Palanichamy, M S, Basic Civil and Mechanical Engineering, Tata McGraw Hill
8. National Building Code (NBC) – Bureau of Indian Standards
9. Bureau of Indian Standard Codes for Civil Engineering Materials

COURSE OUTCOME

At the end of the course, the students will be

1. able to gain the knowledge on the basic civil engineering materials
2. able to know the importance of NBC and relevance of IS Codes to Civil engineering materials, site selection of a building and its components and materials
3. exposed to various types of surveys, linear and angular measurements and GPS measurements
4. Be able to relate with processes in various energy conversion devices involving heat and work.
5. Be able to identify and suggest various processes of manufacturing and materials involved.
6. Be able to appreciate the interdisciplinary existence between heat, work, fluid flow and manufacturing processes.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	LW201TMC01							-	-	-
<i>Subject:</i>	INDIAN CONSTITUTION	2	0	-	-	-	-			

Course Learning Objectives:

- To the importance of preamble of the constitution of India.
- To understand the fundamental rights and duty as a citizen of India.
- To understand the functioning of union and state government and their inter-relationship.

Course Content:

UNIT 1: Introduction: Constitution-meaning of the term, Sources and constitutional theory, Features, Citizenship. Preamble.

UNIT 2: Fundamental Rights and Duties: Fundamental Rights, Fundamental Duties, Directive Principles of State Policy

UNIT 3: Union Government: Structure of Indian Union: Federalism, Centre-State relationship President: Role. Power and position, Prime Minister and council of ministers, Cabinet and Central Secretariat, Lok Sabha. Rajya Sabha

UNIT 4: State Government: Governor: Role and position, Chief Minister and council of ministers, State Secretariat

UNIT 5: Relationship between Centre and States: Distribution of Legislative Powers, Administrative Relations, Coordination between States

Textbooks/References:

1. Constitution of India, V.N. Shukla
2. The Constitutional Law of India, J.N. Pandey
3. Indian Constitutional Law. M.P. Jain

Course Outcome: At the end of the course students will be able to:

- Describe the salient features of the Indian Constitution
- List the Fundamental Rights and Fundamental Duties of Indian citizens
- Describe the Directive Principles of State Policy and their significance

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	CY201PBS01						20	50	01
<i>Subject:</i>	CHEMISTRY LAB	0	0	2	30	30			

Course Learning Objectives:

The Lab sessions would help in learning:

- Application of iodometrically & titration in lab.
- Recognition of different chemical reaction.
- Advanced lab methods like Spectro photometry and chromatography

Course Content:

Group – A:

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution.
2. To determine the Normality and Strength (g/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (N/30) solution 'B' taking KMnO₄ solution as an intermediate.
3. To determine the concentration of hypo solution (Na₂S₂O₃.5H₂O) iodometrically with given Iodine (N/50) solution.
4. Find out the Temporary hardness of given water sample using 0.01M EDTA solution, buffer solution (pH-10) and EBT as an indicator.
5. To determine chloride ion in a given water sample by Argentometric method (Mohr's method)

Group – B:

6. Preparation of Urea Formaldehyde resin.
7. Acetylation of Primary Amine: Preparation of Acetanilide.
8. Base Catalyzed Aldol Condensation: Synthesis of dibenzalpropanone.
9. [4+2] Cycloaddition Reaction: Diels-Alder reaction.
10. Preparation of aspirin and calculate its yield.

Group – C:

11. To calculate the λ_{\max} of a given compound using UV-visible spectrophotometer.
12. To separate the metallic ions by paper chromatography.

13. To determine the surface tension of a liquid by stalagmometer.
14. To determine the percentage composition of the given mixture consisting of two liquids A and B (non- interacting system) by viscosity method.
15. To determine the relative viscosity of given liquids by Ostwald's viscometer.

Note: At least two Experiments from each group must be performed.

Course Outcomes- On completion of the course, the students will be able to handle the chemicals of synthesis as well as titration that will ultimately make them efficient and develop their future chemistry laboratory skills

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	CE2011ES01						20	50	01
<i>Subject:</i>	ENGINEERING MECHANICS LAB	0	0	2	30	30			

Course objectives:

- To perform the practical giving basic understanding to fundamental principles of mechanics like parallelogram of forces, triangle of forces and polygon of forces by universal force table
- To perform the practical giving basic understanding to fundamental application of mechanics like screw jack, winch crab and simple wheel and axle

Course Content:

List of Experiments

1. Verification of law of parallelogram of forces.
2. Verification of law of triangle of forces.
3. Verification of law of polygon of forces by universal force table.
4. Verification of law of moment by parallel forces apparatus.
5. Practical verification of forces in the member of jib crane.
6. Practical verification of forces in the member of the truss.
7. Determination of coefficient of friction between two given surfaces by inclined plane method.
8. Determination of efficiency of simple screw jack.
9. Determination of efficiency of single purchase winch crab.
10. Determination of efficiency of double purchase winch crab.
11. Determination of efficiency of simple wheel and axle.

Course Outcome: At the end of the course students will be able to:

- Verify the fundamental principles of mechanics like parallelogram of forces, triangle of forces and polygon of forces by universal force table
- Analyze the friction coefficient between two surfaces
- Calculate the efficiency of screw jack, winch crab and wheel and axle

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	CS201PES02	L	T	P	IA	TOTAL	20	50	01
<i>Subject:</i>	COMPUTER PROGRAMMING LAB	0	0	2	30	30			

Course Learning Objectives:

- To learn the Branching and logical expressions and Loops
- To learn the Arrays and Function
- To understand the Numerical methods and Recursion

Course Content:

The laboratory should be preceded or followed by a tutorial to explain the approach or Algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

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

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

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

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Course Outcomes- At the end of the course students will be able to

- Utilization of Branching and logical expressions and Loops, Arrays and Function and Numerical methods and Recursion for writing the programmes for various engineering applications

SEMESTER-II

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	MA202TBS02	L	T	P	CT-I	CT-II	TOTAL	70	100	04
<i>Subject:</i>	MATHEMATICS-II	3	1	-	15	15	30			

Course Content:

Unit 1: First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit 2: Ordinary differential equations of higher orders (Prerequisite 2c, 4a) second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit 3: Partial Differential Equations – First order (Prerequisite 5a-b): First order partial differential equations, solutions of first order linear and non-linear PDEs.

Unit 4: Partial Differential Equations– Higher order (Prerequisite 5b-c) Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems).

Unit 5: D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary- value problems for various linear PDEs in various geometries.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.
7. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
8. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
9. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
10. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010
11. Denian murry,defferential equations ,oxford publications

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	PH202TBS04	L	T	P	CT-I	CT-II	TOTAL	70	100	04
<i>Subject:</i>	PHYSICS	3	1	-	15	15	30			

Course Learning Objectives:

- To know the basic principles, effects and applications such as physical, optical parameters used for engineering applications.
- To learn about various laws and applications of electromagnetic theory.
- To know the basic structure, working principles and applications of lasers and optical fibre communication.
- To know the basics of semiconductor physics, semiconductor materials and devices and its characterization for advance technological applications
- To familiarize the basis of quantum theory and to make students to solve the physical problems for advancement of the technology.

Course Content:

Unit 1: Optics: Interference and Diffraction

Introduction, Young's experiment theory of interference, Coherent and non-coherent sources, Fresnel's Bi- prism and Newton's ring experiment. Diffraction of light, Fresnel and Fraunhofer's diffraction, diffraction due to plane diffraction grating.

Unit 2 Electromagnetic Theory

Coulomb's law electrostatics field and potential, electric flux, Gauss' law, Poisson's and Laplace's equation. Equation of continuity for charge conservation, Ampere's and Faraday's laws, Maxwell's Electromagnetic equations.

Unit 3 Laser and Fiber optics

Introduction, elementary idea of spontaneous and stimulated emission, active medium population inversion, Einstein's coefficients, Types of lasers and important applications of lasers.

Introduction to optical fibers, basic principles of optical fiber, critical angle

numerical aperture, maximum acceptance angle, classification of optical fiber.

Unit 4 Semiconductor physics and Devices

Formation of energy in solids, Energy band gap of metals, insulators and semiconductors, classification of semiconductor: Intrinsic and Extrinsic semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, Electrical conductivity in conductors and semiconductors, working of P-N junction diodes and bipolar junction transistor.

Unit 5 Introduction to Quantum Mechanics

Introduction to Quantum Mechanics, photoelectric effect, Compton effect, wave-particle duality, uncertainty principle, wave function, De-Broglie waves, phase and Group velocity, Davisson and Germer experiment, Schrodinger wave equation, particle in a box (I-Dimensional)

Textbooks/References:

1. Applied physics-I and II By Navneet Gupta, Dhanpat Rai & Co.
2. Engg. Physics by S. K. Srivastava and R.A. Yadav, New Age Pub. New Delhi
3. Engg. Physics by Uma Mukherjee, Narosa Publication.
 4. Engg. Physics by M.N. Avadhanulu, S. Chand Pub.
5. Electricity and Magnetism by Rangwala and Mahajan, Tata McGraw Hill. 1998
6. Concepts of Physics Part-II by H. C. Verma, Bharati Bhawan (P&D), 1998
7. Modern physics by Beiser, McGraw Hill Inc. New York, Publication 1995
8. Modern physics by Mani and Mehta, East-West Press Pvt.Ltd.1998
9. Introduction to Electrodynamics, David Griffith
- 10.J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.(1995).
- 11.B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons. Inc.2007).
- 12.S.M. Sze, Semiconductor Devices: physics and Technology, Wiley (2008)
- 13.Yariv and p.yeh, Photonics Optical Electronics in Modern Communications, Oxford University press, New York (2007)
- 14.P. Bhattacharya, Semiconductor Optoelectronic Devices, prentice Hall of India (1997)
- 15.Online course: "Semiconductor Optoelectronics" by M. R. Shenoy on NPTEL.
- 16.Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak on NPTEL.

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

- Student's ability to understand the basic principles and applications of physical

optics for physical parameters measurements such as length, thickness, aperture size etc.

- Student's will be able to design, characterized the lasers and optical fibers and their effective utilization in optical communications, imaging etc.
- Students demonstrate appropriate competence and working knowledge of laws of electromagnetic theory and semiconductor physics and devices for their advance applications

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	EC202TES04	L	T	P	CT-I	CT-II	TOTAL	70	100	04
<i>Subject:</i>	BASIC ELCETRICAL ENGINEERING	3	1	-	15	15	30			

Course Learning Objectives:

- To impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- To provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
- To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.
- To highlight the importance of transformers in transmission and distribution of electric power.

Couse contents:

Unit 1: DC Circuits

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

Unit 2: AC Circuits

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

Unit 3: Transformer

Magnetic materials, nature of magnetic field of long straight conductor, concepts of solenoid and toroid. Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship. Simple series and parallel magnetic circuits. Comparison between electrical and magnetic circuits. Construction, classification, ideal and practical transformer, equivalent circuit, losses in transformers, tests, voltage regulation and efficiency. Auto-transformers.

Unit 4: Electrical Machines

Construction of DC machine, working, characteristic and speed control of DC motor.

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

Unit 5: Semiconductor Devices

Classification of solids based on energy band theory - Intrinsic semiconductors - Extrinsic semiconductors - P type and N type - P-N junction - V I characteristic of PN junction diode - Zener diode - Zener diode characteristics - Half wave and full wave rectifiers - Voltage regulation, SCR.

Bipolar junction transistor - CB, CE, CC - Configurations and characteristics - Biasing circuits - Field Effect Transistor - Configurations and characteristics - FET amplifier.

Textbooks/References:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
6. Donald A. Neaman, "Semiconductor Physics & Devices", McGraw Hill, 2017.

Course Outcomes:

- To understand and revise concept of electrical circuit and do the analysis.
- Understand and learn to solve single and three phase AC circuits.
- To understand the theory of transformer and analyse its parameters.
- To learn the basic principle and working of DC and AC machines
- To understand the basics of semiconductor devices.

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	IT202TES05	L	T	P	CT-I	CT-II	TOTAL	70	100	02
<i>Subject:</i>	INTRODUCTION TO INFORMATION TECHNOLOGIES	2	-	-	15	15	30			

Course Objective

1. To illustrate the concepts of cyber security and familiar and aware with various cybercrimes attack and their prevention.
2. To describe the different services model of Cloud Computing and understand Understanding of different evaluating computer model of cloud computing.
3. To relate theoretical concepts with problem solving approach in IoT and assess the comparative advantages and disadvantages of Virtualization technology.
4. To provides the basic knowledge of use appropriate storage and access structures. the student must be able to analyse familiar with the machine learning algorithms and applications of various data science.
5. To integrate classroom learning into an everyday communicative activity in distributed system. Familiar with various web services activity.

Unit 1: -Cyber Security Fundamentals Security Concepts: Authentication, Authorization, Non-repudiation, Confidentiality, Integrity, availability. Cyber Crimes and Criminals: Definition of cyber-crime, types of cyber-crimes and types of cyber-criminals.

Unit 2: -Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

Unit 3: -Internet of Things–Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IOT Communication APIs IoT enabled Technologies – Wireless Sensor Networks,

Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Unit 4. Data Science: -Introduction and Importance of Data Science, Statistics, Information Visualisation, Data Mining, Data Structures, and Data Manipulation, Algorithms used in Machine Learning, Data Scientist Roles and Responsibilities. Data Acquisition and Data Science Life Cycle.

Unit 5: -Evaluation and Emergence of Web Services – Evaluation of Distributed Computing, Core Distributed Technologies, Challenges in Distributed System, and Introduction to web services, Web Services Architecture, Basic steps of implementing web services

Textbooks/References:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group
3. Cloud Computing Principles and Paradigm by Rajashekar Buyya, James Broberg, Andhrz M. Wiley 2011.
4. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547.
5. Mining of Massive Datasets, by Leskovec, Rajaraman, and Ullman.
6. R. Nagappan, R.Scokzylas, R.P. Sriganesh, Developing Web Services, Wiley India.

Course Outcome:

1. Ability to learn about cybercrimes and how they are planned.
2. Ability to understand the cloud computing concepts and services model.
3. Ability to understand Internet of Things –Definition and Characteristics of IoT.
4. Explain how data is collected, managed and stored for data science. Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists
5. Understand the details of web services Evolution of Distributed Computing.

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	EN202THS01	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	ENGLISH COMMUNICATION	3	-	-	15	15	30			

Course Learning Objectives

- To build up word power, to brush up the knowledge of English grammar, to develop good writing and speaking skills in the students

Course Content:

Unit 1: - Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

Unit 2: -Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

Unit 3: -Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

Unit 4: -Nature and Style of sensible Writing

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.

Unit 5: -Writing Practices

Comprehension, Précis Writing, Essay Writing.

Oral Communication (This unit involves interactive practice sessions in Language Lab)

Listening Comprehension

Pronunciation, Intonation, Stress and Rhythm

Common Everyday Situations: Conversations and Dialogues

Communication at Workplace

Interviews

Formal Presentations

Textbooks/References:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
4. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcome:

At the end of the course students will be able learn a lot of new words. They also learnt the particularities and peculiarities of English grammar. As a result, they could speak and write English with the least possible error

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	PH202PBS02	L	T	P	IA	TOTAL	20	50	01
<i>Subject:</i>	PHYSICS LAB	0	0	2	30	30			

Course Learning Objectives:

- To learn and perform the various practical related to optical components characterization, semiconductor material and devices characterization and know their applications in advance areas such as communication, industries, defence, navigation etc.

Course Content:

LIST OF PRACTICALS:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.
2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.
3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colours of mercury (white) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of line per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the energy band gap (E_g) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by the Thomson's method.
11. To study the P-N junction diode characteristics, in forward and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in C-B and C-E mode.
14. Determine the Planck's constant.

Course Outcomes: On completion of the course, the students would be able to:

- Know about basic optical facts and phenomenon, characterization of optical components and devices
- To know the basic semiconductor materials and devices and their applications
- To know how the performance of semiconductor devices can be improves.

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	ME202PES03						20	50	03
<i>Subject:</i>	ENGINEERING GRAPHICS	1	0	3	30	30			

Course Learning Objectives:

- To learn the basic of Engineering Drawing and Orthographic Projections
- To learn the Sections and Sectional Views of Right Angular Solids
- To learn the Isometric Projections covering and overview of Computer Graphics

UNIT 1: Introduction Engineering Graphics and Engineering Curves:

Principles of engineering graphics and their significance – drawing instruments and their use – conventions in drawing – lettering – BIS conventions. Dimensioning rules, geometrical construction. Engineering Curves - Conic Sections, Special Curves-Cycloids, Epicycloids, Hypocycloids, Involute and trochoid.

UNIT 2: Projection of Points, Straight lines and Planes: Principles of orthographic projections – conventions – first and third angle projections. Projections of points and lines inclined to both the planes. Projections of regular planes, inclined to both planes

UNIT 3: Projections Solids: Introduction, Type of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

UNIT 4: Section of Solids and Development of Surfaces: Sectioning of regular solids - Section planes perpendicular to one plane and parallel or inclined to other plane - Development of surfaces of right, regular solids – development of prisms, cylinders, pyramids, cones and their parts.

UNIT 5: Isometric Projections and Orthographic Views: Principles of Isometric Projections-Isometric Scale- Isometric Views Conventions-Plane Figures, Simple and Compound Solids. Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric projections, vice-versa. Introduction to perspective projection.

Computer Aided Drafting: Introduction to computer aided drafting package to make 2-D drawings. Demonstration purpose only - not to be included in examinations.

Textbooks/References:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. CAD Software Theory and User Manuals

Course Outcomes:

1. At the end of the course, the student shall be able to
2. Draw engineering curves, orthographic projections of lines, planes and solids.
3. Draw sections of solids including cylinders, cones, prisms and pyramids.
4. Make development of surfaces, Orthographic and Isometric projections
5. Overview of Computer Graphics.

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	ME202PES04						20	50	02
<i>Subject:</i>	WORKSHOP TECHNOLOGY & PRACTICES	1	0	2	30	30			

Course objectives:

- To impart student knowledge on various hand tools for usage in engineering applications.
- Be able to use analytical skills for the production of components.
- Design and model different prototypes using carpentry, sheet metal and welding.
- Make electrical connections for daily applications.
- To make student aware of safety rules in working environments.

Course Content:

Lectures & videos:

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

Textbooks/References:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008. (iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc-Graw Hill House, 2017.

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

- Make half lap joint, Dovetail joint and Mortise & Tenon joint
- Produce Lap joint, Tee joint and Butt joint using Gas welding
- Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
- Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	EC202PES05						20	50	01
<i>Subject:</i>	BASIC ELECTRICAL ENGINEERING LAB	0	0	2	30	30			

Learning Objectives:

1. To understand basic electrical wiring, measurements, and method.
2. To get acquainted with different measuring instruments.
3. To practically provide the concept of different theorems.
4. To make students understand d measurement errors.
5. To have actually hands-on on machines like transformers to get better understanding.

Course Content:

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and Verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
4. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve non-linearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
6. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
7. Study of Diodes and transistors.

Scheme & Syllabus
(2nd Year to 4th Year)

B.Tech.
(Civil Engineering)
III- SEM. to VIII-SEM.

SCHEME OF B.TECH. III SEMESTER CIVIL ENGINEERING (New CBCS)

W.E.F. 2021-22 (ODD SEMESTER)

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1	CE 203TBS05	Engineering Mathematics-III	3	1	0	30	70	100	4
2	CE203TPC01	Strength of Materials	3	1	0	30	70	100	4
3	CE203TPC02	Fluid Mechanics-I	3	0	0	30	70	100	3
4	CE203TPC03	Building Materials & Construction	3	0	0	30	70	100	3
5	CE203TPC04	Surveying & Geomatics	3	0	0	30	70	100	3
6	CE203THS03	Professional Practice, Law & Ethics	2	0	0	30	70	100	2
Practicals									
1	CE203PPC01	Survey Lab	0	0	2	30	20	50	1
2	CE203PPC02	Fluid Mechanics Lab	0	0	2	30	20	50	1
TOTAL						Total Credits			21
L - Lecture Hours, T-Tutorial Hours, P - Practical Hours, CT - Class Test, ESE – End Semester Exam;									

SCHEME OF B.TECH. IV SEMESTER CIVIL ENGINEERING (New CBCS)

W.E.F. 2021-22 (EVEN SEMESTER)

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1	CE204TPC05	Engineering Economics	3	1	0	30	70	100	3
2	CE204TPC06	Concrete Technology	3	1	0	30	70	100	3
3	CE204TPC07	Structural Analysis-I	3	0	0	30	70	100	4
4	CE204TPC08	Fluid Mechanics-II	3	0	0	30	70	100	3
5	CE 204THS02	Effective Technical Communication	3	0	0	30	70	100	3
6	CE204TMC02	Management (Organizational Behaviour)	2	0	0	-	-	-	0
Practicals									
1	CE204PES06	Computer Aided Civil Engg. Drawing	0	0	2	30	20	50	1
2	CE204PPC03	Material Testing Lab	0	0	2	30	20	50	1
3	CE204PHS01	Effective Technical communication lab	0	0	2	30	20	50	1
TOTAL						Total Credits			19
L - Lecture Hours, T-Tutorial Hours, P - Practical Hours, CT - Class Test, ESE – End Semester Exam;									

SCHEME OF B.TECH.V SEMESTER CIVIL ENGINEERING (New CBCS)

W.E.F. 2020-21 (ODD SEMESTER)

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1	CE05TPC08	Design of Concrete Structures	3	1	0	30	70	100	4
2	CE05TPC09	Structural Analysis - II	3	1	0	30	70	100	4
3	CE05TPC10	Highway Engineering	3	0	0	30	70	100	3
4	CE05TPC11	Soil Mechanics - I	3	0	0	30	70	100	3
5	CE05TPC12	Environmental Engineering - I	3	0	0	30	70	100	3
6	CE05THS07*	Management (Organizational Behaviour)	3	0	0	-	-	-	0
Practicals									
1	CE05PPC04	Highway Engineering Lab	0	0	3	30	20	50	1.5
2	CE05PPC05	Soil Mechanics Lab	0	0	3	30	20	50	1.5
TOTAL						Total Credits			20

L - Lecture Hours, T-Tutorial Hours, P - Practical Hours, CT - Class Test, ESE – End Semester Exam; * Mandatory Course

SCHEME OF B.TECH.VI SEMESTER CIVIL ENGINEERING (New CBCS)

W.E.F. 2020-21 (EVEN SEMESTER)

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1	CE06TPC13	Water Resources Engineering -I	3	0	0	30	70	100	3
2	CE06TPC14	Environmental Engineering - II	3	0	0	30	70	100	3
3	CE06TPC15	Design of Steel Structures	3	1	0	30	70	100	4
4	CE06TPC16	Soil Mechanics - II	3	0	0	30	70	100	3
5	CE06TPE01	Professional Elective -1X	3	1	0	30	70	100	4
6	CE06TOE01	Open Elective -1X	3	0	0	30	70	100	3
		Internship/Industrial Training*							
Practicals									
1	CE06PPC06	Environmental Engineering Lab	0	0	3	30	20	50	1.5
2	CE06PPC07	Computer Applications in Civil Engg. Lab	0	0	3	30	20	50	1.5
TOTAL						Total Credits			23

L - Lecture Hours, T-Tutorial Hours, P - Practical Hours, CT - Class Test, ESE – End Semester Exam; * Students have to undergo internship/industrial training for a period of 04 weeks during the summer vacation and shall submit a report signed by the concerned organization to the Department in the 7th Semester.

SCHEME OF B.TECH.VII SEMESTER CIVIL ENGINEERING (New CBCS)

W.E.F. 2021-22 (ODD SEMESTER)

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1	CE07TPC17	Water Resources Engineering-II	3	0	0	30	70	100	3
2	CE07TPE02	Professional Elective -02X	3	0	0	30	70	100	3
3	CE07TPE03	Professional Elective -03X	3	0	0	30	70	100	3
4	CE07TPE04	Professional Elective -04X	3	0	0	30	70	100	3
5	CE07TPE05	Professional Elective -05X	3	0	0	30	70	100	3
6	CE07TOE02	Open Elective -02X	3	0	0	30	70	100	3
Practicals									
1	CE07PPC08	Seminar*	-	-	3	50	-	50	1.5
2	CE07PPC09	Minor project	0	0	6	60	40	100	3
3	CE07PPC10	Estimation and Costing	0	0	3	30	20	50	1.5
TOTAL						Total Credits			24
L - Lecture Hours, T-Tutorial Hours, P - Practical Hours, CT - Class Test, ESE – End Semester Exam; * Seminar on Industrial Training/Internship undergone during summer vacation of 6th Semester									

SCHEME OF B.TECH.VIII SEMESTER CIVIL ENGINEERING (New CBCS)

W.E.F. 2021-22 (EVEN SEMESTER)

S.No.	Course No.	Subject Theory	Periods			Evaluation Scheme			Credits
			L	T	P	IA*	ESE	Total	
1	CE08TPC18	Earthquake Resistant Design of structure	3	0	0	30	70	100	3
2	CE08TPE06	Professional Elective -06X	3	0	0	30	70	100	3
3	CE08TPE07	Professional Elective -07X	3	0	0	30	70	100	3
4	CE08TOE03	Open Elective -03X	3	0	0	30	70	100	3
Practicals									
1	CE08PPC11	Major Project	0	0	14	120	80	200	7
2	CE08PPC12	Structural Detailing Lab	0	0	3	30	20	50	1.5
TOTAL						Total Credits			20.5
L - Lecture Hours, T-Tutorial Hours, P - Practical Hours, CT - Class Test, ESE – End Semester Exam									

SEMESTER III

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE203TBS05	L	T	P	CT-I	CT-II	TOTAL	70	100	04
Subject:	Engineering Mathematics-III	3	1	-	15	15	30			

Course Objectives:

The students will be able to use of the concepts of correlation, Regression and various types of distributions. To provide students with the skills, knowledge and attitudes required to determine approximate numerical solutions to mathematical problems which cannot always be solved by conventional analytical techniques, and to demonstrate the importance of selecting the right numerical technique for a particular application, and carefully analysing and interpreting the results obtained.

Course Content:

UNIT-1 Correlation & Regression: Scatter diagram, Linear Correlation, Measures of Correlation. Karl Pearson's Coefficient of correlation, Limits for correlation coefficients, Coefficient of correlation for vicariate frequency distribution, Rank correlation, Linear Regression, Equations to the line of Regression. Regression coefficient. Angle between two lines of Regression.

UNIT-2 Theoretical Distributions: Discrete and Continuous probability distribution's Mathematical expectation, Mean and Variance, Moments, Moments generating function, probability distribution, Binomial, Poisson and Normal distribution, Test of significance based on chi-square, T,F, and Z distribution, degree of freedom, conditions for applying χ^2 (chi-square) test, student's test.

UNIT-3 Introduction of Errors and their Analysis, types of errors, numerical problems on error analysis, curve fitting: method of least squares; Numerical Solution of Algebraic and Transcendental Equations: Graphical method bisection Method, Secant Method, Regula-falsi Method, Newton Raphson Method.

UNIT- 4 The Calculus of Finite Differences: Finite differences, Difference formula, operators and relation between operators. Inverse Operator, Interpolation with equal intervals: - Newton's forward and backward interpolation formula.

Interpolation with Unequal intervals: - Lagrange's interpolation Newton's difference formula, inverse interpolation.

UNIT- 5 Numerical Differentiation and Integration: - Numerical Differentiation Newton's forward and Backward difference interpolation formula. Maxima and Minima of a Tabulated function, Numerical Integration :-Trapezoidal rule, Simpson's (1/3)rd and (3/8)th rule, Boole's rule, Weddle rule.

Text Books:

- 1) Prasad C "Advanced Engineering mathematics",
- 3) Dass H.K. "Advanced Engineering mathematics",
- 4) Ray M. "Mathematics statistics",
- 5) Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.,
- 6) Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons,
- 7) Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.,
- 8) Applied Mathematics by P.N. Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Griha Prakashan, Pune.,
- 9) JAIN & IYNGAR Numerical Methods for Scientific and Engineering Computations.
- 10) RAO G.S. Numerical Analysis.
- 11) Grewal B S Numerical Methods In Engineering and Science.
- 12) Rajaraman V Computer Oriented Numerical Methods
- 13) P. Kandasamy K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company,
2nd Edition, Reprint 2012.
- 14) S. S. Sastry, Introduction methods of Numerical Analysis, PHI, 4th Edition, 2005.

Course Outcomes-

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

- Understand the statistical concept of correlation regression and distribution, theory with special reforms to engineering problems.
- Analyse the errors obtained in the numerical solution of problems.
- Using appropriate numerical methods, determine the solutions to given non-linear equations.
- Using appropriate numerical methods, determine approximate solutions to systems of linear equations.
- Using appropriate numerical methods, determine approximate solutions to ordinary differential equations.

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE203TPC01							70	100	04
Subject:	Strength of Materials	3	1	-	15	15	30			

Course Objectives:

The objective of this Course is to:

- To develop understanding of mechanical properties to compute response in the material (Stress and Strain) using analytical and graphical method. To apply the fundamentals of simple stresses and strains.
- To analysis the structural element (Beam) for different loading condition to obtain design parameters (BM, SF, Slope and Deflection)
- To determine and study stress variation in beams using conceptual theories.
- To learn engineering principles for understanding the behavior of compression member.
- To study theory of torsion in solid and hollow shaft and stresses developed in cylindrical shells.

Course Content:

UNIT-1: Simple Stresses -Strain and compound stresses: Types of stresses and strains, Mechanicals properties, Hooke's law, stress– strain curve for mild & Cast iron, hardness, impact strength, Poisson's ratio, Relation between the elastic moduli & Poisson's ratio, Bars subjected to varying loads, Temperature stresses in composite bars, Elongation of bars of constant and varying sections. Stress at a point. Components of stress in rectangular coordinates, stresses on an inclined plane, Principal stresses & principle plane, Mohr's circle of stresses.

UNIT-2: Shear Force - Bending Moment: Shear Force & Bending Moment diagrams in statically determinate beams loaded with different load combination, Relationship between Load intensity- Shear Force - Bending Moment, Thrust diagram, Point of contra flexure, loading diagram & Bending moment diagram from shear force diagram, beam with internal hinge. Bending Stress

UNIT-3: Shear Stresses in Beams Derivation of Shear Stress formula,

assumptions, and Shear stresses in symmetrical elastic beam with different sections.

Slope and Deflections of simple Beams: Derivation of differential equation for deflection, Slope & Deflection of Beams by Double integration method, Macaulay's method & Moment area method.

UNIT -4: Torsion: Equation of Pure Torsion, Assumptions, and Power transmitted, Stiffness of Shafts, Comparison of Solid & Hollow shaft, Strain energy in Torsion.

Columns: Stable and unstable equilibrium, Short columns, Euler's formula for long columns, Equivalent length, Limitation of Euler's formula, Rankine's formula.

UNIT -5: Thin-walled pressure vessels: Cylindrical pressure vessels, Spherical vessels. Thick Cylindrical vessels: Lamé's theory, Graphical method for determining stresses Spherical shells.

Text Books:

- 1.Strength of Materials – R.K. Rajput (S. Chand & Co.)
- 2.Strength of Materials – R.K. Bansal (Laxmi Publication)
- 3.Strength of Materials – S.S Ratnam (Tata McGraw Hill)
- 4.Strength of Materials – Timoshenko, S. & Gere (CBS Publishers)
- 5.Introductions to Solid Mechanics –Shames &Pitarresi (Prentice Hall of India)
- 6.Strength of Materials–S. Ramamurtham (DhanpatRai Publications)

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

- Describe mechanical properties of material (stress & strain) in two dimensional systems by analytical and graphical method.
- Analyze structural member (beams) to evaluate behavioural response (BM, SF, Slope, Deflection) for various loading condition.
- Estimate torsional stress in solid and hollow shaft. Analyse various situations involving structural members subjected to bending, shear and torsion.
- Characterize and analyze the types of column on the basis of engineering theories.
- Evaluate stresses variation in thin and thick cylindrical shells.

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE203TPC02							70	100	03
Subject:	Fluid Mechanics- I	3	-	-	15	15	30			

Course Objectives:

- To introduce and give explanation of fundamentals of Fluid Mechanics and give fundamental knowledge of fluid with its properties, behaviour, forces on various surfaces and stability of submerged and floating body.
- To develop understanding about Kinematics of fluid flow.
- To imbibe basic law of energy and equation used for analysis of dynamic fluids.
- To introduce the importance of fluid Flow in Pipes and determine the losses in a flow system.
- To develop understanding about flow through mouthpieces and orifices.

Course Content:

UNIT-1: Introduction: Fluid, physical properties of fluids ideal and real fluid, Newtonian and Non-Newtonian Fluid Statics: Pressure density height relationship, pressure measurement by Manometers, Pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, metacentric height.

UNIT-2: Kinematics of fluid flow : Steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow, one, two and three dimensional flow, streamlines and path lines, rotational and irrotational flow, continuity equation, three dimensional continuity equation. Velocity potential and stream function.

UNIT-3: Dynamics of fluid flow: Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Venturimeter, orificemeter, and problems related to application of momentum equations.

UNIT-4: Flow in Pipes: Major and minor losses in pipe lines, loss due to sudden contraction & expansion, Pipes in series and parallel Flow in open Channel: Comparison between open channel and pipe flow, definition of

uniform and non-uniform flow, Chezy's and Manning's Formula, Hydraulically efficient channel section of rectangular, trapezoidal.

UNIT -5: Flow through mouthpieces and orifices: Hydraulic coefficients of orifice, flow through large rectangular orifice, mouthpieces, Borda's mouthpieces. Notches and Weirs: Rectangular, triangular and trapezoidal notches and weir, cippoletti and broad crested weir.

Name of Text Books:

- 1.Fluid Mechanics and Machines – Dr. A.K. Jain (Khanna Publications)
- 2.Fluid Mechanics and Machines – Dr. R.K. Bansal (Laxmi Publications)
- 3.Fluid Mechanics & Hydraulic Machines – Dr.P.N.Modi&S.M.Seth,(Narosa Publishing House)

Name of Reference Books:

- 1.Mechanics of Fluid – Irving H. Shames (McGraw Hill)
- 2.Introduction to Fluid Mechanics – James A. Fay (Prentice Hall India)
- 3.Fluid Mechanics – R.J. Garde (New Age International Publication)
- 4.Fluid Mechanics – Streeter V.L. & Wylie E.B. (Tata McGraw Hills)
- 5.Fluid Mechanics – John F Douglas (Pearson Publication)
6. Introduction to Fluid Mechanics Fox, R.W. and McDonald, A.T., John Wiley & Sons.
- 7.Fluid Mechanics”, Streeter, V.L. and Benjamin, W.E., “McGraw-Hill.
- 8.Fluid Mechanics and Fluid Mechanics Som, S.K. and Biswas, G., Tata McGraw Hill.
- 9.Introduction to Fluid Mechanics, Fox, R. W. and A. T. McDonald, 6th ed., John Wiley, New York, (2004)

Course Outcomes- At the end of the course students will be able to

- Define fluid properties and state the Newton's law of viscosity with explain the mechanics of fluid at rest
- Describe the Kinematics of fluid flow.
- Employ Bernoulli's equation for ideal and real fluid flow and deduce expressions for Venturimeter, orifice meter and pitot tube.
- Explain the concept of Flow in Pipes and types of losses in pipe flow.
- Describe Flow through mouthpieces & orifices and distinguish it.

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE203TPC03							70	100	03
Subject:	Building Materials & Construction	3	-	-	15	15	30			

Course Objectives:

- To introduce the basic engineering properties of building materials like brick, stones, timber, ceramics, plastics, etc.
- To understand the elementary characteristics of construction materials like cement aggregates, concrete, steel, etc.
- To understand the types of foundations, functions, types of masonry, lintels, etc.
- To learn the structure supporting method like Shoring, Underpinning, and other advanced construction materials & Techniques.

Course Content:

UNIT- 1: Stones, Bricks, Tiles, Timber; Properties, Classification & Uses

UNIT-2: Miscellaneous Engineering Materials; Ceramics & glass; Plastics & Rubber; Paints, Varnishes and distempers; Composite materials; Adhesives; Thermal, Electrical & Sound Insulators.

UNIT 3: Cement, Aggregate, Concrete and Steel; classification, properties & uses.

UNIT-4: Foundations, Masonry, Arches & Lintels; Classification, Requirements & Uses.

UNIT-5: Shoring, Underpinning, Formwork, Advanced construction materials & Techniques.

The relevant IS Codes for all the materials and NBC.

Name of Text Books:

1. Building Materials – S.K. Duggal (New Age Publication)
2. Building Materials – S. C. Rangwala (Charotar Publication)
3. Building Construction by S.G. Rangwala, Charter Publishing House, Anand, India.
4. Building Construction by Sushil Kumar, Standard Publ. and Distributors, New Delhi
5. Building Construction by Punmia B.C., Lakshmi Publications, New Delhi.
6. Advanced Building Materials and Construction by Mohan Rai and Jai Sing, CBRI Publications, Roorkee

7. Concrete Technology – A.M. Neville & J.J. Brooks (Pearson Education)
8. Concrete Technology – M.S. Shetty (S. Chand & Co.)
9. Engineering Materials – Surendra Singh (Laxmi Publication)
10. Construction Engineering and Management – S. Seetharaman (UmeshPublication)
11. Building Materials – Gurucharan Singh (Standard Publishers, Delhi)

Course Outcomes- At the end of the course students will be able

- To compare the properties of most common and advanced building materials.
- To understand the typical and potential applications of these materials
- To select the appropriate building material for building construction
- To identify the different components of a building and differentiate various types of foundations, masonry, arches and lintels
- To select the appropriate supporting structure for strengthening of the building

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE203TPC04							70	100	03
Subject:	Surveying & Geomatics	3	-	-	15	15	30			

Course Objectives:

- To understand the Concepts of levelling & its application on the field.
- To learn about the concepts of theodolites, tacheometry & triangulation.
- To understand subsidiary surveying like photographic & hydrographic surveying.
- To learn to apply advanced application of surveying like Remote sensing, EDM.

Course Content:

Unit 1: Levelling & Contouring: Temporary and permanent adjustment of levels. Sensitivity of bubble tube, Levelling staff, Types of levelling: - Reciprocal, Profile, Differential, Plotting of profiles Correction: - curvature and refraction.

CONTOURING; Introduction to contouring, Contouring: definitions, contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring.

Unit 2: Theodolite and Tacheometry: Vernier theodolites, Temporary and permanent adjustments, Requirements of nonadjustable parts, Measurement of horizontal angle by repetition and reiteration method, Measurement of vertical angles.

TACHEOMETRY: Definitions, Principles of stadia systems. Instrument constants, Substance and Tangential Systems. Construction and use of Reduction Tacheometers.

CONTOURING; Introduction to contouring.

Unit 3: Triangulation: Principle and classification of Triangulation System, Strength of Figures, Station marks and Signals, Satellite station, intersected and Resected points.

Plane Table Surveying: Principles, Advantages and disadvantages, Plane table equipment, Use of Telescopic Alidade, Different methods of Plane Table Surveying. Area and volume measurements

Unit 4: Photographic & Hydrographic Surveying: Photo theodolite, principle of the method of terrestrial photogrammetry, scale and distortion of the vertical and tilted photograph.

HYDROGRAPHIC SURVEYING: Introduction, shore line survey, soundings methods

Unit 5: (A) Principle of Electronic Distance Measurement: Principle, Type, Use, Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications.

(B) Remote Sensing: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors, Introduction to GPS

Text/Reference Books:

1. B.C Punamia, A.K Jain, Surveying Vol. 1 & 2, Laxmi Publications.
2. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

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

- Remember concepts, techniques, basics, and instruments of the discipline to engineering and surveying activities
- Understand various methods and Application of levelling
- Understand the working principles of various surveying instruments
- Apply the knowledge of Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE203THS03							70	100	02
Subject:	Professional Practice, Law & Ethics	2	-	-	15	15	30			

Course Objectives:

- To know about roles of various stakeholders in formulating standards of practice and to learn about ethical values in professionalism.
- To study general principles of contracts management and practice involving tender proposal.
- To understand ADR mechanism like arbitration, conciliation, Lok Adalat in judicial system.
- To learn legal aspect of labour engagement and other construction related law in civil engineering.
- To understand law and policy related to Intellectual property, Copyright, Trademarks, Patents and Piracy

Course Content

UNIT 1:Professional Practice – Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards).Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

UNIT 2:General Principles of Contracts Management: Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their

features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /“Red Flag” conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Term.

UNIT 3: Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

UNIT 4: Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piecerate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen’s Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

UNIT 5: Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation

treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies.

Text Book/ References:

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. The National Building Code, BIS, 2017
3. RERA Act, 2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R. (1979), Law of Contract, Oxford University Press
9. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
10. Wadhwa (2004), Intellectual Property Rights, Universal Law Publishing Co.
11. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
12. Bare text (2005), Right to Information Act
13. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
14. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
15. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
16. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss2, pp 117-127, MCB UP Ltd
17. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
18. Ethics in Engineering- M.W.Martin&R.Schinzinger, McGraw-Hill
19. Engineering Ethics, National Institute for Engineering Ethics, USA
20. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
22. CONSTRUCTION CONTRACTS,
<http://www.jnormanstark.com/contract.htm>
23. Internet and Business Handbook, Chap 4, CONTRACTS LAW,
<http://www.laderapress.com/laderapress/contractslaw1.html>
24. Contract&Agreements
<http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm>
25. Contracts, <http://206.127.69.152/jgretch/crj/211/ch7.ppt>
26. Business & Personal Law. Chapter 7. “How Contracts Arise”,
<http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt>

27. Types of Contracts,
<http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt>
28. IV. TYPES OF CONTRACTS AND IMPORTANT PROVISIONS,
<http://www.worldbank.org/html/opr/consult/guidetxt/types.html>
29. Contract Types/Pricing Arrangements Guideline- 1.4.G (11/04/02),
<http://www.sandia.gov/policy/14g.pdf>

Course Outcomes:

At the end of the course student will be able to

- To describe respective roles of regulatory bodies and ethical practice to be followed by engineering professionals.
- To define principle of tender filing and contract management.
- To distinguish between ADR mechanism and formal judicial proceedings for dispute resolution.
- To explain role of labour and other construction-related laws in civil engineering.
- To identify law and policy related to Intellectual property, Copyright, Trademarks, Patents and Piracy.

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
Subject Code:	CE203PPC01						20	50	01
Subject:	Survey Lab	0	0	2	30	30			

Course Objectives:

The Lab sessions would help in learning:

- Applications of chains & compass in surveying.
- Various Applications of levelling process.
- Use of Plane table surveying in preparing of maps of a location
- Tacheometry & its applications.
- Relative adjustment of non- accessible stations
- Principle & operation of Total Station.

Course Content:

List of experiments:

1. Linear measurement, offsetting & Determination of the area of the given field by cross staff survey & metric chain.
2. Compass open & closed traversing using prismatic compass and elimination of local attraction.
3. To find the difference in elevation between the two non-invisible stations by the method of differential levelling.
4. To draw longitudinal & cross-sectional profile of the road by the method of profile levelling.
5. Measurement of horizontal angle by repetition & reiteration method.
6. Traversing of the given area by radiation & intersection method using plane table survey.
7. Find the plane table instrument station using Resection method (Two-point problem & three-point problem)
7. Determination of Tacheometric constants (K & C).
8. Determination of elevation and height by tangential method when both angles are angles of elevation.
9. Determination of elevation and distance when line of sight inclined Upward & Downward
10. To perform the experiment for reduction to center from different positions of a satellite station when: (i) Satellite station in north position, (ii) Satellite station in left position
11. To perform the experiment for reduction to centre from different positions of a satellite station when: (i) Satellite station in south position, (ii) Satellite station in right position

12. Study of total station

Text Book:

1. Surveying and Leveling. N.N.Basak, 1st Edition, Tata McGraw Hill
2. Surveying (Vol. I & II) – Punmia, B.C. (Laxmi Publications, New Delhi, 1996)
3. Surveying (Vol. I & II) – Kanetkar (Pune VidyarthiGrihaPrakashan, Pune)

Reference Books:

1. Surveying (Vol. II & III) – Agor, R (Khanna publications, Delhi, 1995)
2. Surveying (Vol. II & III) – Arora, K.R. (Standard Book House, Delhi, 1993)
3. Surveying (Vol. I & II) – S.K. Duggal (Tata McGraw Hill)

Course Outcomes- On completion of the course, the students will be able to:

- Remember about conventional surveying tools such as chain/tape, compass, plane table, level in the field of civil engineering applications such as structural plotting and highway profiling.
- Understand & apply the procedures involved in field work and to work as a surveying team.
- Design a Plan of survey appropriately with the skill to understand the surroundings.
- Apply concepts of accurate measurements techniques, field booking, plotting and adjustment of errors.

SYLLABUS	(SEMESTER-III)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
Subject Code:	CE203PPC02	L	T	P	IA	TOTAL	20	50	01
Subject:	Fluid Mechanics Lab	0	0	2	30	30			

Course Learning Objectives:

- To understand the verification of bernoulli's equation.
- Determination of Meta centric height of ship model
- Calibration of flow measuring devices as Venturimeter
- Calibration of flow measuring devices as Orificemeter.
- Demonstrate and find out co-efficient of velocity for orifice and Mouthpiece.
- Demonstrate and find out co-efficient of discharge for various types notches.
- Determination of friction factor for pipes
- Determination of critical velocity in pipe
- Determination of the co-efficient of pitot tube.
- Determination of coefficient of impact for vanes
- To plot velocity profile across the cross section of pipe
- Determine the Reynold's Number in pipe.
- To learn the Calibration of rectangular sharp cornered weir and to study the pressure distribution on the upstream face of the weir.
- To learn the Calibration of rectangular streamlined weir and to study the pressure distribution on the upstream face of the weir.

Course Content:

List of experiments:

1. To calculate the total energy at different points and plot the graph between total energy vs. distance.
(Verification of Bernoulli's equation)
2. To determine the Meta centric height with angle of ship model.
3. To determine the co-efficient of Discharge Cd for Venturimeter
4. To determine the co-efficient of Discharge Cd for Orificemeter.
5. To determine the co-efficient of discharge and the co-efficient of velocity for Orifice.
6. To determine the co-efficient of discharge and the co-efficient of velocity for Mouthpiece.
7. To determine the coefficient of discharge Cd of Rectangular Notch.

8. To determine the coefficient of discharge Cd V Notch - 45°
9. To determine the coefficient of discharge Cd V Notch - 60°
10. To determine the friction factor for Darcy-Weisbach equation
11. Experimental determination of critical velocity in pipe.
12. To determine the coefficient of impact for vanes
13. To find the co-efficient of pitot tube
14. To plot velocity profile across the cross section of pipe
15. To determine the Reynold's Number in pipe
16. Calibration of rectangular sharp cornered weir and to study the pressure distribution on the upstream face of the weir.
17. Calibration of rectangular streamlined weir and to study the pressure distribution on the upstream face of the weir.

Course Outcomes-At the end of the course students will be able to

- Verification of basic principles energy (Bernoulli's equation).
- Utilization of basic measurement techniques of fluid flow in Venturimeter.
- Utilization of basic measurement techniques of fluid flow in Orificemete.
- Gaining knowledge to calculate co-efficient of velocity for orifice and Mouthpiece
- Gaining knowledge to calculate co-efficient of discharge for various types notches
- Experimental determination of critical velocity in pipe.
- Understanding of analyzing pipe flow systems and its losses.
- The ability to determine the coefficient of impact for vanes.
- The ability to determine co-efficient of discharge for pitot tube
- To plot velocity profile across the cross section of pipe
- The ability to determine the Reynold's Number in pipe
- The ability to Calibration of rectangular sharp cornered weir and to study the pressure distribution on the upstream face of the weir.
- The ability to Calibration of rectangular streamlined weir and to study the pressure distribution on the upstream face of the weir.

SEMESTER-IV

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE204TPC05	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	ENGINEERING ECONOMICS	3	-	-	15	15	30			

Course Objectives:

1. To learn about the basics of economics and elements of cost in engineering
2. To study about the value engineering and interest formulae
3. To understand various alternative methods of cost comparison analysis
4. To know about replacement and maintenance involved in engineering components.
5. To understand depreciation of a product.

Course Content:

UNIT 1: Introduction to Economics

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT 2: Value Engineering

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT 3: Cash Flow

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method

(Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT 4: Replacement and Maintenance Analysis

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT 5: Depreciation

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TEXT BOOKS:

1. Panneer Selvam, R, —Engineering Economics|, Prentice Hall of India Ltd, New Delhi, 2001.
2. Suma Damodaran, — Managerial economics|, Oxford university press 2006.
3. Chan S.Park, —Contemporary Engineering Economics|, Prentice Hall of India, 2002.

Course Outcome: At the end of the course students shall be able to:

1. Explain the basics of engineering economics and elements of costs.
2. Describe value engineering and can make use of various interest formulae for real life computations
3. Observe and identify the best alternative for cost comparison
4. Determine between replacement and maintenance needed by an asset.
5. Compute the depreciation cost and determine the economic life of a product.

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE204TPC06							70	100	03
Subject:	Concrete Technology	3	-	-	15	15	30			

Course Objectives:

- To learn about various ingredients materials of concrete, like cement aggregates, water, etc
- To understand the role of various Admixtures added to concrete mixes
- To design various grades of concrete as per IS method.
- To understand the various testing methods for fresh & hardened properties of concrete.
- To learn about various special application concretes.

Course Content:

Unit 1: Constituent Material

Cement-Types-Chemical composition and Properties -Tests on cement-IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS grading requirements- Water- Quality of water for use in concrete.

Unit 2: Chemical and Mineral Admixtures

Accelerators-Retarders- Plasticisers- Super plasticizers- Water proofers – Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaolin -Their effects on concrete properties

Unit 3: Proportioning of Concrete Mix

Principles of Mix Proportioning-Properties of concrete related to Mix Design Physical properties of materials required for Mix Design – Design Mix and Nominal Mix-BIS Method of Mix Design – Mix Design Examples

Unit 4: Fresh and Hardened Properties of Concrete:

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS – Properties of Hardened Concrete-Determination of Compressive and Flexural Strength-Stress-strain curve for concrete Determination of Young's Modulus.

Unit 5: Special Concretes:

Light weight concretes – High strength concrete – Fibre reinforced concrete – Ferrocement – Ready mix concrete – Slurry infiltrated fibrous concrete

(IFCON) - Shotcrete – Polymer concrete – High performance concrete-Geopolymer Concrete.

Text Books:

1. Gupta.B.L., Amit Gupta, “Concrete Technology”, Jain Book Agency, 2010.
2. Shetty,M.S, “Concrete Technology”, S.Chand and Company Ltd, New Delhi, 2003
3. Santhakumar,A.R; “Concrete Technology” , Oxford University Press, New Delhi, 2007
4. Neville, A.M; “Properties of Concrete”, Pitman Publishing Limited, London,1995
5. Gambir, M.L; “Concrete Technology”, 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
6. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.

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

1. Remember & understand properties and role of ingredients like cement, aggregate, admixtures etc. to produce better quality concrete.
2. Understand various classification & role of admixtures on properties of concrete.
3. Apply design concepts (as per IS method) to design various grades of concrete as per requirement.
4. Demonstrate destructive, semi-destructive and non-destructive tests for concrete.
5. Understand about various special application concretes.

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE204TPC07							70	100	04
Subject:	Structural Analysis-I	3	1	-	15	15	30			

Course Objectives:

- To study the strain energy principles and their application to beams and pin joint plane frames
- To learn about analysis of arches & cables.
- To know how to construct the influence line diagrams for determinate beams and its application to estimate the maximum shear force, bending moment at a section and absolute maximum bending moment in the beams.
- To study the construction of influence lines for determinate trusses and three hinged arches and its applications.
- To learn about the static indeterminacy of structures and methods of analysis, application of three moment theorem to beams

Course Content:

UNIT 1: Principle of superposition, virtual work principle, Maxwell reciprocal theorem, deflection of beams using conjugate beam method. Deflection of beams and truss using energy method (Castigliano theorem), Analysis of plane truss using tension coefficient method (determinate).

UNIT 2: Three-hinged Arches: Bending Moment, Shear force, axial force for three-hinged arches, Analysis of Suspension Bridge without stiffening girders.

UNIT 3: Influence Lines: Basic concept of moving load and influence line; influence lines for reactions, Shear force and bending moment for determinate beams; absolute maximum shearing force and bending moment.

UNIT 4: Influence lines for three-hinged arches and stresses in simply supported plane determinate trusses.

UNIT 5: Static and kinematic indeterminacy of structure, Method of structural analysis, Analysis of fixed beam, continuous beam using Theorem of three moments, Effect of yielding of supports.

Reference Book:

1. Structural Analysis by Devdas Meenon
2. Fundamental of Structural Analysis by Lee.

3. Elementary structural Analysis by A.K. Jain
4. Advanced Structural Analysis by A. K. Jain
5. Structural Analysis (SI units) by R C Hibbeler
6. Structural Analysis by L S Nagi & R S Jangid

Course Outcomes:

At the end of the course the students will be able

- To apply the concept of conjugate beam and strain energy methods to estimate the deflections of determinate beams and trusses
- To be able to analyze three hinged arches and cables.
- To construct and use the influence lines for estimation of different force functions in determinate beams
- To be able to draw the ILDs for reactions and internal forces in three hinged arches and determinate trusses and find their values
- To differentiate the determinate and indeterminate structures and apply the three-moment area theorem for the analysis of continuous beams and fixed beams

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE204TPC08							70	100	03
Subject:	Fluid Mechanics-II	3	-	-	15	15	30			

Course Objectives:

- To introduce and give explanation of fundamentals of turbulent flow in pipe.
- To develop understanding about Boundary layer Analysis.
- To develop understanding about non-uniform flow in open channel.
- To introduce the importance of Compressibility effect in pipe flow.
- To develop understanding about Hydraulic Machines.

Course Content:

UNIT 1: Turbulent flow in pipe: Nature of turbulence, free and wall turbulence, turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, Colebrook-White equation, Moody's diagram, Explicit equation for friction factors.

UNIT 2: Boundary layer Analysis: Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, and laminar sub layer, Application of momentum equation, local and average friction coefficient. Fluid flow past submerged bodies. Drag and lift, drag on sphere and cylinder Magnus effect.

UNIT 3: Non-uniform flow in open channel: Specific energy, critical flow, analysis of flow over hump and transition, equation of gradually varied flow, hydraulic jump and evaluation of its elements in rectangular channel.

UNIT 4: Compressibility effect in pipe flow: Transmission of pressure waves in rigid and elastic pipes, water hammer Dimensional analysis and Hydraulic similitude. Dimensional analysis, Buckingham's theorem, important dimensionless numbers and their significances, geometric, kinematics and dynamic similarity, model study.

UNIT 5: Hydraulic Machines: Turbines: Classification of turbines, draft tube, specific speed, unit quantities, and characteristics curves of turbines, and governing of turbine. Pump: Introduction, Centrifugal pumps, efficiencies, specific speed, cavitations, slip, percentage slip.

Name of Text Books:

- 1.Fluid Mechanics and Machines – Dr. A.K. Jain (Khanna Publications)
- 2.Fluid Mechanics and Machines – Dr. R.K. Bansal (Laxmi Publications)
- 3.Fluid Mechanics – Dr. P.N. Modi (Standard Book House)
- 4.Mechanics of Fluid – Irving H. Shames (McGraw Hill)
- 5.Introduction to Fluid Mechanics – James A. Fay (Prentice Hall India)

Name of Reference Books:

- 1.Fluid Machines – Dr.Jagdish Lal (Metropolitan Book Company Private Ltd.)
- 2.Fluid Machines – John P. Douglas (Pearson Publication)

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

- Define Turbulent flow in pipe and velocity equations for smooth and rough boundary of pipe.
- Describe the Boundary layer theory and drag and lift.
- Explain the concept of non-uniform flow in open channel.
- Explain the concept of Compressibility effect in pipe flow
- Describe the concept of Hydraulic Machines.

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE204THS02							70	100	03
Subject:	Effective Technical Communication	3	-	-	15	15	30			

Course Objectives:

Effective Technical communication is critical in today's world. Most problems in an organization arise as a result of poor communication. Effective communication ensures a smooth flow of ideas, facts, decisions, and advice. This way, employees eliminate hindrances in achieving the organization's target.

Course Content:

Unit-1 Fundamentals of Communication Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; the flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-2 Constituents of Technical Written Communication Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-3 Business Communication Principles, Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance. Negotiation & Business Presentation skills.

Unit-4 Presentation Strategies and Listening Skills. Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-5 Value-Based Text Readings Following essays form the suggested text book with emphasis on Mechanics of writing. (i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior (ii) The Language of Literature and Science by A. Huxley (iii) Man and Nature by J.Bronowski (iv) The Social Function of Literature by Ian Watt (v) Science and Survival by Barry Commoner (vi) The Mother of the Sciences by A.J.Bahm (vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book :

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji-Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha,

Course Outcomes:

- At the end of the semester, employability skills of the students will develop.
- Students will improve their Vocabulary and their Accent.

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE204TMC02							-	-	-
<i>Subject:</i>	Management (Organizational Behaviour)	3	-	-	-	-	-			

Course Learning Objectives:

The objective of this Course is

- To improve students understanding of human behavior in organization and the ability to lead people to achieve more effectively toward increased organizational performance.
- To understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories.
- To understand group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations.
- To understand the organizational system, including organizational structures, culture, human resources, and change.

Course Content:

UNIT 1: FOCUS AND PURPOSE: Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

UNIT 2: INDIVIDUAL BEHAVIOUR: Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification. Misbehaviour – Types – Management Intervention. Emotions- Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Effects on work behavior.

UNIT 3: GROUP BEHAVIOUR: Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of

informal leaders and working norms – Group decision making techniques Team building - Interpersonal relations – Communication – Control.

UNIT 4: LEADERSHIP AND POWER: Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT 5: DYNAMICS OF ORGANIZATIONAL BEHAVIOUR: Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives –. Organizational effectiveness

TEXT BOOKS

1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.

Course Outcomes:

At the end of the course the students shall be able

- To Compare and contrast theories of organizational behavior.
- To analyze management issues as related to organizational behavior.
- To evaluate ethical issues as related to organizational behaviour
- To examine challenges of effective organizational communication
- To examine the differences and similarities between leadership, power, and management.
- To assess the impact of culture on organizational behavior

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
Subject Code:	CE204PES06						20	50	01
Subject:	Computer Aided Civil Engineering Drawing	0	0	2	30	30			

Course objectives:

1. To introduce the fundamentals of Civil Engineering drawing.
2. To practice the understanding of the principles of planning.
3. To develop capability to understand and learn drafting of building drawings.
4. To impart knowledge on drafting software such as AutoCAD

Course Content:

List of Experiments: (at least 10 sheets / plates are mandatory)

1. Drawing of symbols used in building drawings.
2. Drawing of Wooden and Steel, doors, windows and ventilators (Panelled/Glazed).
3. Drawing of different masonry bonds and masonry walls
4. Drawing of different Foundation
5. Drawing of different stair cases (RC/Steel).
6. Drawing of Industrial buildings with trusses
7. Drawing of Plan, elevation and section of Residential Buildings with tiled/flat roof.
8. Drawing of Preparation of site plan and service plans as per building rules for single and two storied buildings.
9. Drawing of Plan, elevation and section of public building like school, college etc.
10. Drawing of septic tanks and soak pit.

Text Books / References:

1. Shah, M.G., Kale, C. M. and Patki, S.Y. Building Drawing with An Integrated Approach to Built Environment, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. AutoCAD Essentials, Autodesk official Press, John Wiley & Sons, USA.
3. National Building Code of India.

4. Building drawing with an integrated approach to built environment by M. Shah, C. Kale, S. Patki, Tata McGraw Hill Education; 4th edition.
5. Building Planning and Drawing by y M.V. Chitawadagi S.S. Bhavikatti, Dreamtech Press.
6. Civil Engineering Drawing & House Planning: A Text Book by B. P. Verma, khanna publishers.
7. Civil Engineering Drawing by by Rangwala, Charotar Publishing House Pvt. Ltd.
8. Building Planning and Drawing by Dr. N. Kumara Swamy, A. Kameswara Rao, Charotar Publishing House Pvt. Ltd.
9. N Krishna Raju, Structural Design and Drawing, Second Edition, Universities Press (India), Private Limited, Hyderabad.

Course Outcomes:

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

1. The students will be able to plan areas according to the functional requirements and develop line sketches and working drawings of RCC residential buildings for the given area and requirements.
2. The students will be able to prepare the plan, section and elevation of a RCC building from given line sketches
3. The students will be able to plan and propose a stair case as per the requirements, suitability and availability of space.
4. The students will be able to plan and draw the elevations and sections of industrial buildings with steel trusses and the joint connections.
5. The students will be able to develop site plan of a given building using building bye laws/regulations
6. The students will be able to make use of Auto CAD software for preparation of plan, elevation and section of a structure/component/element.

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
Subject Code:	CE204PPC03	L	T	P	IA	TOTAL	20	50	01
Subject:	Material testing lab	0	0	2	30	30			

Course Objectives:

- To Remember & understand various Properties of Cement & to learn testing methodology of each properties of cement.
- To learn to perform various experiments related to properties of Aggregates.
- To be able to examine the various properties of prefabricated bricks.
- To learn to perform various Destructive & non –destructive tests on concrete.

Course Content:

List of experiments

Testing of cement:

- 1.Normal Consistency, Fineness of Cement, Setting times of Cement
2. Specific Gravity of Cement
3. Soundness of Cement
4. Compressive strength of cement

Testing of aggregate:

5. Fineness modulus of Fine and Coarse aggregate
6. Bulk density of aggregate
7. Specific Gravity and Water Absorption of Aggregate
8. Bulking of Sand

Testing of bricks

9. Compressive strength, Water Absorption & Efflorescence of Bricks

Testing of concrete:

10. Workability of Concrete
11. Compressive strength
12. Modulus of Elasticity
13. Tensile Strength of Concrete
14. NDT Test of Concrete

Text Books / References:

1. Building Materials – S.K. Duggal (New Age Publication)
2. Building Materials – S. C. Rangwala (Charotar Publication)
3. Building Construction by S.G. Rangwala, Charter Publishing House, Anand, India

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

- Understand & demonstrate various tests on cement, Aggregates & Bricks.
- Design Concrete for desired grade & test its various mechanical properties.
- Demonstrate modern Non – Destructive method of concrete in-situ testing.

SYLLABUS	(SEMESTER-IV)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
Subject Code:	CE204PHS01						20	50	01
Subject:	Effective Technical Communication Lab	0	0	2	30	30			

Course Learning Objectives:

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

Course Content:

List of Experiments:

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books:

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

Course Outcomes: On completion of the course, the students would be able to:

- Improve interpersonal communication

- Overcome stage fright and enhance confidence
- Participate in GDs
- Master presentation Skills and Interview Skills
- Learn and practice Listening, Reading, Writing and Speaking Skills

(SEMESTER-V)

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE05TPC08							70	100	04
<i>Subject:</i>	Design of Concrete Structures	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To understand the various philosophies of design of concrete structures, related IS Codes
- To understand the design beam for flexure, shear, bond and torsion
- To know the design of slabs and staircase and their detailing
- To learn the design of columns and isolated footings and their detailing

Course Content:

UNIT-1: Introduction to design of concrete structures-limit state analysis and design beams for flexure, bond

UNIT-2: Shear and torsion

UNIT-3: One way slabs, staircases, Two-way slabs

UNIT-4: Axially and eccentrically loaded columns. (uniaxial only)

UNIT-5: Footings – different types of isolated footings, synthesis of limit state working Stress methods.

Text Books:

1. Reinforced Concrete Design by S Unnikrishna Pillai & Devadas Menon
2. Limit State Design of Reinforced Concrete by P.C. Verghese
3. Design of Reinforced Concrete Structures by N Krishna Raju

Course Outcomes

At the end of the course the students shall be able

- To recognise the design philosophy of concrete structures
- To understand the difference between the structural behavior of different reinforced concrete structural elements
- To analyze and design the reinforced concrete structural elements subjected to gravity loads

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE05TPC09							70	100	04
<i>Subject:</i>	Structural Analysis - II	3	1	-	15	15	30			

Course Learning Objectives:

- The objective of this Course is
- To understand the principles of energy methods and their applications to indeterminate beams and plane frames
- To know the principles of different slope-deflection and moment distribution methods and their applications to indeterminate beams and plane frames
- To study the principles of matrix methods and their applications to beams and frames
- To know the influence lines for indeterminate structures and two-hinged arches

Course Content:

UNIT-1: Analysis of indeterminate beams by Consistent Deformation methods, Analysis of indeterminate rigid plane frames and truss using energy method.

UNIT-2: Slope Deflection Method: Continuous beams and portals by moment distribution due to load and yielding of supports.

UNIT-3: Moment-distribution method. Continuous beams and portals by moment distribution due to load and yielding of supports.

UNIT-4: Introduction to Flexibility matrix and Stiffness Matrix methods: Applications of the methods to simple indeterminate beams.

UNIT-5: Analysis of symmetrical two hinge arches (parabolic and circular). Influence lines for propped cantilevers, continuous beams using Muller-Breslau's principle.

Text Books:

1. Structural Analysis by Devdas Meenon
2. Indeterminate Structural Analysis by C. K. Wang
3. Fundamental of Structural Analysis by Lee.
4. Advanced Structural Analysis by A. K. Jain
5. Structural Analysis (SI units) by R C Hibbeler
6. Structural Analysis by L S Nagi & R S Jangid

Course Outcomes

At the end of the course the students shall be able

- To identify the suitable method of analysis for the analysis of indeterminate structures.
- To analyse the indeterminate beams and rigid and pin joint plane frames for gravity and wind loads
- To analyse the indeterminate structures and two-hinged arches for moving loads by constructing the influence lines

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE05TPC10							70	100	03
Subject:	Highway Engineering	3	-	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To provide a coherent development to the students for the courses in sector of Engineering like Transportation & Traffic Engineering etc.
- To present the foundations of many basic Engineering tools and concepts related Highway Engineering.
- To give an experience in the implementation of engineering concepts which are applied in field of Transportation Engineering.
- To involve the application of scientific and technological principles of planning, analysis, design and management to highway engineering

Course Content:

UNIT-1: Introduction: Importance of highway transportation, Modes of transportation, characteristics of highway transport. Historical development & planning: Historical development of roads, Road development and planning in India, Necessity of planning, Roads classification, patterns, Planning surveys. Highway alignment and surveys: Engineering Surveys for highway location Maps and Drawing. Highway drainage: Importance, Surface and subsurface drainage.

UNIT- 2: Geometric Design: Cross Section elements, Sight Distance, Design of horizontal and vertical Alignment.

UNIT -3: Traffic Engineering: Traffic characteristics, studies such as volume, density, Speed, 'O' and 'D' and their uses, Traffic control devices and road accidents.

UNIT- 4: Highway Materials: Behavior of highway materials, properties of Subgrade materials and pavement component materials. Tests on subgrade soil, aggregate and bitumen.

UNIT- 5: Pavement Design: Types of pavements, Factors affecting design of flexible and rigid pavements, Design of flexible pavements: Group index, I.R.C. recommended method, California highway department method, U. S. Corp

method. Design of Rigid pavement: Westergard's stress analysis of wheel loads for design of pavement, effect of temperature and warping stress in design

Text Books:

1. Principle and Practices of Highway Engineering – Kadiyali & Lab (Khanna Publishers, Delhi).
2. Highway Engineering – S. K. Khanna & C.E.G. Justo (Khanna Publishers, Delhi).
3. Highway Engineering – Rangawala S.C. (Charotar Publishers).
4. A textbook of Transportation Engineering – S.P. Chandola (S. Chand)
5. Transportation Engineering – A.K. Upadhyay (S.K. Kataria & Sons).
6. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, Scitech Publications (India), Chennai, 2010.
7. Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand & Bros, Roorkee (U.A).
8. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
9. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.
10. IRC – 37 “Guidelines for Design of flexible Pavements”, IRC, New Delhi, 2001.
11. IRC – 67 “Code of Practice for Road Signs”, IRC, New Delhi – 2001. 30
12. IRC: 58, 2002: “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, IRC, N. Delhi, December, 2002.
13. IRC:70, 1977: “Guidelines on Regulation and Control of Mixed Traffic in Urban Areas”
14. IRC:106, 1990: “Guidelines for Capacity of Urban Roads in Plain Areas”
15. IRC-73
16. IRC-12
17. Specifications for Road and Bridge Works – MOST (IRC Publishers) Manual for Survey, Investigation and Preparation of Road Projects – IRC Publication 2001.

Course Outcomes

At the end of the course the students shall be able

- To gain an experience in the implementation of Transportation Engineering on engineering concepts which are applied in field Highway Engineering.
- To get a diverse knowledge of highway engineering practices applied to real life problems.
- To learn to understand the theoretical and practical aspects of highway engineering along with the design and management applications.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE05TPC11							70	100	03
Subject:	Soil Mechanics - I	3	-	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To understand the engineering properties of soil.
- To develop the basic understanding of characteristics of soil like permeability, seepage.
- To learn the effective stress and vertical stress in soil.
- To learn the significance of compaction and consolidation on the stability of soil.
- To learn shear strength of different type of soils.

Course Content:

Unit 1: Introduction to Soil Mechanics and Geotechnical Engineering, Complexity of Soil Nature, Soil Formation and Soil Types.

Index Properties of Soil: Basic Definitions, Phase Relationships, Classification of Soils-The Unified Soil Classification System and Indian Standard Soil Classification System, Soil Structure and Clay Minerals.

Unit 2: Soil Compaction: Definition and Compaction Theory, Laboratory Compaction Tests-Standard Proctor Compaction Test & Modified Compaction Test, Factors Affecting Compaction, Effect of Compaction on Engineering Properties of Soil , Field Compaction and Controls.

Principle of Effective Stress, Capillarity and Permeability: Principle of Effective Stress, Capillarity in Soils, Effective Stress under Different Field Conditions, Seepage Pressure, Quick Sand Condition, Permeability, Darcy's Law, Determination of Permeability, Permeability of Stratified Soils, Absolute Co-efficient of Permeability, Factors Affecting Permeability , Seepage through Soils- Laplace's Equation, Flow Nets.

Unit 3: Vertical Stresses below Applied Loads: Stresses due to Applied Loads, Boussinesq and Westergaard Theories for Vertical Stresses under Concentrated Loads, Uniformly Loaded Circular and Rectangular Areas,

Pressure Bulb, Variation of Vertical Stress under Point Load along the Vertical and Horizontal Planes, Newmark's influence chart.

Stability of Soil Slopes: Introduction, Types of Slope Failures, Slip Circle Method, Determination of Centre of Most Critical Slip Circle, Taylor's Stability Charts, Stabilization of Soil Slopes.

Unit 4: Shear Strength: Introduction, Stress at a Point and Mohr's Stress Circle, Normal and Shear Stresses on a Plane, Mohr-Coulomb Failure Criterion, Laboratory Tests for Shear Strength Determination, Shear Strength Parameters, Direct shear test, Triaxial shear test, Unconfined Compression Test and Vane Shear test, Shear Strength Characteristics of Normally Consolidated and Reconsolidated Clays, Factors Affecting Shear Strength.

Unit 5: Compressibility: Introduction to Compressibility, Consolidation, Effects of Soil Type, Stress History and Effective Stress on Compressibility, Factors Affecting Consolidation and Compressibility Parameters, Normally Consolidated and Over Consolidated Soils, Types of Consolidation, Terzaghi's Theory of 1-D Consolidation and Time Rate of Consolidation.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao, New Age International (P) Limited, Publishers, New Delhi-110002.
2. Textbook of Soil Mechanics and Foundation Engineering Geotechnical Engineering Series (PB 2018) by V. N. S. Murthy, CBS Publication, New Delhi.
3. Soil Mechanics and Foundations by Dr. B. C. Punmia, Ashok Kr. Jain & Arun Kr. Jain, Laxmi Publications (P) Ltd, New Delhi-110002.
4. Soil Mechanics by Robert V. Whitman & T. William Lambe, Wiley India Pvt Ltd. New Delhi.
5. Soil Mechanics and Foundation Engineering by Purushotama Raj, Pearson Publications, New Delhi.

6. Soil Mechanics and Foundation Engineering (Geotechnical Engineering)
by Dr. P. N. Modi, Standard Book House (Rajsons Publications Pvt Ltd)
New Delhi-110002

Course Outcomes

At the end of the course the students shall be able

- To have an understanding of soil capable to behaving in different practical conditions.
- To have an idea of engineering properties of soil suitable for foundation.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE05TPC12							70	100	03
Subject:	Environmental Engineering - I	3	-	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To learn about various sources of water supply & population forecasting method
- To learn the principles and design of water treatment and distribution.
- To learn about the aspects of air & noise pollution

Course Content:

UNIT 1: Introduction: Necessity and importance of water supply schemes. Water demand: Classification of water demands, Estimation of quantity of water required by a town, per capita demand, factors affecting per capita demand, design period and population forecasting, variation in water demand. Sources of water supply. Surface sources and underground sources, Intake works, site selection, type of intake works.

UNIT 2: Quality of water: Common impurities, physical, chemical and biological characteristics of water, water quality standards for municipal and domestic supplies. Water Processing: Object of water processing, flow diagrams of typical ground water system and surface water systems. Sedimentation Theory of sedimentation, sedimentation tanks and its types, design parameters related with sedimentation tanks, sedimentation with coagulations, coagulants and coagulant aids, Jar test for determining coagulant dosage.

UNIT 3: Filtration; Theory of filtration, slow sand and rapid sand filters, Construction and operation. Disinfection, Methods of disinfection, Chlorination, Types of chlorination, Break Point chlorination.

UNIT 4: Softening: Methods of Softening, Iron Removal, Fluoridisation. Distribution System: Methods of distribution, layout of distribution system, methods of analysis, pressure in the distribution system, distribution reservoirs, functions and its types, storage capacity of distribution reservoir.

UNIT 5: Air Pollution: Introduction, causes, sources, characteristics, effects of air pollution on plants, humans, animals and materials and atmosphere, air pollution control methods and equipment. **Noise Pollution:** Definition, sources, effects of noise pollution on humans, animals and non-living things, methods of noise control.

Text Books:

1. Water Supply Engineering – S.K. Garg (Khanna Publication).
2. Water Supply Engineering – B.C. Punmia (Laxmi Publication, New Delhi)
3. Environmental Engineering – Peavy & Rowe (Tata McGraw Hill, New Delhi).
4. Water Supply and Sanitary Engineering – G.S. Birdi (DhanpatRai Publications).
5. Introduction to Environmental Science – Y. Anjaneyulu (B.S. Publications)
6. Environmental Science and Engineering – Henry and Heinke (Pearson Education)

Course Outcomes

At the end of the course the students shall be able

- To get an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
- To get an understanding of water quality criteria and standards, and their relation to public health,
- To be able to design and evaluate water supply project alternatives on basis of chosen selection criteria.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE05THS07*							-	-	0
Subject:	Management (Organizational Behaviour)	3	-	-	-	-	-			

Course Learning Objectives:

The objective of this Course is

- To improve students understanding of human behavior in organization and the ability to lead people to achieve more effectively toward increased organizational performance.
- To understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories.
- To understand group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations.
- To understand the organizational system, including organizational structures, culture, human resources, and change.

Course Content:

UNIT 1: FOCUS AND PURPOSE: Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

UNIT 2: INDIVIDUAL BEHAVIOUR: Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification. Misbehaviour – Types – Management Intervention. Emotions- Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Effects on work behavior.

UNIT 3: GROUP BEHAVIOUR: Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

UNIT 4: LEADERSHIP AND POWER: Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT 5: DYNAMICS OF ORGANIZATIONAL BEHAVIOUR: Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives –. Organizational effectiveness

TEXT BOOKS

3. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
4. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.

Course Outcomes:

At the end of the course the students shall be able

- To Compare and contrast theories of organizational behavior.
- To analyze management issues as related to organizational behavior.
- To evaluate ethical issues as related to organizational behaviour
- To examine challenges of effective organizational communication
- To examine the differences and similarities between leadership, power, and management.
- To assess the impact of culture on organizational behavior

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE05PPC04							20	50	1.5
<i>Subject:</i>	Highway Engineering Lab	0	0	3	-	-	30			

Course Learning Objectives:

The objective of this Course is

- To introduce Bitumen and & its engineering behavior.
- To introduce Aggregate & its engineering behavior.
- To introduce Concept of traffic behavior.

Course Content:

Minimum 10 experiments to be performed

1. To determine the crushing value of the given aggregate sample.
2. To determine 10% finer value of the given aggregate sample.
3. To determine the abrasion value of the given aggregate sample by los angles apparatus.
4. To determine the impact value of the given aggregate sample.
5. To determine the elongation index of the given aggregate sample.
6. To determine the flakiness index of the given aggregate sample.
7. To determine the water absorption of the given coarse aggregate.
8. To determine the specific gravity of the given coarse aggregate.
9. To determine the penetration value of the given bitumen material.
10. To determine the softening point of the given bitumen material.
11. To determine the ductility of the given bitumen material.
12. To determine the viscosity of the given bitumen material
13. CBR Test

Course Outcomes

At the end of the course the students shall be able

- To identify engineering properties of aggregate.
- To identify the grade & properties of bitumen.

SYLLABUS	(SEMESTER-V)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE05PPC05							20	50	1.5
<i>Subject:</i>	Soil Mechanics- Lab	0	0	3	-	-	30			

Course Learning Objectives:

The objective of this Course is

- To learn the basic tests analysing engineering properties of soil.
- To learn the practical tests computing bearing capacity of soil.
- To learn the sampling of soil.

Course Content:

Minimum 10 experiments to be performed

1. To determine the water content of soil (%) by Oven dry method.
2. To determine the specific gravity of soil sample by
 - a) Pycnometer Bottle Method.
 - b) Density Bottle Method.
3. To determine the particle size distribution of a soil by Mechanical Analysis.
4. To determine the grain size distribution by Hydrometer apparatus
5. To determine the liquid limit and Plastic limit of a soil sample and Shrinkage limit of a soil sample.
6. To determine in situ dry density of soil by
 - a) Core cutter method.
 - b) Sand replacement method.
7. To determine the permeability of soil by
 - a) Falling Head Methods.
 - b) Constant Head Methods.
8. To determine the shear strength of a coarse grained soil (Direct Shear Test).
9. To determine the compressive shear strength of Clay (Unconfined Compression Test/UCS test).
10. To determine the shear strength of c-φ Soil (Triaxial Test).
11. To determine the consolidation of soil/Clay sample.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao, New Age International (P) Limited, Publishers, New Delhi-110002.
2. Soil Mechanics and Foundations by Dr. B. C. Punmia, Ashok Kr. Jain & Arun Kr. Jain, Laxmi Publications (P) Ltd, New Delhi-110002

Course Outcomes

At the end of the course the students shall be able

To have an understanding of performing various tests on soil accurately giving them practical exposure.

(SEMESTER-VI)

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TPC13	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Water Resources Engineering -I	3	0	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To understand the need of Irrigation, types of irrigation systems and Methods of Irrigation.
- To understand the Canal Irrigation systems and design of stable channels in alluvium.
- To understand Water Logging and its Control.
- To know the River behaviour, control and training.
- To know the Reservoir Planning, Hydrograph and Flood Routing and its principle.

Course Content:

UNIT 1: Introduction: Need for Irrigation, advantages and disadvantages of irrigation, types of irrigation systems – Flow irrigation, Lift irrigation. Methods of Irrigation: Introduction, requirement of irrigation methods, surface and sub-surface irrigation. Water Requirement of crops: Introduction, water requirement of crop, crop season and crops of India, crop period and base period, delta, duty of water, relationship between delta, duty and base period, factors affecting duty.

UNIT 2: Canal Irrigation: Classification of canal, parts of canal irrigation system, canal alignment, typical canal cross section, command areas, losses in irrigation systems. Design of stable channels in alluvium. Introduction, Kennedy's silt theory, Lacey's Theory, Lacey's regime equations, Lacey's shock theory, Design of channels by Kennedy's and Lacey's theories, maintenance of irrigation channels.

UNIT 3: Water Logging and its Control. Causes and ill effects of water logging, prevention and control, reclamation of water logged lands, surface drainage. Design of Lined Channels. Introduction, benefits of lining, types of lining, economics of lining, procedure and design of lined canals.

UNIT 4: River behaviour, control and training. Objects, river characteristics, classification of river training works, methods of river training embankments, bank protection, cut-offs, meandering causes and parameters. Flood Control; Introduction, channel improvement, flood ways evacuation and flood plain zoning.

UNIT 5: Reservoir Planning: Introduction, type of reservoirs, investigation for reservoir planning, site selection criteria for reservoir, basic terms and definitions of reservoir, storage zones of a reservoir, mass curve and demand curve, determination of reservoir capacity,

reservoir losses, reservoir sedimentation, factors affecting sedimentation, type of sediment load, life of reservoir, safe field.

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
2. Irrigation Engineering – B.C. Punmia (Laxmi Publications)
3. Irrigation, Water Resources and Water Power Engineering – Dr. P.N. Modi (Standard Book House)
4. Theory and Design of Irrigation Structures (Volume – I & II) – Varshney (Nem Chand & Bros.)
5. Irrigation and Water resources Engineering – Asawa G.L. (New Age International Publications)
6. Fundamentals of Irrigation Engineering – Bharat Singh (Nem Chand & Bros)
7. Water Resources Engineering Larry -W. Mays (Wiley, John & Sons)

Course Outcomes

At the end of the course the students shall be able

- To describe about the types of Irrigation systems, and methods of irrigation.
- To design irrigation canals and canal network
- To illustrate about the solution regarding water logging and drainage.
- To illustrate river training work sand Flood Control of river.
- To find out capacity of reservoir and use Flood Routing principle for Reservoir Planning.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE06TPC14							70	100	03
Subject:	Environmental Engineering - II	3	--	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena in the sewage
- To understand the concept successful design, operation and maintenance of sewage treatment plant

Course Content:

UNIT 1: Objective, design period, Physical, Chemical and Biological characteristics. Waste water sampling, self-purification of natural streams, effluents Standards, Oxygen Sag Curve, sources of sewage. Design of sanitary sewers, minimum size of sewer, velocities in sewers and gradient of sewers. Sewer appurtenances viz. manholes, street inlets, flushing devices, Vent pipes etc.

UNIT 2: Waste Water primary Treatment: characteristics of wastewater. Effluent discharge standards, Primary, secondary and tertiary treatment of wastewater. Types of screens, design of screen chamber, sources of grit, design of grit chamber, disposal of grit, oil and grease removing skimming tanks, design of PST with inlet and outlet details, primary sludge and its disposal

UNIT 3: Aerobic Treatment UNITS: Biological principle of ASP, SVI, sludge bulking and control; biological principle of Trickling filter, re-circulation, operational troubles; Rotating biological contactor. Low cost treatment methods: Principle of Oxidation pond, symbiosis, principle of Aerated Lagoons, aeration method, Principle of Oxidation Ditches, sewage farming, ground water recharge.

UNIT- 4: Anaerobic Treatment UNITS: Septic tanks, biological Principle, method of treatment and disposal of tank effluent. Anaerobic digester, principle of anaerobic digestion, Stages of digestion, bio-gas production. Sludge disposal methods, advantages and disadvantages, Design of STP.

UNIT 5: Municipal Solid Wastes: Characteristics, generation, collection & transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment & disposal), environmental & health implications, disposal of solid waste by land filling, composting and incineration methods. Hazardous waste management, environmental and health implications due to Exposure, incineration, landfill disposal, site remediation, disposal of refuse by Composting.

TEXT BOOKS:

1. Environmental Engineering – Peavy & Rowe (Tata McGraw Hill, New Delhi).
2. Waste Water Engineering – S.K. Garg (Khanna Publication).
3. Manual on sewerage & sewage Treatment published by Ministry of UrbanDev. GOI, Ministry of Urban development
4. Waste Water Engineering – Metcalf Eddy (Tata McGraw Hill, New Delhi).
5. Hazardous Waste management: M.D. LaGrega, P.L. Buckingham, J.C.Evans
6. Manual on Municipal Solid Waste Management: CPHEEO (Ministry of Urban Dev.)
7. Environmental Engineering-II.P.Venugopala Rao Tata McGraw Hill
8. Water and Wastewater Technology ,Hammer (PHI)

Course Outcomes

At the end of the course the students shall be able

- To estimate sewage generation and design sewer system including sewage pumping stations
- To understand the characteristics and composition of sewage, self-purification of streams
- To perform basic design of the unit operations and processes that are used in sewage treatment

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE06TPC15							70	100	04
Subject:	Design of Steel Structures	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To introduce steel structures and its basic components
- To introduce structural steel fasteners like welding and bolting
- To design tension members, compression members, beams and beam-columns.
- To design column splices and bases Course outcomes
- To introduce the design of eccentric connections, plate girders.

Course Content:

UNIT 1: Introduction: General, types of Steel, mechanical behaviour of steel, measures of Yielding, measures of Ductility, types of Structures, Structural Steel Sections.

Methods of Structural design: Introduction- Design Philosophies-Working Stress method-Ultimate Strength method-Load and Resistant factor- Limit State Method-Partial safety factor-Load-Load combinations-Classification of Cross sections- General aspects in the design.

UNIT 2: Design of Steel fasteners: Types of fasteners – Riveted connections- Bolted connections- Assumptions- Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld- fillet weld – Design examples.

UNIT 3: Design of Tension Members: General – Modes of Failure of Tension member- Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design. Design of Compression Members: General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members – Design of Angle struts – Design Examples- Built up Columns-

Design of Lacing – Design of Battens- Design Examples- Design of Roof members.

UNIT 4: Design of Beams: General- Lateral Stability of Beams- Bending Strength of Beams – Plastic Section Modulus - Design Examples. Design of Beam Columns: Behaviour of members under combined loading – Modes of Failures – Design Examples. Design of Column Splices and Column Base: Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design Examples.

UNIT 5: Design of Eccentric Connections: Design of Brackets- Type-1 and Type 2 – Moment Resistant connections - Design Examples. Design of Plate Girder: General- Components of Plate Girder- Optimum depth – Bending Strength – Shear Strength – Shear Buckling- Simple Post critical method- Tension Field method- Stiffeners-Bearing- Transverse stiffeners - Design Examples.

Text Books:

Limit state Design of Steel Structures – S K Duggal.

2. Design of Steel structures: By Limit State Method– S. S. Bhavikatti.

3. Design of Steel Structures- K. S. Sai Ram

4. Design of Steel Structures-Limit States Method-N. Subramanian

5. Comprehensive Design of Steel Structures – Dr B.C.Punmia, Ashok Kr.Jain,
Arun Kr. Jain

6. Design of Steel Structures- S. Ramamrutham

7. Steel Structures (Design & Drawing) – A. K. Upadhayay

8. Fundamentals of Structural Steel Design – M. L. Gambhir

9. Limit state Design of Steel Structures – S Kanthimathinathan

10. Design of Steel Structure Volume-I- Ramchandra

11. Design of Steel Structure Volume-II- Ramchandra

12. Design and Analysis of Connections in Steel Structures-Fundamentals and
examples- Alfredo Boracchini

13. IS-800:2007- Indian Standard- General Construction in Steel-Code of Pr., &

Steel Tables

Course Outcomes

At the end of the course the students shall be able

- To understand design philosophies and behaviour of structural steel
- To analyze and design of tension members
- To analyze and design of columns
- To analyze and design of beams
- To analyze and design of beam-columns
- To analyze and design of simple bolted and welded connections
- To design plate girders

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE06TPC16							70	100	03
Subject:	Soil Mechanics - II	3	-	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To understand the effect of backfill on retaining wall.
- To learn the bearing capacity of soil and methods to calculate it.
- To learn the analysis of stability of shallow and deep foundation for superstructure loading.
- To learn about exploration and sampling of soil.

Course Content:

Unit 1: Soil Exploration: Introduction, Different Phases of Soil Explorations, Methods of Subsurface Exploration- Trail Pits, Boring Methods, Sounding Test and Geophysical Explorations, Samples and Samplers, Soil Exploration Reports and Bore Log.

Unit 2: Earth Pressures: Introduction, Effect of Wall Movement on Earth Pressure, Earth Pressure at Rest, Rankine's Earth Pressure Theory and its Limitations, Coulomb's Theory of Earth Pressure, Culmann's Graphical Method, Additional Earth Pressure due to Surcharge.

Unit 3: Shallow foundations: Types of shallow foundations and choice, basic requirements, significance of these foundations

Bearing capacity of foundation: Introduction, Bearing Capacity and its Different Forms, Modes of Shear Failure, Evaluation of Bearing Capacity- Prandtl's Method, Terzaghi's Bearing Capacity, Skempton's Method, Meyhof's Method, Hansen's and Vesic's Assumptions and IS Code Recommendations, Estimation of Bearing Capacity Based on Field Methods-Standard Penetration Test, Static Penetrations Test and Plate Load Test, Settlement of Shallow Foundations.

Unit 4: Pile Foundations: Introduction, Classifications of Piles, Cast in Situ Pile Construction, Selection of Pile Type, and Pile Load Capacity in Compression- Static Pile Load Formulae, Pile Load Test, Dynamic Pile Formulae, Group Action of Piles, Negative Skin Friction, Group Efficiency of Piles and Settlements.

Unit 5: Well Foundation: Introduction, Types of Well or Caissons, Components of Well Foundation, Shapes of Wells, Depth of Well Foundation, Forces Acting on Well Foundation, Construction and Sinking of a Well.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao, New Age International (P) Limited, Publishers, New Delhi-110002.
2. Textbook of Soil Mechanics and Foundation Engineering Geotechnical Engineering Series (PB 2018) by V. N. S. Murthy , CBS Publication, New Delhi.
3. Soil Mechanics and Foundations by Dr. B. C. Punmia, Ashok Kr. Jain & Arun Kr. Jain, Laxmi Publications (P) Ltd, New Delhi-110002.
4. Foundation Engineering by B. C. Chattopadhyay & Joyanata Maity, PHI Learning Private Limited, Delhi-110092.
5. Soil Mechanics by Robert V. Whitman & T. William Lambe, Wiley India Pvt Ltd. New Delhi.
6. Soil Mechanics And Foundation Engineering by P.Purushotama Raj, Pearson Publications, New Delhi.
7. Geotechnical Engineering by B. M. Das, Bharat Singh, SamsheerAlam.
8. Soil Mechanics and Foundation Engineering (Geotechnical Engineering) by Dr. P. N. Modi, Standard Book House (Rajsons Publications Pvt Ltd) New Delhi-110002 .

Course Outcomes

At the end of the course the students shall be able

- To have an understanding of suitable foundation for different practical conditions.
- To have an idea about sampling of soil for various tests.

SYLLABUS		(SEMESTER-VI)						
<i>Subject Code:</i>	CE06TPE01X	CREDITS: 4			SESSIONAL - TA			ESE
<i>Subject:</i>	Professional Elective -1X	L	T	P	CT-I	CT-II	TOTAL	
			3	1	-	15	15	30
Professional Elective-1A or Professional Elective-1B or Professional Elective-1C or Professional Elective-1D or Professional Elective-1E					Any one subject to be Selected from the Professional Electives (Group-1 i.e. CE06TPE01A or CE06TPE01B or CE06TPE01C or CE06TPE01D or CE06TPE01E)			
Professional Electives Group -1								
CE06TPE01A					Structural Analysis by Matrix Methods			
CE06TPE01B					Advanced Surveying			
CE06TPE01C					Advanced Concrete Design			
CE06TPE01D					Railway Engineering			
CE06TPE01E					Basics of Computational Hydraulics			

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE06TPE01A							70	100	04
Subject:	Structural Analysis by Matrix Methods (Professional Elective -1X)	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this course is

- To understand the flexibility and stiffness matrices and their relationship between them
- To understand the analysis of continuous beams by force (flexibility) and displacement (stiffness) methods
- To understand the analysis of rigid and pin jointed plane frames by force and displacement methods
- To differentiate the force and displacement methods

Course Content:

UNIT-1: Static indeterminacy, kinematic indeterminacy; Matrix concepts and Matrix analysis of structures: Flexibility and Stiffness; Flexibility Matrix; Stiffness matrix; Relationship between Flexibility matrix and Stiffness matrix; Force displacement methods;

Indeterminate Beams: Introduction; Analysis of indeterminate beams by flexibility and stiffness methods; Comparison of flexibility and stiffness methods;

UNIT-2: Rigid Joint Plane Frames: Introduction; Static indeterminacy; Analysis of rigid joint plane frames by flexibility method.

Unit-3: Rigid Joint Plane Frames: Introduction; Kinematic indeterminacy; Analysis of rigid joint plane frames by Stiffness matrix method.

UNIT-4: Pin-jointed Plane Frames (Trusses): Introduction; Static indeterminacy of pin jointed truss; Analysis of pin joint plane frames (trusses) by flexibility method.

Unit-5: Introduction; Kinematic indeterminacy of a Pin-jointed plane frame; Analysis of pin joint plane frames (trusses) by stiffness method.

Text Books:

1. Devdas Menon, "Advanced Structural Analysis", Narosa Publishing House, 2009
2. Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co., USA, 1999.
3. Weaver W. and Gere J. M., "Matrix Analysis of Framed Structure", CBS Publishers, Delhi.
4. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.
5. Devdas Menon, "Structural Analysis", Narosa Publishing House, 2008.
6. McGuire, W., Gallagher R. H. & Zimian, R. D. "Matrix structure analysis", John Willey Publication
7. G S Pandit & S P gupta, "Structural Analysis-A Matrix Approach"

Course Outcomes

At the end of the course the students shall be able

- To develop stiffness and flexibility matrix for prismatic members
- To do matrix computations to analyse structures

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE06TPE01B							70	100	04
Subject:	Advanced Surveying (Professional Elective -1X)	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To understand about concepts of Astronomical Surveying.
- To know the applications of cadastral surveying in different projects.
- To be capable to compute the accuracy of observations made.
- To learn the theory of triangulations surveying.
- To learn about various advanced equipment of surveying

Course Content:

UNIT 1: Triangulation and Baseline Measurements: Triangulation figures or systems, station marks, signals, towers, baseline measurement by rigid bars, flexible apparatus, problems, satellite station and reduction to centre.

UNIT 2: Theory of Errors: Types and sources of errors, theory of least squares, method of weights, method of correlates, angle and station adjustment, figure adjustment. Land Surveys: Layouts, measurements.

UNIT 3: Aerial photogrammetry : Introduction, Principle, Uses, Aerial camera, Aerial 6 10 photographs, Definitions, Scale of vertical and tilted photograph,, Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar.

UNIT 4: Field Astronomy: Introduction, purposes, astronomical terms, determination of azimuth, latitude , longitude and time corrections to the observations.

UNIT 5: Remote Sensing Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global Positioning system.

Geographical Information System Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering.

Text Books:

1. Borden D. Dent, Jeffrey Troguson, Thomas W. Hodler, Cartography: Thematic Map Design, McGraw-Hill Higher Education, 2008.
2. Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2007.
3. Hoffman.B, H.Lichtenegga and J.Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.
4. Punmia B. C, Ashok K. Jain, Arun K. Jain, Higher Surveying, Laxmi Publications, 2005.
5. Surveying Vol. I, II and III by Dr. B.C. Punamia, Laxmi Publishers. New Delhi
6. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh
7. Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House. New Delhi
8. Surveying Vol. I and II by S. K. Duggal, Tata Mcgraw Hill, New Delhi
9. Surveying and Levelling by N.N. Basak, Tata Mcgraw Hill, New Delhi
10. Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi
11. Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
12. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
13. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
14. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
15. Remote sensing and Image interpretation by T.M Lillesand,. R.W Kiefer,. and J.W Chipman, 5th edition, John Wiley and Sons India
16. Surveying theory and practice 7th Edition by James M Anderson and Adward M Mikhail Tata McGraw Hill Publication.

Course Outcomes

At the end of the course the students shall be able

- To be able to understand the aspects of astronomical surveying.
- To be able to define boundaries of construction area of projects.
- To be able to adapt the surveying equipment on the field.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE06TPE01C							70	100	04
Subject:	Advanced Concrete Design (Professional Elective -1X)	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this Course is

- To understand the design procedures for combined footings.
- To study the design of retaining walls
- To know the design of different types of water tanks
- To learn the design of flat slabs
- To know the design of RCC chimneys

Course Content:

UNIT 1: Combined Footings: Simple Rectangular, trapezoidal footings (with and without central beam); Strap footing; raft foundation.

UNIT 2: Types of retaining walls; Cantilever Retaining wall design; Counterfort retaining wall (demonstration only)

UNIT 3: Water tanks resting on ground; Intze type water tank design

UNIT 4: Large span concrete roofs, Introduction– classification- behaviour of flat slabs - direct design and equivalent frame method- Codal provisions - waffle slabs.

UNIT-5: Chimneys, analysis of stresses in concrete chimneys- uncracked and cracked sections- Codal provisions- design of chimney.

Text Books:

1. Purushothaman, P., Reinforced Concrete Structural Elements-, Tata McGraw Hill, 1986
2. Ashok K Jain, Reinforced Concrete –Nem Chand Bros. Roorkee , 1998
3. Jain and Jaikrishna, Plain and Reinforced Concrete – Vol I and II Nem Chand Bros., Roorkee, 2000.

4. Taylor C Pere, Reinforced Concrete Chimneys, Concrete publications, 1960
5. Design of deep girders, Concrete Association of India, 1960
6. Advanced Reinforced Concrete Design by N Krishna Raju
7. Mallick and Gupta, Reinforced Concrete, - Oxford and IBH, 1982
8. BIS codes (IS 456 , IS 2210, IS 4998, IS 3370, SP 16, SP 24, SP 34).
9. IRC Codes (IRC 5, IRC 6, IRC 21)
10. Reinforced Concrete Design by Devdas Menon and S U Pillai,

Course Outcomes

At the end of the course the students shall be able

- To design different types of combined footings
- To design cantilever retaining wall
- To design Water tanks resting on ground and Intze tank with staging and foundation
- To design flat slabs
- To design RCC chimneys

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credit s
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TPE01D									
<i>Subject:</i>	Railway Engineering (Professional Elective -IX)	3	1	0	15	15	30	70	100	04

Course Learning Objectives:

The objective of this Course is

- Comprehend different parts of the rail track, their functions and its operation system with respect to construction and engineering applications.
- Comprehensive understanding of the main factors involved in constructing, maintaining and operating railway networks.
- Explain essential features and requirements of different types of crossings and signal system, maintenance of tracks and required procedures.
- Provides scope and opportunities to the students of civil engineering for acquiring appropriate knowledge, skills and abilities in order to perform their job effectively related to construction and management of railway

Course Content:

UNIT 1: Introduction to Railways in India: Role of Indian Railways in National Development Railways for Urban Transportation –LRT & MRTS. Alignment of Railway Lines: Engineering Surveys for Track Alignment. Permanent Way: Components and their Functions

UNIT 2: Rails - Types of Rails, Length of rail, Weight of Rail, Rail Joints, Creep of rail, Buckling of rail, Kinks of Rail Fastenings, Coning of Wheels& tilting of rails.

Sleepers –Types, Functions, sleeper density

Ballasts- Types, function, advantage & disadvantage of each type.

UNIT 3: Geometric Design of Railway Tracks: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal Curves.

UNIT 4: Points and Crossings, Turnouts: Working Principles, Cross overs.

UNIT 5: Signalling: Types and their function. Station and Yards: Types, Requirements, factors for site selection.

Text Books:

1. Chandra S. and M.M. Agarwal, Railway Engineering, Oxford University Press, New Delhi, India, 2007.
2. Saxena, S.C. and S.P. Arora, Railway Engineering, Dhanpat Rai and Sons, New Delhi, India, 1997.
3. Agarwal, M.M., Indian Railway Track, Prabha and Co., New Delhi, India, 1988.
4. Rangwala, S.C., Principles of Railway Engineering, Charotar Publishing House, Anand, India, 1988.
5. J. S. Mundrey, “Railway Track Engineering”, McGraw Hill Publishing Co., 2009

Course Outcomes

At the end of the course the students shall be able to:

- The Students are expected to handle the design, construction, and operation of railroads and mass transit systems that use a fixed guide way.
- The Students are expected to handle the tasks that include determining horizontal and vertical alignment design, station location and design, and construction cost estimating.
- Explain various aspects related to construction and maintenance of Railway.
- Describe various procedures for construction activities related to Railway.
- Supervise Railway

SYLLABUS	SEMESTER-VI	Periods/Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TPE01E									
<i>Subject:</i>	Basics of Computational Hydraulics (Professional Elective -1X)	3	1	0	15	15	30	70	100	04

Course Learning Objectives:

The objective of this Course is to

- Provide knowledge on application of computational fluid mechanics to different Civil of engineering problems.
- Provide knowledge on conservation law and the numerical approach to solve by converting different form of partial differential equations.
- Provide some experience in the software engineering skills associated with the implementation of MATLAB computer programming and use of Computational Fluid Dynamics (CFD) software.

Course Content:

Unit 1: Introduction, significance of computational hydraulics, discrete forms of the laws of conservation of mass, momentum and energy, examples of free surface flows.

Unit 2: Continuous forms of the conservation laws, lateral inflow's 1-D expansions and contractions, homogeneous and stratified fluid flows.

Unit 3: Introduction to computer programming and computation with MATLAB and using of Computational Fluid Dynamics (CFD) software.

Unit 4: Pipe flow analysis, Open channel flow: Types of Open Channel Flow, Estimation of normal and critical depth, uniform flow computations

Unit 5: Computation of water surface profile (WSP) gradually varied flow estimation using direct step methods.

Text Books:

1. Sreenivas Jayanti, Computational Fluid Dynamics for Engineers and Scientists, Springer, 2018.
2. J.D. Hoffman, Numerical Methods for Engineers and Scientists, CRC Press, Special Indian Edition, 2011.

3. K. A Hoffmann, Computational Fluid Dynamics, Engineering Education System, 2000.
4. M.H. Choudhary, Applied Hydraulic Transients, Van Nostrand Reinhold, New York, 1997.
5. M.B. Abbot & A.W. Minns, Computational Hydraulics, Ashgate Publication, 1994.
6. J.D. Anderson, Computational Fluid Dynamics, McGraw Hill, 1995.
7. C.B. Vreugdenhill, Computational Hydraulics: An Introduction, Springer-Verlag, Berlin, 1989.
8. M.B. Abbott & J.A. Gunge, Engineering Applications of Computational Hydraulics –Pitman Books Ltd., 1982.

Course Outcomes

At the end of the course the students shall be able

- To understand the governing equations based on conservation principals in fluid flow problems,
- To know the use of finite difference method applied to fluid flow problems,
- To check the output from numerical method as compared to the observed data
- To develop computer skill.

SYLLABUS	(SEMESTER-VI)							
Subject Code:	CE06TOE01X	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Open Elective -1X	L	T	P	CT-I	CT-II	TOTAL	
			3	-	-	15	15	30
<p>Open Elective-1A or Open Elective-1B or Open Elective-1C or Open Elective-1D</p>		<p>Any one subject to be Selected from the Open Electives Group (i.e. CE06TOE01A or CE06TOE01B or CE06TOE01C or CE06TOE01D)</p>						
Open Electives Group 1								
CE06TOE01A		Metro Systems and Engineering						
CE06TOE01B		Rural Technology and Community Development						
CE06TOE01C		Remote Sensing and GIS						
CE06TOE01D		ICT for Development						

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TOE01A									
<i>Subject:</i>	Metro Systems and Engineering (Open Elective -1X)	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

- To introduce concepts of different types of mode of transportation and associated facilities.
- To familiarize the students with the concepts of 1-D and 2-D signals, design of 1-D and 2-D filters and various aspects of image processing.
- To study town planning concepts and theories.
- To perceive the concept of urbanization and various growth patterns.
- To study the concepts for different area planning for urban PTS.
- To understand the concept of urban transport scenario, traffic characteristics and transport development.
- To get the knowledge of advanced transportation engineering planning and management techniques.
- To understand the approach and utility of Environmental Impact Assessment for the urban infrastructural measures.

Course Content:

Unit 1: Modes of Transportation: Transportation parameters- Traffic and Transport Problems of a city, Mass transport system, Modes of transportation & characteristics, Public transport system, public private transport system, Advantages and disadvantages of Public transport system. Role of transportation in mass transportation, advanced modes.

Transportation Infrastructure- Green bays, control stations, mitigation buildings, separator lanes and safety islands.

Unit 2: Urban Public Transport System Rapid transit systems: BRTS, Bus Lane system, Advantages and limitations in Indian Scenario, Rail System, Types of rail system, advantages and disadvantages of rail system, sky walk and under bridge and its advantages. Advances in infrastructure.

Urban Pedestrian Safety- Skyways, Intersection subways, halt stations, crossing measures, flexibility in accessibility.

Unit 3: ITS Background and Telemetric systems: Definitions, features and objectives of ITS, History of ITS and its development over the world, telemetric

concept, transport telemetric, telemetric structure, ITS taxonomy, ITS application areas, uses, and application overview, ITS implication through AI, ITS based regression models.

Unit 4: ITS components, tools and strategies: Components of user services; advanced traffic management system, advanced traveler information systems, advanced vehicle control system, commercial vehicle operational management, advanced public transportation system, electronic payment system, advanced rural transportation, security and safety systems, urban traffic control, benefits and limitations, traffic calming systems, freight management by ITS.

Unit 5: Environmental Impact Assessment: Description of proposed activity, structural audits, analysis of site selection procedure, baseline conditions / major concerns, green building and its advantages, description of potential positive and negative environmental, social, economic and cultural impacts including cumulative, regional, temporal and spatial considerations, significance of mitigation plans and monitoring plans (impacts and mitigation efforts)

Text Books:

1. Kadialy L.R., “Traffic Engg. and Transport Planning”, 8thedition, Khanna Publishers, 2011.
2. O. Flaherty C.A., “Traffic Engineering and Transport Planning”, 2006.
3. AUSTRROADS, The Implication of Intelligent Transport Systems for Road Safety, Austroads Incorporated, 1999. 2. Bob Williams, Intelligent Transport Systems Standards, Artech House Publishers, 2008.
4. Chowdhury, M. A. and Sadek, A, Fundamentals of Intelligent Transportation Systems Planning, Artech House, 2003.
5. E. Bekiaris and Y.J. Nakanishi, Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies, Elsevier/JAI, 2004. 5. IET Intelligent Transport Systems and 15th International IEEE Conference on Intelligent Transportation Systems (ITSC), 16-19 September, 2012. (<http://digital-library.theiet.org/content/journals/iet-its>)
6. J.M. Sussman, Perspectives on Intelligent Transportation Systems (ITS), Springer, 2005
7. L. Vlacic, M. Parent, F. Harashima, Intelligent Vehicle Technologies – Theory and Applications, Butterworth-Heinemann, 2010.
8. M.A. Chowdhury and A. Sadek, Fundamentals of Intelligent Transportation Systems Planning, Artech House, 2010.

9. R. Stough, *Intelligent Transport Systems: Cases and Policies*, Edward Elgar, 2001, *Artificial Intelligence and Intelligent Transportation Systems*, National Academy Press, 2010.
10. Gonzalez R. C. and Woods R. C., “*Digital Image Processing*”, 2nd Ed., Pearson Education, 2007.
11. Jain A. K., “*Fundamentals of Digital Image Processing*”, Prentice Hall, 2007.
12. R.R. Barthwal “*Environmental Impact Assessment*” New Age International, January 2012.
13. A.R. Gajbhiye & S.R. Khandeshwar N.S. Raman, “*Environmental Impact Assessment*”, I.K. International, 2014

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

- Concepts of different types of mode of transportation and associated facilities with advanced system.
- Identify and differentiate ITS user services and its components.
- Select and provide appropriate ITS technology to solve real-life traffic problems.
- Manage the traffic congestion by acquisition of big data using advanced devices.
- Implement the suitable ITS and services for effective transportation.
- Propose the mitigation plan for the EIA for the urban infrastructure.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TOE01B									
<i>Subject:</i>	Rural Technology and Community Development (Open Elective -IX)	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

The objective of this Course is

- To understand theories and practices in the rural development model.
- To learn and analyse rural life and rural economy.
- To understand different measures in rural development.
- To learn different technologies used in upliftment of rural life.

Course Content:

UNIT 1: INTRODUCTION: RURAL DEVELOPMENT - Concepts and connotations, Basic Elements, Growth vs. Development, Why rural development, Rising expectations and development, Development and Change, Human beings as cause and consequences of development. **RURAL ECONOMY OF INDIA** - Introduction, size and structure, The characteristics of rural sector, The role of agricultural sub-sector, The role of non-agricultural sub-sector, Challenges and opportunities

UNIT 2: RURAL DEVELOPMENT - MEASURES AND PARADIGMS:
MEASURES OF DEVELOPMENT - Introduction, Measures of level of rural development, Measures of income distribution, Measures of development simplified, Concepts and measures of rural poverty. **PARADIGMS OF RURAL DEVELOPMENT** - Introduction, The modernization theory, The dependency theory of Marxist School, Rosenstein- Rodan's theory of 'Big Push', Lewis' model of economic development, The human capital model of development, The Gandhian Concept of Rural Development theories from other social sciences.

UNIT 3: TECHNOLOGIES FOR RURAL DEVELOPMENT Using Water Resources - The water cycle, Drinking Water, Water quality testing, Water filtering ,Extraction from Groundwater ,Pumps Rope and washer pump ,Manuel pumps, Treadle pump, Irrigation for agriculture, Channel systems, Sprinkler systems, Drip systems Water diversion ,Water storage Building Infrastructures and Creating Energy - Basic energy uses , Energy Sources - Firewood, Solar Energy, Hydro-electricity, Hydro-mechanical, Wind Energy, Energy Storage, Connecting to the Electrical Network, Environmental Use of ICT in Rural and agricultural development - Education, Healthcare, Agriculture, Business, Resource Mapping, Digital and Social Media Marketing Decision Support

Systems for soil conservation and farm management Waste Management and Sanitation.

UNIT 4: COMMUNITY DEVELOPMENT: Introduction, Service Learning and community development, Theory and practice of community development, Community development issues. The diverse meaning of community development, the knowledge base of community development, International community development.

UNIT 5: COMMUNITY DEVELOPMENT - RURAL ENTREPRENEURSHIP: Different forms of Rural Entrepreneurship, Significance , Business planning for a new venture: the concept of planning paradigm, Forms of business enterprises-Sole proprietorship, partnership and corporations, Product and Process development, Marketing analysis and competitive analysis, strategies; Financial resources; debt financing, banks and financial institutions and other non-bank financial sources; Government programmes : direct loan assistance and subsidies; Industrial and legal issues for rural enterprises.

Text Books:

1. Rural Development: Principles, Policies and Management” - Katar Singh , Sage Publications.
2. Introduction to Community Development - Theory, Practice and Service Learning”, Edited by J W Robinson, Sage Publications.
3. G. N. Tiwari, Solar Energy: Fundamentals, Design, Modelling and Applications, Narosa, 2002.
4. “Fundamentals of Entrepreneurship”, H. Nandan, Third Edition, PHL Learning Pvt. Ltd.,
5. Monetary Economics-Institutions, Theory and Policy”, First Edition, S B Gupta, S Chand Publications, ISBN – 9788121904346.

Course Outcomes: At the end of the course the students shall be able to

- Understand rural development model.
- Learn different measures in rural development and its impact on overall economy.
- Understand and learn importance of technologies in rural and community development.
- Understand challenges and opportunities in rural development.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credi ts
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TOE01C									
<i>Subject:</i>	Remote Sensing and GIS (Open Elective - 1X)	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

The objective of this Course is

- To understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
- To illustrate Energy interactions with atmosphere and with earth surface features, Interpretation of satellite and topo sheet maps.
- To understand different components of GIS and Learning about map projection and coordinate system.
- To develop knowledge on conversion of data from analogue to digital and working with GIS software.

Course Content:

UNIT 1: INTRODUCTION AND CONCEPTS : Introduction of Remote Sensing – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with atmosphere scattering, absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern , vegetation, soil, water bodies- Spectral reflectance.

UNIT 2: AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY: Introduction-Terrestrial and Aerial photographs - vertical and oblique photographs - height determination contouring - photographic interpretations - stereoscopy – parallax bar- Flight Planning- Photo Interpretation, Applications of aerial photos-photo theodolite.

UNIT 3: SATELLITE REMOTE SENSING PRINCIPLES: Data acquisition – Procedure, Reflectance and Digital numbers- Intensity Reference data, Ground truth, Analog to digital conversion, Detector mechanism-spectro- radiometer-ideal remote sensing system – characters of real and successful remote sensing system- platforms and sensors- orbits types – resolution

UNIT 4: REMOTE SENSING SATELLITES:Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series,

NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT.

UNIT 5: BASICS OF GIS: Introduction, concepts , information system , components of GIS, History, Geospatial data architecture, Operations, geographic co-ordinate systems, map projections, concepts, input data for GIS , display ,types of output products. GIS categories, Level and scale of Measurement, importance of data quality.

Text Books:

1. M. Anji Reddy, Textbook of Remote Sensing and Geographical Information systems, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.
2. A.M.Chandra and S.K. Gosh. Remote Sensing and GIS, Narosa Publishing Home, New Delhi 2009.
3. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman Remote sensing and image interpretation John Wiley & Sons, 2008.
4. George Joseph, Fundamentals of Remote Sensing Universities Press, Hyderabad

Course Outcomes

At the end of the course the students shall be able

- To understand the concepts of Photogrammetry and compute the heights of objects;
- To understand the principles of aerial and satellite remote sensing, able to comprehend the energy interactions with earth surface features, spectral properties of water bodies;
- To understand the basic concept of GIS and its applications, know different types of data representation in GIS;
- To understand and Develop models for GIS spatial Analysis and will be able to know what are the questions that GIS can answer and
- To apply knowledge of GIS software and able to work with GIS software in various application fields.

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06TOE01D									
<i>Subject:</i>	ICT for Development (Open Elective - 1X)	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

The objective of this Course is to provide a

- Multi-disciplinary platform along with an emphasis on modern day real time applications.
- Due to the day to day changes in the field of science and technology, ICT program of Engineering will facilitate and provide an opportunity to equip with the skills and knowledge required to design, implement & manage a variety of Information system.

Course Content:

Unit-1: ICT Fundamentals; Information Technology philosophy, Need of information technology, Logic of Information, Cybernetics, Definitions(Peirce, Shannon-Weaver, Bateson), Information and society, Information Processing cycle, Impact of information on the society, IT act of India (Just Introduction), ICT models (brief), Analog Communication, Digital Communication, Data Communication, Structure of Communication, Transmission modes (Simplex, half duplex, Full duplex), Synchronous and Asynchronous transmission, Serial and Parallel communication, Need of Modulation, Antenna Height/length, Energy, Band-Edge Ratio, Multiplexing, Amplitude modulation, Definition, Mathematical derivation and calculation of modulation index, power, Frequency spectrum, Frequency modulation, Definition, Mathematical Derivation and calculation of frequency deviation Frequency spectrum.

Unit-2: Data Networks; Models of Network Computing (Centralize Computing, distributed Computing, collaborative Computing), Client Server Network and Peer to Peer Network, Network Topologies (Bus, Mesh, Star, Ring), Various types of computer Network (LAN, MAN, WAN), Types of switching network (Circuit and Packet), Need of layered mechanism, OSI Model (brief description of each layer), TCP/IP Model (brief description of each layer).

Unit-3: Physical View of ICT; Multiplexing, Definition and need, Time Division Multiplexing, Frequency Division Multiplexing, Code Division Multiplexing, Orthogonal Frequency Division Multiplexing, Identification of various transmission media, Wired media (Coaxial, Twisted Paid cable and their connectors), Wireless media (Microwave, Radio), Application of wireless media in satellite Communication, block diagram, important Definitions, Network Connecting devices (Switch, Router, Repeater, Bridges, Gateway) 3.4 IEEE standards for LAN(Introduction only).

Unit-4: Network Addressing; IPv4 addressing, Need of IP address, IPv4 addressing scheme, Address space and notations, Mask, netid, hosted, Sub-netting and super-netting, Classful and classless notations, Network address translations, IPv6 addressing, Need for IPv6 migration, IPv6 addressing scheme, Hexadecimal column notation, Uni-cast addresses, multicast addresses, anycast addresses Reserved addresses and local addresses, Address mapping (logical to physical, physical to logical), Ping and trace-route commands.

Unit-5: Protocols and Data Transportation; UDP and TCP protocols, Connectionless and connection oriented communication, Reliable and Unreliable communication UDP and TCP protocols, Data traffic and congestion management, DNS, Domain, domain name, domain zone, root server, Domain types, Address resolution, Address mapping, Address, mapping address to names, recursive resolution, iterative resolution, caching) Protocols(introduction only), Data link layer protocols, ARP,RARP,ICMP protocols (only brief explanation), Routing (brief explanation), Routing table, Uni-cast routing protocols and multicast routing protocols), SMTP, POP, IMAP, WWW and HTTP.

Text Books:

1. Richard Heeks, “Information and Communication Technology for Development”. Routledge; 1 edition (November 7, 2017)
2. Nureni and Yekini “Information Communication Technology”, Hasfem Publication center Shomolu
3. Sreekumar T.T., “ICTs and Development in India”, Anthem Press. Ravichandran A. “Fundamentals of Information Technology”, Khanna Publishers
4. James Irvine and David Harle “Data Communications and Networks”, Wiley-Blackwell; 1 edition (22 October 2001)
5. Achyut S. Godbole and Atul Kahate “Data Communications and Networks”, 2nd Edition, June 13, 2011, McGraw-Hill Education
6. Keshav S. “An Engineering Approach to Computer Networking”, Pearson Education India; 1 edition (2002)
7. Prakash C. Gupta, “Data Communication and Computer Networks”, 2nd Edition, Jan 2014 PHI Learning Pvt. Ltd.

Course Outcomes

At the end of the course the students shall be able

- To understand the importance of information and information communication technology.
- To understand basic concept of analog communication.
- To Identify network, servers, topologies and networking component
- To understand protocols and IEEE standards

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06PPC06							20	50	1.5
<i>Subject:</i>	Environmental Engineering Lab	0	0	3	-	-	30			

Course Learning Objectives:

The objective of this Course is

- To determine the physical, chemical and biological characteristics of water and wastewater through practical tests.
- To determine optimum dosage of coagulant and other critical tests to find the quality of water.

Course Content:

Determination of the following Parameters in the given Water Sample:

1. Turbidity by Nephelometer.
2. TDS and fixed solids by Gravimetric method.
3. pH using pH-meter.
4. Carbonate, Bi-Carbonate & Hydroxide Alkalinity.
5. Dissolved Oxygen [DO] using DO meter.
6. Concentration of Chlorides.
7. Optimum coagulant dose for coagulation by Jar test apparatus.
8. Chlorine Demand of Water.
9. Total Hardness and Calcium Hardness.
10. Study of Weather Monitoring Station.
11. Study of Sound Level Meter.

Course Outcomes

- Students will be able to know the procedure for quantifying quality parameters for water and sewage

SYLLABUS	(SEMESTER-VI)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE06PPC07							20	50	1.5
<i>Subject:</i>	Computer Applications in Civil Engg. Lab	0	0	3	-	-	30			

Course Learning Objectives:

The objective of this Course is

- To understand the need for software tools for analysis and design of Civil Engineering Structures.
- To use the software tools for Modelling, Analysis and Design of Civil Engineering Structures

Course Content:

Minimum 10 problems to be solved either by using STAAD Pro/Excel Programming

USING MS EXCEL Programs

1. Analysis of simple beams
2. Design of simply supported RCC beams
3. Design of columns
4. Design of isolated footing (Flat, stepped and sloped)
5. Design of combined footings
6. Design of cantilever retaining walls
7. Design of slabs (one way and Two way)

USING STAAD Pro

8. Analysis of simple beams and Frames (2-D)
9. Analysis of multi storey frames for DL and LL
10. Analysis of multi storey frames for DL, LL, WL/EQL
11. Design of structural elements
12. Analysis and design of combined footing
13. Analysis and design of roof truss
14. Analysis of simple beams for rolling loads

Course Outcomes

At the end of the course the students shall be able

- The students shall be able to analyse, determinate and Indeterminate Civil Engineering Structures.
- To design various RCC components of buildings and other Civil Engineering Structures

SEMESTER VII

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPC17							70	100	3
<i>Subject:</i>	Water Resources Engineering-II	3	0	0	15	15	30			

Course Learning Objectives:

- Introduce the types of dams and its failure criteria for structural stability
- Introduce the concepts of spillways and energy dissipaters
- Discuss the concept of diversion Head-works and understand design theory of seepage flow
- Introduce the concepts of regulation works, falls and hydraulic gates of spillways
- Know the concepts and design principles of Cross Drainage Works

Course Content:

UNIT 1: Dams: Types of Dams, Forces, failure of dams and criteria for structural stability, principle and shear stress, stability analysis, Elementary profile of a gravity dam, Profile from practical considerations, Openings in dams.

UNIT 2: Spillways and Energy Dissipaters: Introduction, essential requirements of a spillway, spillway capacity, components, Types of spillways, Ogee Spillway, Energy Dissipation below spillways, Types of Energy dissipater, USBR and Indian stilling basins.

UNIT 3: Diversion Head-works: Introduction, Types of diversion works, location and components, Weir and Barrage, Effect of construction of weir on the river regime, Bligh's creep theory, Theory of seepage flow, Khosla's theory, Vertical drop Weir.

UNIT 4: Regulation Works: Introduction, Definition of falls, necessity and location of falls, comparative study of the main types of falls. Hydraulic Gates: Spillway gates, types, tainter gates, Roller gates.

UNIT 5: Cross Drainage Works: Introduction, suitability, various types of C-D Works, Design principles of C-D Works

Text Books:

1. Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
2. Irrigation Engineering – B.C. Punmia (Laxmi Publications)
3. Irrigation, Water Resources and Water Power Engineering – Dr. P.N. Modi (Standard Book House)

Course Outcome

- Explain the various forces acting on gravity dam and its stability analysis
 - Design of ogee spillway and getting concept of energy dissipation
 - Explain the diversion head-works and the theory of seepage flow
 - Demonstrate the concept of regulation works, falls and spillways gates
- Apply the basic design principles of Cross Drainage Works

SYLLABUS

<i>Subject Code:</i>	CE07TPE02X	CREDIT S: 3			SESSIONAL - TA			ESE
<i>Subject:</i>	Professional Elective -2X	L	T	P	CT -I	CT -II	TOTAL	70
		3	0	0	15	15	30	
Professional Elective-2A or Professional Elective-2B or Professional Elective-2C or Professional Elective-2D or Professional Elective-2E		Any one subject to be Selected from the Professional Electives Group-2						
Professional Electives Group -2								
CE07TPE02A	Pre-stressed Concrete							
CE07TPE02B	Construction Engineering Materials							
CE07TPE02C	Disaster Preparedness and Planning							
CE07TPE02D	Advanced Structural Analysis							
CE07TPE02E	Low Cost Housing Techniques							

SYLLABUS	(SEMESTER VII)	Periods / Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE02A							70	100	3
<i>Subject:</i>	Pre-stressed Concrete	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce fundamental of pre stressing and develop understanding of pre stressing system.
- To determine loss of pre stress in pre tensioned and post tensioned members as per IS Code provision.
- To analyze simple and composite section in flexure.
- To evaluate deflection in beam and design simply supported beams as per IS Code provision.
- To design the members for shear reinforcement, Ultimate Shear Strength and end block design.

Course Content:

UNIT 1:Introduction: Fundamentals of prestressing - Classification and types of prestressing- Concrete Strength and strain characteristics - Steel mechanical properties - Auxiliary Materials like duct formers.

UNIT 2: Prestressing Systems: Principles of pretensioning and post tensioning - study of common systems of prestressing for wires strands and bars. Losses of Prestress: Losses of prestress in pre tensioned and post tensioned members - I.S. code provisions.

UNIT 3: Analysis of Sections: In flexure, simple sections in flexure, kern distance - cable profile - limiting zones - composite sections cracking moment of rectangular sections.

UNIT 4: Deflection of Beams: Long term and Short term deflection and Design of Simply Supported Beams, Allowable stress as per I.S. 1343 - elastic design of rectangular and I-sections.

UNIT 5: Shear and Bond: Shear and bond is prestressed concrete beams - conventional design of shear reinforcement - Ultimate shear strength of a section - Prestress transfer in pretensioned beams-Principles of end block design.

Text Books:

1. Krishna Raju. N “Prestressed Concrete”, Tata Mc Graw Hill.
2. Lin.T.Y, “Prestressed concrete”, Mc Graw Hill Pub. Co.
3. Rajagopalan, “Prestressed concrete”, Narosa Publishing House.

Course Outcomes-

- **Describe** mechanical properties of pre stressed concrete, types of pre stressing and its system.
- **Calculate** losses in pre-tensioned and post tensioned members.
- **Analyze** pre-stressed concrete members for flexure, shear and cracking moment.
- **Design** pre stressed concrete beams of rectangular and I section and compute deflection.
- **Explain** principle of end block design, pre stress transfer, shear and bond.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE02B							70	100	3
<i>Subject:</i>	Construction Engineering Materials	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce various construction materials on the basis of various classifications.
- To understand about various mortar making materials & its classification.
- To understand the emerging role of using polymers as construction material.
- To introduce about various modern construction materials.

Course Content:

UNIT-1 Construction Materials

Classifications of Construction Materials. Consideration of physical, Mechanical, thermo-physical Properties, characteristics behaviour under stress, Selection criteria for construction materials, green building materials.

UNIT-2 Materials for making Mortar and concrete

Lime manufacture, properties, hardening of lime, types of lime, lime concrete uses. Cement, pozzolanic material, aggregates, water, admixtures - characteristics, properties and uses. Types of mortars, special mortars, their properties and applications.

UNIT-3 Polymers in civil engineering

Rubber and plastics, properties, effect of temperature on mechanical properties. Uses and application. Polymers, fibres and composites, Fibre reinforced plastic. Architectural use and aesthetics of composites. Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers, Polymer foams and polymers in Building Physics. Polymer concrete composites

UNIT- 4 Metals & Ceramics

Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel, Corrosion of concrete and reinforcing steel in various environments. Ceramic Materials: Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistance materials, Uses and application.

UNIT V MODERN MATERIALS

Glass – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles– Geomembranes and Geotextiles for earth reinforcement.

Text Books:

1. Rangawala S.C. Engineering Materials Chortor Publications 1991.
2. S.K. Duggal Building Materials, New Age International Publications 2006.
3. Bruntley L.R Building Materials Technology Structural Performance & Environmental Impact McGraw Hill Inc 1995.
4. R Chudley Construction Technology, Vol I - IV Longman Group Construction Ltd. 1973.

Course Outcomes- On completion of this course the student will be able:

1. To remember & understand about various physical, Mechanical, thermo-physical Properties of various construction materials.
2. To Acquire knowledge about composition, microstructure, and engineering behavior of various materials used in civil engineering applications.
3. To understand about various Mortar & Concrete producing materials
4. To Remember & understand about modifications possibilities in construction materials.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
<i>Subject Code:</i>	CE07TPE02C	L	T	P	CT-I	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Disaster Preparedness and Planning	3	0	0	15	15	30			

Course Learning Objectives:

1. Provide an understanding of the social nature of natural hazards and disasters.
2. Give students knowledge of the social factors affecting disaster mitigation, preparedness, response, and recovery.
4. Reveal unfounded myths about human behaviour in disasters.
5. Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.
6. Teach students skills to use information technology to access current disaster-relevant information for assessing, planning, mitigating, responding to and recovery from disaster from local through global levels.

Course Content:

UNIT-1 Introduction – Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT–2 Disaster Impacts – Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT-3 Disaster Risk Reduction (DRR)– Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT- 4 Structural and non-structural safety measures

UNIT- 5 Development vs Sustainable Development

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques and Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Course Outcomes-

The student will develop competencies in

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

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE02D							70	100	3
<i>Subject:</i>	Advanced Structural Analysis	3	0	0	15	15	30			

Course Learning Objectives:

- To learn stiffness method for analyzing determinate and indeterminate structure.
- To study general theory regarding beams subjected to concentrated and distributed loads.
- To analyze curved beams in plane.
- To understand symmetrical and non-symmetrical bending of straight beams.
- To define basic fundamental of structural dynamics.

Course Content:

UNIT-1: Direct stiffness method Introduction - element stiffness matrix - rotation transformation matrix - transformation of displacement and load vectors and stiffness matrix - equivalent nodal forces and load vectors - assembly of stiffness matrix and load vector - determination of nodal displacements and element forces - analysis of plane truss - plane frame (with numerical examples) - analysis of grid - space-truss and space-frame (without numerical examples) - computer Implementation - introduction to analysis packages (A project on development of an analysis program using above method is envisaged at this stage)

UNIT-2: Beams on elastic foundation: general theory - infinite beam subjected to concentrated load - boundary conditions - infinite beam subjected to a distributed load segment - semi-infinite beam subjected to loads at its end - semi-infinite beam with concentrated load near its end - short beams.

UNIT-3: Beams curved in plane: Analysis of cantilever beam curved in plan - analysis of circular beams over simple supports

UNIT-4: Non-symmetrical bending of straight beams: Shear centre – a review, symmetrical and non-symmetrical bending - bending stresses in beams subjected to non-symmetrical bending - deflections of straight beams subjected to unsymmetrical bending - fully plastic load for unsymmetrical bending.

UNIT-5: Introduction to Structural Dynamics

Single degree of freedom – un-damped and damped vibration-free vibration - forced vibration, introduction to multi degree of freedom systems.

Text Books:

1. Wang, C. K., Matrix Methods of Structural Analysis, International Textbook Company, 1970.
2. Przemieniecki, J. S., Theory of Matrix Structural Analysis, McGraw Hill, New York, 1985.
3. Weaver, W., and Gere, J. M., Matrix Analysis of Framed Structures, CBS Publishers, 2004.
4. Rajasekaran, S., and Sankarasubramanian, G., Computational Structural Mechanics, PHI
5. Boresi, A. P. and Sidebottom, O. M., Advanced Mechanics of Materials, John Wiley and Sons, 2003.
6. Srinath, L. S., Advanced Mechanics of Solids, Tata McGraw Hill, 2009.
7. Timoshenko, S., Strength of Materials, Part II, CBS Publishers, 2002.
8. Reddy, C. S., Basic Structural Analysis, Tata McGraw Hill, New Delhi, 2007.
9. Paz M., Structural Dynamics, CBS Publishers, 2007.
10. Meirovich, L., Elements of Vibration Analysis, McGraw Hill, 2007.

Course Outcomes-

- To interpret force-displacement relationship in truss, space frame etc. using direct stiffness method.
- To investigate semi-infinite & infinite beam subject to concentrated and distributed loads.
- To analyze circular and cantilever beams curved in plane.
- To explain symmetrical and non-symmetrical bending of straight beams.
- To outline basic fundamental of structural dynamics; free & forced vibration and multi degree of freedom systems.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
<i>Subject Code:</i>	CE07TPE02E	L	T	P	CT-I	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Low Cost Housing Techniques	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce various housing technique adopted in different zones in country.
- To study various uses of cost effective Technologies.
- To learn needs and innovations of building techniques for low cost construction.
- To learn space norms for low cost construction.
- To learn about building materials and costing of low cost construction.

Course Content:

UNIT-1 An introduction to the subject to understand the various building techniques adopted in different climatic zones of the country, which resulting in varied vernacular expressions.

UNIT–2 Use of cost effective technologies through the use of local materials, up gradation of traditional technologies, prefabrication etc.

UNIT-3 Need for low cost construction, both in the rural and the urban sectors. Innovations of building techniques for low cost construction.

UNIT- 4 Analysis of space norms for low cost buildings. Study of usages pattern of low cost buildings by the habitants.

UNIT- 5 Comparative analysis of building materials and costing. Works of Laurie Baker, Hassan Fathy and other prominent architects.

Text Books:

1. “Building Systems for Low Income Housing”, Ashok Kumar Jain; Management Publishing House, 1992
2. “Low Cost Housing in Developing Countries”, Guru Charan Mathur; For Centre for Science & Technology of the Non-Aligned and Other Developing Countries, Oxford & IBH Publishing Company, 1993

Course outcomes:

Upon completion of this course students will be able to

- To classify various housing techniques adopted in different zones in country.

- To identify various uses of cost effective Technologies.
- To understand needs and develop innovations of building techniques for low cost construction.
- To explain space norms for low cost construction.
- To analysis about building materials and costing of low cost construction.

**SYLLABUS
(SEMESTER-VII)**

Subject Code:	CE07TPE03X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Professional Elective -3X	L	T	P	CT 1	CT 2	TOTAL	70
		3	-	-	15	15	30	
Professional Elective-3A or Professional Elective-3B or Professional Elective-3C or Professional Elective-3D or Professional Elective-3E		Any one subject to be Selected from the Professional Electives						
Professional Electives Group -3								
CE07TPE03A	Environmental Geo-technology							
CE07TPE03B	Air Pollution Control Engineering							
CE07TPE03C	Solid and Hazardous Waste Management							
CE07TPE03D	Design of Hydraulic Structures							
CE07TPE03E	Environmental Impact Assessment and Life Cycle Analysis							

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
<i>Subject Code:</i>	CE07TPE03A	L	T	P	CT-1	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Environmental Geo-technology	3	0	0	15	15	30			

Course Learning Objectives:

- Learning various soil engineering for land reclamation purposes, conversion of degraded waste land in new land use.
- Understanding land degradation and soil pollution and their restoration.
- Integration of engineering techniques with ecological process for restoration of productivity.

Course Content:

UNIT-1 Soil and ground water pollutants - their sources, nature, composition and polluting effects. The physico-chemical aspects of soils contaminated by various pollutants. Effects of environment and wastes on the properties of soils.

UNIT-2 Solid and liquid wastes disposal method and management. land treatment systems.

UNIT-3 Man made changes in geotechnical environment - mining, embankments, pumping, reservoir, landfills and reclamation effects and control.

UNIT- 4 Control of contamination with use of clay barriers, geosynthetics, cut-off walls, leachate collection systems.

UNIT- 5 Stabilization - different materials and techniques in control of ground pollution and treatment.

Text Books:

1. D.E.Daniel, Geotechnical Practice for Waste Disposal, Chaman & Hall, London, 1993
2. Hsai_Yang Fang and Daniels, J.L. Introductory Geotechnical Engineering an Environmental Perspective, Taylor & Francis, Oxon., 2006.
3. Lakshmi N. Reddy, Hilary. I. Inyang – Geo-Environmental Engineering – Principles and Applications – Makcel Dekker Ink, 2000
4. Mitchell, J.K. and Soga, K., Fundamentals of Soil Behaviour, John Wiley & Sons, Inc., New Jersey., 2005.
5. Mohamed, A.M.O. and Antia, H.E., Geo-environmental Engineering, Elsevier, Netherlands, 1998.

6. Reddy, L.N. and Inyang. H. I., Geo-environmental Engineering –Principles and Applications, Marcel Dekker, Inc., New York., 2000.
7. Yong, R. N., Geo-environmental Engineering: Contaminated Soils, Pollutant Fate and Mitigation”, CRC press LLC, Florida., 2001.

Course Outcomes-

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

CO-1: Understanding causes of soil pollution.

CO-2: Understand the fundamentals of soil behavior under varied environmental conditions.

CO-3: Identify contaminant transport mechanisms in soils.

CO-4: Specify site investigation techniques in the characterization of the contaminated site

CO-5: Understand remediation techniques to reclaim degraded land for conversion in to various land uses.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
<i>Subject Code:</i>	CE07TPE03B	L	T	P	CT-1	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Air Pollution Control Engineering	3	0	0	15	15	30			

Course Learning Objectives:

The objective of this course is to:

- Comprehend the essential concepts of ambient air pollution and pollution control
- Make aware of techniques and instrumentation of ambient air monitoring, establishment of ambient air monitoring stations, stack monitoring
- Explore the experimental analysis of air gaseous and particulate air pollutants; standards and limits.

Course Content:

Unit 1: INTRODUCTION: Sources and classification of Air pollutants: Natural contaminants, Aerosols, Gases & Vapors; Primary & Secondary Air pollutants; Stationary & Mobile Sources. Meteorology and Air pollution: Factors influencing Air pollution; Atmospheric stability & temperature inversions; Mixing height; Plume behavior; Wind rose; Stack effluent dispersion theories; Stack height.

Unit 2: SAMPLING PROCEDURES: Sampling Methods, Difficulties in sampling, Stages & considerations of air sampling, Instruments for sampling waste gases & atmosphere, sampling period & methods, High volume sampler, Stack sampling techniques, selection of sampling location, procedure for collection & sampling of particulate matter, Gaseous sampling, recent trends in sampling of stack effluents.

Unit 3: Control of Particulates / aerosols: Objectives & types of Collection equipment; Principle, application, working, advantages & disadvantages of: i) Settling chambers, ii) Inertial separators, iii) Cyclones, iv) Filters, v) Electrostatic Precipitators & vi) Scrubbers; Choice of equipment.

Unit 4: Control of Smoke -Gaseous Contaminants & Odour: Smoke: Sources, measurement by Ringelmann chart, miniature chart & other method; Prevention & control of smoke. Control of exhaust emissions. Gaseous Contaminants:

Methods of control viz combustion, absorption, adsorption, closed collection & masking. Odour Control.

Unit 5: Control measures for Industrial Applications: Introduction to control of air pollution by process changes. Control measures for industries such as Cement Industry, Concrete batching plant, Asphaltic concrete plant, Glass manufacture, Asbestos processing, Thermal Power plant and Coal tar industry.

Text Books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering.
2. Martin Crawford: Air Pollution Control Theory.
3. Wark and Warner: Air Pollution: Its Origin and Control.
4. M.N.Rao & HVN Rao, Air Pollution, Tata McGraw-Hill Publishing Company Limited, New Delhi.
5. Environmental Pollution Control Engineering- CS Rao, Wiley Eastern Ltd., New Delhi, 1996.
6. Environmental Noise Pollution – PE Cunniff, McGraw Hill, New York, 1987
7. Mycock, McKenna and Theodore: Handbook of Air Pollution Control Engineering and Technology.
8. Suess and Craxford: W.H.O. Manual on Urban Air Quality Management

Course Outcomes-

After studying the course, the students will be able to

CO1: Understand & attribute air pollution, its driving forces, meteorological influence, impacts and control options.

CO2: Identify sampling techniques and analyze the air pollutants in ambient air & chimney.

CO3: Determine the stack height, assess the plume behavior and apply dispersion model for computing pollutant concentration.

CO-4: Understand the sources, measurements and control techniques for smoke and odour nuisance.

CO-5: Apply different control measures in Industrial air pollutant emissions.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE03C							70	100	3
<i>Subject:</i>	Solid and Hazardous Waste Management	3	0	0	15	15	30			

Course Learning Objectives:

- To define and characterize municipal solid wastes from technical and regulatory points of view.
- To provide comprehensive ways of collection, transportation and management of different types of solid wastes.
- To classify the waste and remove hazardous wastes; apply different methods of management.
- .To introduce the most common techniques for hazardous waste disposal.
- To use laboratorial tests in sampling & characterization of solid wastes.

Course Content:

UNIT-1: Municipal Solid Waste Management: Legal and Organizational foundation: Definition of Solid Waste, Waste Generation Technological Society, Major Legislation, Monitoring Responsibilities, Sources and Types of Solid Waste, Sampling and Characterization – Determination of Composition of MSW, Storage and Handling of Solid Waste ,Future Changes in Waste Composition.

UNIT-2: Collection and Transport of Solid Waste: Collection of Solid Waste: Type of Waste Collection Systems, Analysis of Collection System, Alternative Techniques for Collection System, Separation, Processing and Transformation of Solid Waste: UNIT Operations User for Separation and Processing, Materials Recovery Facilities, Waste Transformation through Combustion and Aerobic Composting, Anaerobic Methods for Materials Recovery and Treatment, Energy Recovery.

Incinerators Transfer and Transport: Need for Transfer Operation, Transport Means and Methods, Transfer Station Types and Design

Requirements, Landfills, Site Selection, Design and Operation, drainage and Leachate Collection Systems , Requirements and Technical solution, Designated Waste Landfill Remediation, Integrated Waste Management Facilities.

UNIT-3: Hazardous Waste Management: Definition and Identification of Hazardous Wastes-Sources and Characteristics, Hazardous Wastes in Municipal Waste ,Hazardous Wastes Regulations ,Minimization of Hazardous Waste-Compatibility, Handling and Storage of Hazardous Waste-Collection and Transport, e-waste Sources, Collection, Treatment and Reuse Management.

UNIT-4: Hazardous waste treatment and Design: Hazardous Waste Treatment Technologies, Design and Operation , Facilities for Physical, Chemical and Thermal Treatment of Hazardous Waste –,Solidification, Chemical Fixation and Encapsulation, Incineration, Hazardous Waste landfills: Site Selection, Design and Operation, Remediation of Hazardous Waste Disposal Sites.

UNIT-5: Laboratory Practice: Sampling and Characterization of Solid Wastes; TCLP Tests and Leachate Studies.

Text Books:

- 1) Integrated Solid Waste Management by George Tchobanoglous et al, McGraw-Hill Publication, 1993.
- 2) Hazardous Waste Management by Charles A. Wentz, McGraw Hill Publication, 1995.

Reference Books:

- 1)Solid and Hazardous Waste Management by S.C. Bhatia, Atlantic Publishers; Edition (1 December 2007).
- 2) Solid and Hazardous Waste Management by M.N Rao & Razia Sultana,BS Publications, Second Edition (2020)

Course Outcomes- At the end of the course completion, the students shall be able to:

CO1 Ability to characterize municipal solid wastes from technical view.

CO2 Learn ways of collection ,transportation and management of different types of solid wastes.

CO3 Apply different methods of managements for hazardous wastes.

CO4 Develop most suitable techniques for disposal of hazardous wastes.

CO5 Learn different laboratorial tests for solid wastes.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE03D							70	100	3
<i>Subject:</i>	Design of Hydraulic Structures	3	0	0	15	15	30			

Course Learning Objectives:

- Recognise the different types of dams, identify its purpose and function and to select the most appropriate dam.
- To introduce and give explanation the Principles of Design of Hydraulic Structures.
- To develop understanding for Analysis of gravity dam.
- To develop understanding about Earth dam and stability analysis.
- To introduce the importance of Spillways and energy dissipation systems.

Course Content:

UNIT 1: Introduction - Classification of dams, Gravity dams, Earth dams, Arch dam, Buttress dam, Steel dams, Timber dams, selection of site for dam, selection of type of dam, investigations of dam sites, Engineering surveys, Geological investigations, Types of hydropower plants, site selection for power plant, General arrangement of a hydropower project.

UNIT 2: Principles of Design of Hydraulic Structures - Hydraulic structures on permeable foundations, Theories of subsurface floor, Khosla's method of independent variables, Exit gradient, Location of Hydraulic jump, water surface profiles, scour due to subsurface flow, Design Principles, Energy dissipation principles.

UNIT 3: Gravity Dams - Types of storage head works, Forces acting on gravity dams, Analysis of gravity dams, Profile of a gravity dam, Finite Element Method, Design of gravity dam, joints in gravity dam, Galleries in gravity dam, Adits and shafts, Construction of gravity dam, Foundation Grouting, Instrumentation of gravity dams.

UNIT 4: Earth dams - Types of earth dams, Causes of failure of earth dams, Seepage analysis, phreatic line, flow net construction, criteria for safe design of

gravity dams, typical cross sections of earth dams, Stability analysis, Seepage control, and design of filters.

UNIT 5: Spillways and energy dissipation systems - Essential requirements of spillways, Required spillway capacity, component parts of spillway, Types of spillways, Design of Ogee spillway, Design of shaft spillway, Design of siphon spillway, Design of stilling basins. Hydropower structures - Storage power plant, Runoff River plant, Pumped storage plant, Water conveyance systems, Tunnels and Penstocks, Gates, Surge tanks, Power house layout.

Text Books:

1. Golze, A. R., Handbook of Dam Engineering, Von Rostrand Reinhold Co., 1977
- Sharma, H.D., Concrete Dams, CBIP Publication, 1998.
3. Siddiqui, I H, Dams and Reservoirs: Planning, Engineering, Oxford University Press, USA, 2009.
4. Novak, P., Moffat, A. I. B., Nalluri, C and Narayan, R., Hydraulic Structures, Taylor & Francis, 2006.
5. Modi P.M., Irrigation Water Resources and Hydropower Engineering, Standard Publishing Company, New Delhi, 2000.
6. Arora K.L. Irrigation Water Resources Engineering, Standard Book Publishing Co., Delhi, 1996.

Course Outcomes-

- Define different types of dams.
- Describe the Principles of Design of Hydraulic Structures.
- Explain the concept of Gravity Dams.
- Explain the concept of Earth dams and its stability analysis.
- Describe the concept of spillways and energy dissipation systems.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE03E									
<i>Subject:</i>	Environmental Impact Assessment and Life Cycle Analysis	3	0	0	15	15	30	70	100	3

Course Learning Objectives:

- Identify environmental attributes for the EIA study.
- Identify methodology and prepare EIA reports.
- Specify methods for prediction of the impacts.
- Formulate environmental management plans.
- Understand the concept of life cycle analysis (LCA) and the basic principles.

Course Content:

UNIT-1 Introduction: Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India.
 – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA – Public Participation in EIA. EIA process- screening – scoping - setting – analysis – mitigation

UNIT–2 Components and Methods for EIA: Matrices – Networks – Checklists
 – Connections and combinations of processes – Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modelling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment – Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation. EIA methods in other countries.

UNIT-3 Environmental Management Plan: Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment.

UNIT- 4 An Introduction to Sustainability Concepts and Life Cycle Analysis (Introduction, Material flow and waste management, What it all means for an engineer? Water energy and food nexus). Risk and Life Cycle Framework for Sustainability (Introduction, Risk, Environmental Risk Assessment, Example Chemicals and Health Effects, Character of Environmental Problems)

UNIT- 5 Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments, Overview of LCA Methodology - Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools). Life Cycle Assessment – Detailed Methodology and ISO Framework (Detailed Example on LCA Comparisons, LCA Benefits and Drawbacks, Historical Development and LCA Steps from ISO Framework)

Text Books:

1. Anjaneyulu.Y., and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Canter, L.W., Environmental Impact Assessment, McGraw Hill Pub. Co., New York. 1997
3. David P. Lawrence, Environmental Impact Assessment: Practical Solutions to Recurrent Problems, John Wiley & Sons, 2003
4. Environmental Assessment, 2001. Ravi Jain, LV Urban, GS Stacey, H Balbach, McGraw-Hill.
5. Handbook on Life Cycle Assessment : Operational guide to the ISO standards, Kluwer Academic Publishers, 2004
6. Hosetti, B. B., Kumar A, Eds, Environmental Impact Assessment & Management, Daya Publishing House, 1998
7. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Inter science, New Jersey, 2003.
8. Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science, London, 1999.
9. Rau, GJ. And Wooten, C.D., Environmental Impact Analysis Handbook, McGraw Hill 1980
10. Wathern.P., Environmental Impact Assessment- Theory and Practice, Routledge Publishers, London, 2004.

Course Outcomes At the end of the course the student will be able to:

CO1 Identify environmental attributes for the EIA study.

CO2 Identify methodology and prepare EIA reports.

CO3 Specify methods for prediction of the impacts.

CO4. Understand EIA tools & methodologies, auditing and documentation of EIA

CO4 Formulate environmental management plans

CO5 Perform life cycle inventory analysis of products.

CO6 Develop strategies to bring energy efficiency in all stages of the product development cycle.

CO7 Formulate plans for comprehensive environmental protection, in order to comply with environmental laws

**SYLLABUS
(SEMESTER-VII)**

Subject Code:	CE07TPE04X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Professional Elective -4X	L	T	P	CT 1	CT 2	TOTAL	70
		3	-	-	15	15	30	
Professional Elective-4A or Professional Elective-4B or Professional Elective-4C or Professional Elective-4D or Professional Elective-4E		Any one subject to be Selected from the Professional Electives						
Professional Electives Group -4								
CE07TPE04A	Engineering Hydrology							
CE07TPE04B	Structural Dynamics							
CE07TPE04C	Foundation Engineering							
CE07TPE04D	Rock Mechanics							
CE07TPE04E	Water Resources Planning & Management							

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE04A							70	100	3
<i>Subject:</i>	Engineering Hydrology	3	0	0	15	15	30			

Course Learning Objectives:

- 1) To develop the fundamentals of hydrology.
- 2) To study the various forms of precipitation, evaporation and infiltration
- 3) To know the types of Hydrograph and Rainfall-Runoff correlations
- 4) To learn the Flood forecasting and Flood routing methods
- 5) To understand the fundamentals of ground water hydrology

Course Content:

UNIT-1 Introduction- Description of Hydrologic Cycle, Overview of application of hydrology in engineering. Precipitation, Infiltration and Evapotranspiration Runoff and Hydrographs,

UNIT-2 Forms of precipitation, measurement, depth-area-duration and intensity-duration frequency relations, Evaporation - process, measurement, and estimation, Infiltration process, measurement, and estimation, Evapotranspiration measurement and estimation

UNIT-3 Rainfall Runoff correlations, Flow duration curve, Mass curve, Factors affecting flow hydrograph, Unit hydrograph, its analysis, and S-curve hydrograph, Synthetic and instantaneous unit hydrographs.

UNIT- 4 Statistical analysis, Flood frequency studies, Flood forecasting, rational method, Time Area curves, Risk, reliability, and safety factor, Flood control measures. Introduction to basic routing equations, Design flood, Channel and flood routing. Introduction to HEC-RAS software.

UNIT- 5 Occurrence of groundwater, types of aquifers, aquifer properties, Darcy's law, Conductivity and Transmissivity, yield from a well under steady state conditions, Laboratory and field measurement of permeability

Text Books:

1. Engineering Hydrology K.Subramanya, Tata McGraw-Hill Education
2. Hydrology Principles, Analysis and Design H.M.Raghunath, New Age International
3. Hand Book of Applied hydrology V.T.Chow, McGraw-Hill, Inc
4. Viesmann W and Lewis G Lt (2008) “Introduction to Hydrology”. Prentice Hall of India
5. Ojha,C.S.P. , Bhunya, P. and Berndtsson, R.- Engineering Hydrology, Oxford University Press Canada.
6. K. C. Patra, Hydrology and Water Resources Engg., Narosa Publishing house, New Delhi.
7. D. K. Todd, Groundwater Hydrology, John Wiley and Sons

Course Outcomes- Upon completion of this course students shall be able to

- 1) Describe the basic concepts of hydrology and integrate the physical hydrological processes.
- 2) Explain the various process, measurement, and estimation of hydrological components
- 3) Formulate the runoff and hydrograph’s estimation and apply into engineering practices.
- 4) Examine the various statistical methods for Flood studies and can investigate historical datasets.
- 5) Understand and explain the basics of groundwater hydrology.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE04B							70	100	3
<i>Subject:</i>	Structural Dynamics	3	0	0	15	15	30			

Course Learning Objectives:

- 1) To Introduce fundamentals of vibrations of SDOF system
- 2) To Impart damped and undamped system
- 3) To Present free and forced vibration
- 4) To Acquaint with free and forced vibration of MDOF system
- 5) To Present free and forced vibration of continuous system

Course Content:

UNIT- 1: INTRODUCTION: Comparison between static and dynamic analysis; Degrees of freedom; Undamped system; Newton's law of motion; 'D' Alembert's principle; Solution of the differential equation of motion.

UNIT-2: FREE VIBRATION OF SINGLE DEGREE - OF - FREEDOM SYSTEM: Equation of motion for single degree - of - freedom system; free undamped vibration of the SDOF system; Damped single degree - of - freedom system -Viscous damping, Equation of motion, critically damped system, Over-damped system. Under-damped system and Logarithmic decrement.

UNIT-3: RESPONSE OF SDOF SYSTEM TO HARMONIC LOADING: Undamped harmonic excitation; Damped harmonic excitation; Evaluation of damping at resonance; Response to support motion; Force transmitted to the foundation. Response of SDOF system to general dynamic loading; Impulsive loading and Duhamel's integral; Numerical evaluation of Duhamel's integral — Undamped system; Numerical evaluation of Duhamel's integral - Damped system.

UNIT-4: GENERALIZED COORDINATES AND RAYLEIGH'S METHOD: Principle of virtual work; Generalized SDOF system - Rigid body; Generalized SDOF system - Distributed elasticity; Rayleigh's method; Improved Rayleigh's method.

UNIT-5: STRUCTURES MODELED AS SHEAR BUILDINGS: Stiffness equations for the shear building; Flexibility equations for the shear building;

Free vibration of a shear building (Single bay two Storeyed) - Natural frequencies and normal modes. Forced motion of shear buildings (Two Storeyed): Modal superposition method; Response of a shear building to base motion; Harmonic forced excitation.

Text Books/Reference Books:

1. Dynamics of Structures by A.K.Chopra, Second edition (2001), Prentice Hall India Private Ltd
2. Dynamics of Structures by Clough, R.W. & Penzin, J., McGraw Hill, 1993.
3. Earthquake Resistant Design of Structures by Pankaj Agarwal, Manish Shrikhande , 1st edition (2006), Prentice Hall of India Private Ltd., New Delhi .
4. Dynamics of Structures by Humar, J.L., Prentice Hall, 1990.
5. Structural Dynamics by Mario, Paz, CBS Publ. New-Delhi, 1995.
6. Advanced Dynamics by Timoshenko, S., McGraw Hill Book Co, NY, 1948.
7. Elements of Vibration Analysis by Meirovitch, L., 2nd Edi. McGraw Hill Intr. Edi.,Singapore, 1986.
8. Introduction of Structural Dynamics, Biggs, J.M., McGraw Hill, NY, 1964
9. Principles and techniques of vibrations by L Meirovich, 1997, Prentice Hall, NJ.
10. Analytical methods in vibrations by L Meirovich, 1967, Macmillan, NY.
11. Theory of vibrations by W T Thompson, 1983, Prentice hall, New Delhi
12. Vibration: fundamentals and practice by C W de Silva, 1999, CRC Press, Boca Raton.
13. Mechanical Vibrations by S S Rao, 2004, 4th Edition, Pearson Education, New Delhi.
14. Probabilistic theory of structural dynamics by Y K Lin, 1967, Mc-GrawHill.
15. Introduction to random vibrations, N C Nigam, 1983, The MIT press, Massachussets.

Course Outcomes:

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

- 1) Convert a physical structure into SDOF system/model
- 2) Find response of free and force vibration (harmonic, periodic and transient) of SDOF system
- 3) Calculate natural frequency and mode shapes of MDOF system

- 4) Carry out modal analysis of MDOF system
- 5) Get the Response of structures by performing experiments and/or by computer simulation.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE04C							70	100	3
<i>Subject:</i>	Foundation Engineering	3	0	0	15	15	30			

Course Learning Objectives:

- To introduction of different methods of soil exploration.
- To provide comprehensive studies of shallow foundation and calculate settlements.
- To analyze various types of footings & rafts.
- To introduction of various types of piles foundations and to calculate bearing capacity.
- To introduce Comprehensive studies of Retaining walls and determine stability.

Course Content:

UNIT-1 SITE INVESTIGATION AND SELECTION OF FOUNDATION

Scope and Objectives, Methods of Exploration , Auguring and Boring ,Wash Boring and Rotary Drilling ,Depth and Spacing of Bore Holes ,Soil Samples ,Representative and Undisturbed, Sampling Methods Split Spoon Sampler, Thin Wall Sampler, Stationary Piston Sampler ,Penetration Tests (SPT and SCPT) ,Data Interpretation ,Strength Parameters ,Bore Log Report and Selection of Foundation.

UNIT-2 SHALLOW FOUNDATION

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 Bearing Capacity from In-Situ Tests (SPT, SCPT and Plate Load) ,Allowable Bearing Pressure , Seismic Considerations in Bearing Capacity Evaluation, Determination of Settlement of Foundations on Granular and Clay Deposits ,Total and Differential Settlement , Allowable Settlements , Codal Provision , Methods of Minimizing Total and Differential Settlements.

UNIT-3 FOOTINGS AND RAFTS

Types of Isolated Footing, Combined Footing, Mat Foundation, Contact Pressure and Settlement Distribution, Proportioning of Foundations for Conventional Rigid Behavior, Minimum Thickness for Rigid Behavior, Applications, Compensated Foundation, Codal Provisions.

UNIT- 4 PILE FOUNDATION

Types of Piles and Functions ,Factors Influencing the Selection of Pile , Carrying Capacity of Single Pile in Granular and Cohesive Soil , Static Formula ,Dynamic Formulae (Engineering News and Hileys) ,Capacity from In-Situ Tests (SPT and SCPT) , Negative Skin Friction , Uplift Capacity, Group Capacity by Different Methods (Feld's rule, Converse — La-Barrae formula and Block Failure Criterion) ,Settlement of Pile Groups , Interpretation of Pile Load Test (Routine Test Only), Under Reamed Piles, Capacity under Compression and Uplift , Cohesive -Expansive ,Non Expansive — Cohesionless Soils , Codal Provisions.

UNIT- 5 RETAINING WALLS

Plastic Equilibrium in Soils ,Active and Passive States , Rankine's Theory for Cohesionless and Cohesive Soil ,Coulomb's Wedge Theory , Condition for Critical Failure Plane ,Earth Pressure on Retaining Walls of Simple Configurations , Culmann's Graphical method ,Pressure on the Wall due to Line Load ,Stability Analysis of Retaining Walls ,Codal Provisions.

Text Books:

- 1) Foundation Analysis and Design by J. E. Bowels, McGraw Hill. Companies, Inc. 6th Ed. 2001.
- 2) Principles of Foundation Engineering by B. M. Das, CENGAGE Learning. Seventh Edition.
- 3) Foundation Engineering Handbook by R. W. Day, McGraw Hill. ConstructionASCE Press. Ed. 2006.

Reference Books:

- 1) Basic and Applied Soil Mechanics by Gopal Ranjan & A.S. R. Rao, New Age International (P) Limited Publishers, New Delhi-110002.
- 2) Textbook of Soil Mechanics and Foundation Engineering –Geotechnical Engineering Series (PB 2018) by V.N. S. Murthy, CBS Publications, New Delhi

- 3) Soil Mechanics by Robert V. Whitman & T. William Lambe, Wiley India Pvt Ltd., New Delhi.
- 4) Soil Mechanics and Foundation Engineering (Geotechnical Engineering) by Dr. P.N. Modi, Standard Book House(Rajsons Publications Pvt Ltd), New Delhi-110002

Course Outcomes-At the end of the course completion, the students shall be able to:

- CO1 Understand different methods of soil exploration.
- CO2 Analyze various shallow foundations and calculate different types of settlements.
- CO3 Understand various types of footings & rafts.
- CO4 Analyze bearing capacity of piles with different methods
- CO5 Design stability of Retaining walls.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE04D	L	T	P	CT-1	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Rock Mechanics	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the basics of rock mechanics and able to analysis stress.
- To calculate strain and determine physical properties of rocks.
- To determine mechanical properties of rocks by different methods.
- To analyse different models of stress–strain in rocks.
- To determine the static & dynamic elastic constants of rocks.

Course Content:

UNIT – 1: INTRODUCTION TO ROCK MECHANICS

Definition, Scope, Importance & Development, Application in Mining, Discontinuities; Description of Discontinuities, Introduction to Mapping and Hemispherical Projection of Discontinuities, Barton’s Shear Strength of Joints.

Analysis of Stress: Introduction, Definition and Basic Concepts, Stress in a Plane(2-D), Mohr’s Circle of Stress, Secondary Principal Stress, Equations of Equilibrium, Plane Stress Equations.

UNIT – 2: ANALYSIS OF STRAIN

Introduction, Definition and Basic Concepts, Strain in a Pane (2-D), Mohr’s Circle of Strain, Equations of Compatibility, Stress-Strain Relationship, Basic Equations in Elastic Theory, Pain Strain Equations, Elasto Plastic Behaviour of Rocks, Stress – Strain Curves of Various Rocks.

Physical Properties: Definition and Determination of Density, Hardness, Porosity, Permeability, Moisture Content, Degree of Saturation. Electrical and Thermal Properties of Rocks.

UNIT – 3: MECHANICAL PROPERTIES

Definition and Determination of Compressive Strength, Tensile Strength, Shear Strength, Triaxial Testing. Time Dependent Properties, Scaling of Laboratory Data to In-Situ Values.

Rock Indices: Protodyakanov Strength Index, Point Load Strength Index, RQD, In-Situ Strength Properties of Rocks, Necessity and Requirement, Methods of In-Situ Stress Measurements, Plate Load Test, Cable Jack Test, Bore Hole Test, Dilatometer Test, Flat Jack Test, Hydraulic Fracture and Velocity Propagation.

UNIT – 4: RHEOLOGICAL MODELS

Relationship and Rate of Change of Stress-Strain for Idealizing Materials – Models Representing Elastic, Plastic, Viscous, Elasto-Plastic, Non-Elastic and Brittle Rock Properties.

UNIT – 5: STATIC AND DYNAMIC ELASTIC CONSTANTS OF ROCKS

Static Elastic Constants of Rocks: Introduction, Definition, Instrument, Measurement of Deformation, Mechanical, Optical, Electrical Gauges, LVDT, Calculation of Elastic Constants of Rocks.

Dynamic Elastic Constants of Rocks: Introduction, Elastic Wave, Calculation of Modulus of Elasticity.

TEXT BOOKS:

- 1) Rock Mechanics for Engineers - B. P. Verma, 2nd edition, Khanna Publishers, 1989.
- 2) Strata Mechanics in Coal Mining - Jeremic, K. L. Jeremic, Rotterdam, Balkema, 1985.
- 3) Fundamentals of Rock Mechanics - Jager & Cook, Methuen andco. London, 1969.

REFERENCE BOOKS:

- 1) Hand Book on Mechanical Properties of rocks - R.D. Lama, V. S. Vutukuri, Vol. I to IV, Transtech Publications, 1978.
- 2) Mechanics and Engineering - Charles Jaeger, Cambridge University Press, 1979.
- 3) Rock Mechanics for Underground Mining - 2nd edition, Brady and Brown, Kluwer Academic Publishers, 1993.
- 4) Ground Mechanics in Hard rock Mining - M. L. Jeremic, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.
- 5) Rock Mechanics and Design of Structures in Rock - L. Obert & W.I. Duvall, John wiley and Sons, 1966.

- 6) Introduction to Rock Mechanics - R. E. Goodman, 2nd edition, John Wiley and Sons, 1989.
- 7) The elements of Mechanics of Mining Ground - B. S. Verma Vol. I. Julin & Co. Lucknow 1981.
- 8) Engineering Rock Mechanics, An Introduction to the Principles - John A. Hudson and John. P. Harrison Pergamon Press 1997.

Course Outcomes: At the end of the course completion, the students shall be able to:

- CO1 Learn basics of rock mechanics and calculate stresses.
- CO2 Determine physical properties of rocks and strain.
- CO3 Evaluate mechanical properties of rocks.
- CO4 Compare stress strain in rocks by different methods.
- CO5 Determine the static & dynamic elastic constants of rocks.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE04E							70	100	3
<i>Subject:</i>	Water Resources Planning & Management	3	0	0	15	15	30			

Course Learning Objectives:

1. To learn how to assess water resources
2. To study how to develop suitable plans for water resources development and management
3. To understand various types of water resources systems.
4. To learn managing the water resources quality and quantity
5. To understand water quantity and quality modelling.

Course Content:

UNIT 1: Introduction: Role of water in national development, assessment of water resources of country, scope of water resources development vis-a-vis environment, Irrigation development in India, utilisation of Irrigation potential.

UNIT 2: Planning: Water resources planning process; planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives, cost-benefit analysis.

UNIT 3: Water Resources Systems: Definition, types of system, optimization techniques, system approach, system analysis, linear programming, and formulation of a linear programming problem, formulation with different types of constraints, graphical analysis, graphical solution, simplex method, optimization techniques and systems approach.

UNIT 4: Management: Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation, flood control and power generation, inter-basin transfer of water, conjunctive use of surface and ground water.

UNIT 5: Modelling: Water quantity and quality modelling, evaluation of

impacts of water resources projects on river regimes and environment, reservoir sedimentation and watershed management.

Text Books:

1. Principles of Water Resources Planning – Good Man, A.S., (Prentice Hall, Inc., Englewood Cliffs, N.J. 1984.)
2. Water Resources Systems -S Vedula and P P Mujumdar, Tata McGraw-Hill Education, 2005
3. James, L. Douglas, and Robert R. Lee, Economics of Water resources Planning, McGraw-Hill Book Company, 1971.
4. Quentin Grafton, R. and Karen Hussey, Water Resources Planning and Management, Cambridge University Press, 2011.
5. Water Resources System, Planning and Management – M.C. Chaturvedy (Tata McGraw Hill)
6. Water Resources System, Planning and Management – Helweg O.J. (John and Wiley & Sons)

Course Outcomes- after completion of the course the students shall be able to

1. Describe the potential of assessing water resources
2. Prepare master and strategic water resources planning
3. Apply the optimization techniques for water resources systems.
4. Exercise the management of water resources in different real life situations
5. Solve various water resources problems using modelling.

**SYLLABUS
(SEMESTER-VII)**

Subject Code:	CE07TPE05X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Professional Elective -5X	L	T	P	CT 1	CT 2	TOTAL	70
		3	-	-	15	15	30	
Professional Elective-5A or Professional Elective-5B or Professional Elective-5C or Professional Elective-5D or Professional Elective-5E		Any one subject to be Selected from the Professional Electives						
Professional Elective-5 (PE Group-5)								
CE07TPE05A	Industrial Structures							
CE07TPE05B	Airport Planning and Design							
CE07TPE05C	Highway Construction and Management							
CE07TPE05D	Contracts Management							
CE07TPE05E	Construction Projects Planning & Systems							

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
<i>Subject Code:</i>	CE07TPE05A	L	T	P	CT-1	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Industrial Structures	3	0	0	15	15	30			

Course Learning Objectives:

The purpose of this course is to develop an in-depth knowledge in the area of design of industrial structure with the latest code of practice as per the Indian Standard.

Course Content:

UNIT: I Planning and functional requirements- classification of industries and industrial structures- planning for layout- requirements regarding lighting ventilation and fire safety- protection against noise and vibrations

UNIT: II Industrial buildings- roofs for industrial buildings (Steel) - design of gantry girder- design of corbels and nibs- machine foundations

UNIT: III Design of Pre-Engineered Buildings

UNIT: IV Power plant structures- Bunkers and silos- chimney and cooling towers- nuclear containment structures.

UNIT: V Power transmission structures- transmission line towers- tower foundations- testing towers

TEXT BOOKS

1. Handbook on Machine Foundations by P. Srinivasulu and C. V. Vaidyanathan, Structural Engineering Research Center
2. Tall Chimneys- Design and Construction by S. N. Manohar Tata Mc Grawhill Publishing Company

REFERENCES:

1. Transmission Line Structures by S. S. Murthy and A. R. Santakumar McGraw Hill
2. SP 32: 1986, Handbook on functional requirements of Industrial buildings
3. Design of steel structures by N. Subramanian

Course Outcomes-

Course Outcomes: At the end of the course, the student will be able to -

CO1 Plan the functional requirements of structural systems for various industries.

CO2 Get an idea about the materials used and design of industrial structural elements.

CO3 Realize the basic concepts and design of power plant structures.

CO4 Design power transmission structures.

CO5 Possess the ability to understand the design concepts of Chimneys, bunkers and silos

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE05B							70	100	3
<i>Subject:</i>	Airport Planning and Design	3	0	0	15	15	30			

Course Learning Objectives:

1. To familiarize students with of airport planning.
2. To develop the knowledge for design and analysis of airport runway, taxiway and airport pavement crust.
3. To understand air traffic control system.

Course Content:

UNIT-1 Airport Planning: Significance of transport, Different modes of transportation, Airport master plan- FAA recommendation. Regional planning, airport site selection, survey for site selection, Estimation of future air traffic, Characteristics of aircraft, Environmental consideration.

UNIT-2 Runway Design: Orientation of runway , Basic runway length, Corrections for basic runway length, Runway geometric design

UNIT-3 Taxiway Design: Controlling factors of taxiway, Geometric design for taxiway, Design for exit taxiways.

UNIT- 4 Airport Pavement Design: Design factors, Design of flexible pavement, Design of rigid pavement, design of overlay pavements

UNIT- 5 Air Traffic Control and Visual Aids: Air traffic control objectives, control system. Visual aids-airport markings and lighting

Text Books:

1. Dr. S. K. Khanna, M.G. Arora and S.S. Jain, Airport Planning & Design, Nem Chand & Bros.,Roorkee
2. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi
3. S.C. Rangwala and K.S, Rangwala, Airport Engineering, Charotar Publishing House Pvt. Ltd, Anand

Course Outcomes-

After learning the course the students should be able to:

1. Understand the fundamentals of airport planning.
2. Familiarize with design of runway.
3. Recognize design of taxiway
4. Understand airport pavement design
5. Analyse air traffic control system.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE05C									
<i>Subject:</i>	Highway Construction and Management	3	0	0	15	15	30	70	100	3

Course Learning Objectives:

1. To familiarize students with highway construction materials.
2. To develop ability to pavement design.
3. To instruct students to concept of evaluation and strengthening of pavement.
4. To interpret students to concept of highway drainage.
5. To develop knowledge on concept of highway maintenance.

UNIT 1: Highway Materials: Soil, Desirable Properties, Classification, CBR, G. I., Modulus of Subgrade Reaction, Aggregates and their Characterisations, Bituminous materials, Bituminous mixes, Concept of Superpave.

UNIT 2: Construction of Pavement: Highway Constructions - Earth Roads, Gravel roads, Soil Stabilized Roads, WBM Roads, Bituminous roads. Surface dressing, Seal Coat, Tack, Coat, Prime Coat, Grouted Macadam, Premix Methods and their Construction Procedures Construction of Cement Concrete Pavement Slab.

UNIT 3: Evaluation And Strengthening: Flexible And Rigid Pavement Evaluation, Strengthening of Pavements, Design of Overlays

UNIT 4: Highway Drainage: Significance of highway drainage, requirements of highway drainage, Design of surface drainage system, Design of sub-surface drainage system, Road construction in water-logged areas.

UNIT 5: Highway Maintenance: Types of defects in Flexible and Rigid pavement, Causes and Treatment, Special repairs. Pavement Evaluation- Pavement surface conditions and Structural Evaluation.

Text Books:

1. S.K. Khanna and C.E.J. Justo, “Highway Engineering”, Nem Chand Publication.
2. Partha chakrobarty & Animesh Das “Principles of Transportation Engineering”,PHI.
3. Subhash C Saxena “textbook of Highway and traffic engineering” CBS publishers and distributions pvt. Ltd.
4. L.R.Kadiyali&N.B.Lal, “Principles & Practices of Highway Engg, Khanna Publishers.
5. Specification for Road and Bridge Works (Ministry of Surface Transport - Published by Indian Roads Congress.

Course Outcomes:

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

1. identify the highway materials.
2. design and analysis of pavement design.
3. conduct and analysis of evaluation and strengthening of pavement.
4. design and analysis of surface and sub-surface drainage system.
5. use various repair techniques for highway maintenance.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
Subject Code:	CE07TPE05D	L	T	P	CT-I	CT-II	TOTAL	70	100	3
Subject:	Contracts Management	3	0	0	15	15	30			

Course Learning Objectives:

- To introduce about various Authorities, indulge in construction contract management.
- To impart knowledge on municipal bye-laws related to construction.
- To elaborate about construction contracts, arbitration, and litigation procedures

Course Content:

UNIT-1 Introduction and concepts of Construction law-public law-government departments and local authorities.

UNIT-2 Private law-contracts-torts-property law and building law-concepts-salient features sections

UNIT-3 Construction contracts-contracts specifications-types of contract documents used for construction.

UNIT- 4 Contract procurement- selection of contractor-contract procedure-salient features.

UNIT- 5 Arbitration and litigation procedure-preparation, settlement, evidence, price adjustment-need for the formulae-civil engineering and building formulae-practical implications.

Text Books:

1. Gajaria G. T., laws relating to building and engineering contracts in India, M. M Tripathi Private Ltd., Bombay, 1982.
2. Jimmie Hinze, construction contracts, 2nd edition. McGraw hill, 2001.
3. Joseph T. Bockrath, contracts and the legal environment for engineers and architects, 6th edition, McGraw Hill, 2000.

Course Outcomes-

1. To remember about various Authorities, indulge in construction contract management.
2. To understand about municipal bye-laws related to construction.
3. To remember & understand about various classifications of construction contacts.

4. To review about various steps of contract procurement in construction industry.
5. To evaluate the role of Arbitration and litigation procedure in settlement of contract related disputes.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TPE05E									
<i>Subject:</i>	Construction Projects Planning & Systems	3	0	0	15	15	30	70	100	3

Course Learning Objectives:

- To understand the project management and different scheduling techniques.
- To expertise in PERT network analysis.
- To learn CPM network analysis and compared with PERT.
- To understand time-cost analysis and resource scheduling.
- To understand the factor for equipment selection and cost of owning and operating and expertise in evaluation and analysis of different equipment life.

Course Content:

UNIT 1: Introduction: Objectives and functions of project management, project feasibility reports, Planning for construction projects: Steps, factors, advantages and disadvantages for different stake holder.

Scheduling: Scheduling Job layout and Line of balance, project management through networking, Bar Chart, Linked bar chart, Work-break down structures, Activity-on-arrow diagrams.

UNIT 2: PERT: Network analysis, critical path, probability of project.

UNIT3: CPM: Network analysis, Critical Path, Difference between CPM and PERT.

UNIT 4: Time-Cost Trade-off, Resource Scheduling

UNIT 5: Time and motion studies, Standard and special equipment, factors affecting selection of construction equipment, cost of owning and operating the construction Equipment, Equipment Life and Replacement Analysis

Text Books:

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., “PERT and CPM Principles and Applications “, Affiliated East West Press, 2001
3. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
4. Moder.J., C.Phillips and Davis, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
5. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi Willis., E.M., “Scheduling Construction projects”, John Wiley and Sons 1986.
6. Halpin,D.W., “Financial and cost concepts for construction Management”, John Wiley and Sons, New York, 1985.

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

- To apply the knowledge in managing and handling of different civil engineering project and also able to schedule the project.
- To do PERT analysis and able to find the project completion time and its probability.
- To do CPM analysis and able to find the project completion time and compare with PERT analysis.
- To do cost and time analysis and also resource allocation, scheduling and crashing for different activities of the network.
- To apply the knowledge in equipment selection and able to find cost of owning and operating and able to find the equipment life, which help in comparisons of different equipments.

**SYLLABUS
(SEMESTER-VII)**

Subject Code:	CE07TOE02X	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Open Elective - 2X	L	T	P	CT 1	CT 2	TOTAL	70
		3	-	-	15	15	30	
Open Elective-2A or Open Elective-2B or Open Elective-2C or Open Elective 2D-		Any one subject to be Selected from the Professional Electives						
Open Elective-2 (OE Group-2)								
CE07TOE02A		Artificial Neural Network						
CE07TOE02B		Economic Policies in India						
CE07TOE02C		History of Science and Engineering						
CE07TOE02D		Cyber Law and Ethics						

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
<i>Subject Code:</i>	CE07TOE02A	L	T	P	CT-1	CT-II	TOTAL	70	100	3
<i>Subject:</i>	Artificial Neural Network	3	0	0	15	15	30			

Course Learning Objectives:

- 1.To provide an introduction to the field of artificial neural networks
- 2.To Study Basic learning algorithms: the back propagation algorithm, self-organization learning etc.
- 3.Model a Neuron and Express both Artificial Intelligence and Neural Network
4. To promote further independent learning on the topics of artificial neural networks
5. To learn Supervised and unsupervised Learning and Self-organization Feature Map.

Course Content:

UNIT-1 Introduction: Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feedforward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem. XOR Problem, Multilayer Networks. Learning: Learning Algorithms, Error correction, and Gradient Descent Rule Learning objective of TLNs, Perceptron Learning Algorithm, Perceptron Convergence Theorem.

UNIT–2 Supervised Learning: Perceptron learning and Non Separable sets, α -Least Mean Square Learning, MSE Error surface, Steepest Descent Search, μ -LMS approximate to gradient descent, Application of LMS to Noise Cancelling, Multi-layered Network Architecture, Backpropagation Learning Algorithm, Practical consideration of BP algorithm.

UNIT-3 Support Vector Machines and Radial Basis Function: Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function Regularization theory, Generalized RBF Networks, Learning in RBFNs, RBF application to face recognition.

UNIT- 4 Attractor Neural Networks: Associative Learning Attractor Associative Memory, Linear Associative memory, Hopfield Network, application of Hopfield Network, Brain State in a Box neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory.

UNIT- 5 Self-organization Feature Map: Maximal Eigenvector Filtering, Extracting Principal Components, Generalized Learning Laws, Vector Quantization, Self-organization Feature Maps, Application of SOM, Growing Neural Gas.

Text Books:

1. .E.Rich and K.Knight ,Artificial Intelligence ,Forty Sixth Edition Tata McGrawHill,2007
2. D.W. Patterson,Introduction to Artificial Intelligence and Expert Systems, Tenth Edition ,Prentice Hall of India,2001
3. Klaus Obermayer and Terrence J. Sejnowski, Self-Organizing Map Formation, October 2001
4. Daniel J. Amit , Modeling Brain Function, 1989, Cambridge University Press.

Course Outcomes- The students would have learnt:

CO1: Model Neuron and Neural Network, and to analyse ANN learning, and its applications.

CO2:Able to solve the problem of Supervised Learning.

CO3: can able to apply SVM for image classification .

CO4: Evaluate a practical solution obtained using neural networks.

CO5: Can able to use Self-organization Feature Map.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TOE02B							70	100	3
<i>Subject:</i>	Economic Policies in India	3	0	0	15	15	30			

Course Learning Objectives: The course seeks to equip students with sector-specific knowledge and skills to analyze key economic issues and policy documents. It will also enable them to relate theoretical frameworks of macroeconomics and microeconomics to the Indian context.

Course Content:

UNIT-1 Macroeconomic policies and their impact: fiscal policy; financial and monetary policies.

UNIT-2 Agriculture: policies and performance; production and productivity; credit; labor markets and pricing; land reforms; regional variations.

UNIT-3 Industry: policies and performance; production trends; small scale industries; public sector; foreign investment, labor regulation

UNIT- 4 Services and trade: trends and performance, trade and investment policy

UNIT- 5 Indian development experience: a critical evaluation of growth, inequality, poverty and competitiveness, pre-and post-reform eras

Text Books:

1. Dutt Rudder and K.P.M Sunderam (2001): Indian Economy, S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri (2001) "Indian Economy and –Its development experience", Himalaya Publishing House.
3. KapilaUma: Indian Economy: Policies and Performances, Academic Foundation
4. Bardhan, P.K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi.

Course Outcomes-

Students will have the capability to understand government policies and will enable informed participation in economic decision making, thus improving their employment prospects and career advancement.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TOE02C							70	100	3
<i>Subject:</i>	History of Science and Engineering	3	0	0	15	15	30			

Course Learning Objectives:

Course Content:

UNIT-1 Historical Perspective

The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences.

UNIT-2 Policies and Plans after Independence

Nehru's vision of science for independent independent India, Science and technology developments in the new era science and technology developments during the Five Year Plan Periods and science and technology policy resolutions.

UNIT-3 Research and Development (R&D) in India

Expenditure in R&D, Science and Technology Education, Research activities and promotion of technology development, Technology mission, Programs aimed at technological self-reliance, activities of council of scientific and industrial research (CSIR).

UNIT- 4 Science and Technological Developments in Major Areas

Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT services remote sensing applications, Launch Vehicle Technology Ocean Development – Objectives of ocean development, Biological and mineral resources, Marine research and capacity building Defence Research – Spin-off technologies for civilian use, Biotechnology – Applications of biotechnology in medicine, Biocatalysts, Agriculture, Food, Fuel and Fodder, Development of biosensors and animal husbandry Energy – Research and development in conservation of energy, India's nuclear energy program, technology spin-offs.

UNIT- 5 Nexus between Technology Transfer and Development

Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques, Appropriate technology, Technology assessment, Technological forecasting, Technological innovations and barriers of technological change.

Text Books:

1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58.
2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East-West Press (P) Ltd., New Delhi.
3. Ramasamy, K.A., and Seshagiri Rao, K., (Eds), Science, Technology and education for Development, K., Nayudamma Memorial Science Foundation, Chennai – 8.
4. Kohili, G.R., The Role and Impact of Science and Technology in the Development of India, Surjeet Publications.
5. Government of India, Five Year Plans, Planning Commission, New Delhi.
6. Sharma K.D., and Quresh M.A., Science, Technology and Development, Sterling Publications (P) Ltd., New Delhi.

SYLLABUS	(SEMESTER VII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE07TOE02D							70	100	3
<i>Subject:</i>	Cyber Law and Ethics	3	0	0	15	15	30			

Course Learning Objectives:

1. To Create cyber security awareness and to understand principles of web security.
2. To make attentive to students about possible hacking and threats in this communication era.
3. To understand key terms and concepts in cyber law, cybercrimes, intellectual property, Copyright trademarks and domain theft.
4. To understand the business impact and potential of e-commerce and to learn about the technologies required to make e-Commerce viable.
5. Discuss Issues for creating Security Policy, Jurisdictional Issues and dispute resolution in cyberspace.

Course Content:

UNIT-1

Introduction Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, Cyber Law - International Perspectives UN & International Telecommunication Union (ITU) Initiatives Council of Europe - Budapest Convention on Cybercrime, Asia-Pacific Economic Cooperation (APEC), Organization for Economic Co-operation and Development (OECD), World Bank, Commonwealth of Nations.

UNIT-2 Constitutional & Human Rights Issues in Cyberspace Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection, Cyber Crimes & Legal Framework Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud Cyber terrorism, Cyber Defamation.

UNIT-3 Cyber Torts Cyber Defamation, Different Types of Civil Wrongs under the IT Act 2000, Intellectual Property Issues in Cyber Space Interface with

UNIT- 4 E-Commerce Concept, E-commerce-Salient Features, Online approaches like B2B, B2C & C2C Online contracts, Click Wrap Contracts, Applicability of Indian Contract Act, 1872,

UNIT- 5 Dispute Resolution in Cyberspace, Concept of Jurisdiction, Indian Context of Jurisdiction and IT Act, 2000. International Law and Jurisdictional Issues in Cyberspace, Dispute Resolutions .

Text Books:

1. Chris Reed & John Angel, Computer Law, OUP, New York.
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi.
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute.
4. Jonthan Rosenoer, Cyber Law, Springer, New York.
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York.
6. S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd.

Course Outcomes- After successful completion of the course, students

1. Will be able to analyse and evaluate the cyber security needs of an organization.
2. Will be able to implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.
3. Will be able to understanding of the fundamental legal principles relating to confidential information, copyright, patents, designs, trademarks and unfair competition;
4. Will be able to apply the skills necessary for large-scale web based e-commerce project development and e-commerce application.
5. Design operational and strategic cyber security strategies and policies for dispute resolution in cyberspace.

SYLLABUS	(SEMESTER-VII)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	CE07PPC08						-	50	1.5
<i>Subject:</i>	Seminar	0	0	3	50	50			

SYLLABUS	(SEMESTER-VII)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	CE07PPC09						40	100	3
<i>Subject:</i>	Minor project	0	0	6	60	50			

SYLLABUS	(SEMESTER-VII)	Periods/ Week			Internal Assessment (IA)		ESE	Grand Total	Credits
		L	T	P	IA	TOTAL			
<i>Subject Code:</i>	CE07PPC10						20	50	1.5
<i>Subject:</i>	Estimation and Costing	0	0	3	30	30			

Course Objective

1. Impart the knowledge of estimating and costing for civil engineering structures

2. Prepare and Evaluate the

1. Estimation of building (long wall and short wall method)

2. Estimation of building (center line method)

3. Analysis of rate for concrete work

4. Analysis of rate for brick work

5. Analysis of rate for plaster work

6. Estimate quantity of reinforcement

7. Preparation for approximate estimate for road project

8. Estimating cost of building on plinth area method

Course Outcome

1. Prepare quantity estimates for buildings, Roads as per specification

2. Draft detailed specifications and work out rate analysis for all the works related to civil engineering projects

3. Ascertain the quantity of material required for civil engineering work as per specifications

4. Prepare cost estimate for civil engineering work.

SEMESTER VIII

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPC18							70	100	03
<i>Subject:</i>	Earthquake Resistant Design of Structures	3	0	0	15	15	30			

Course Learning Objectives:

- i. To introduce Engineering seismology and functional planning and the effects of configurations of buildings for earthquakes.
- ii. To introduce the requirements for conceptual design for earthquake safety and the analysis methods.
- iii. To acquaint with IS code-based design lateral forces for earthquake resistant design of structures.
- iv. To identify the behavior of structural and nonstructural elements for seismic resistance and impart design of shear walls.
- v. Introduce Capacity Design as per IS 13920: 2016, Capacity Design for Beams, Columns, beam column joints and structure as a whole.

Course Content:

UNIT 1: Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India. Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

UNIT 2: Conceptual Design - Horizontal and Vertical Load Resisting Systems - System and Members for Lateral Loads and High Rise / Tall Structures. Twisting of Buildings – Flexible Building and Rigid Building Systems. Strength and Stiffness – Ductility – Definition – Ductility Relationships – Choice of construction Materials – Unconfined Concrete & Confined Concrete – Masonry, Steel Structures. Design Earthquake Loads – Basic Load Combinations – Permissible Stresses. Seismic Methods of Analysis – Static Method –

Equivalent Lateral Force Method. Dynamic Analysis – Response Spectrum Method – Modal Analysis Torsion.

UNIT 3: Introduction to Earthquake Resistant Design – Seismic Design Requirements and Methods. RC Buildings – IS Code based Method. - Vertical Irregularities – Mass Irregularity Torsional Irregularity - Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear –.

UNIT 4: Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls – Behaviour of Walls Box Action and Bands – Behaviour of infill Walls - Non Structural Elements – Failure Mechanism of Nonstructural Elements – Effects of Nonstructural Elements on Structural System – Analysis – Prevention of Damage to Nonstructural Elements – Isolation of Non-Structures, Design of Shear walls: Classification according to Behavior, Loads in Shear walls, Design of Rectangular and Flanged Shear walls.

UNIT 5: Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquake- Seismic Evaluation and Retrofitting. Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

Text Books/References:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd
3. Earthquake Resistant Design for Engineers & Architects by Dowrick, D. J., John Willey & Sons, 2nd Edition; 1987.
4. Earthquake Resistant Design of structures by S. K. Duggal, Oxford University Press.
5. Concrete Structures in Earthquake Regions by Booth, E., Longman Higher Education, 1994.

6. Reinforced Concrete Structures by Park, R. & Paulay, T., John Willey & Sons, 2nd Edition; 1975.
7. Masonry and Timber structures including earthquake Resistant Design – Anand S. Arya, Nem Chand & Bros.
8. Earthquake – Resistant Design of Masonry Building – Miha Tomazevic, Imperial College Press.
9. Design of Reinforced Concrete Structures by N. Subramanian, Oxford University Press.
10. Dynamics of Structures by A.K. Chopra, Second edition (2001), Prentice Hall India Private Ltd
11. Handbook on Seismic Analysis and Design of Structures by Farzad Naeim, Kluwer Academic Publisher, 2001.

Reference Codes:

1. IS 1893 (Part-1): 2016, “Criteria for Earthquake Resistant – Design of structures.” B.I.S., New Delhi.
2. IS 4326: 2013, “Earthquake Resistant Design and Construction of Building”, Code of Practice, B.I.S., New Delhi.
3. IS 13920: 2016, “Ductile design and detailing of reinforced concrete structures subjected to seismic forces” – Code of practice, B.I.S., New Delhi.

Course Outcomes:

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

- a. Identify the causes of earthquakes, its propagation, and measurement and can quantify the hazard at the location of the structure and quantify the forces based on the source.
- b. Adopt a suitable structural system to resist earthquake forces considering safe behavior of structural and nonstructural elements with different material properties and load combinations.
- c. Design seismically safe structures in accordance with the provisions of Indian code IS 1893.
- d. Implement design of shear wall elements for earthquake safety of structures.
- e. Design or retrofitting of structures by detailing the elements, beams, columns, beam-column joints as per capacity-based design adopting ductility provisions as per IS 1893, IS 13920, to mitigate the vulnerability of earthquake damages of elements and structures.

SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CE08TPE06	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Professional Elective -6	L	T	P	CT-I	CT-II	TOTAL	
		3	-	-	15	15	30	70
Professional Elective-6A or Professional Elective-6B or Professional Elective-6C or Professional Elective-6D or Professional Elective-6E		Any one subject to be Selected from the Professional Electives Group-6						
Professional Electives Group -6								
CE08TPE01A		Offshore Engineering						
CE08TPE01B		Surface Hydrology						
CE08TPE01C		Bridge Engineering						
CE08TPE01D		Water and Air Quality Modelling						
CE08TPE01E		Construction Equipment & Automation						

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE01A	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Offshore Engineering	3	0	0	15	15	30			

Course Objective:

- To introduce basics of offshore structures and its historical development.
- To characterize static and dynamic loads coming on offshore structure.
- To study about general layout consideration of deck and oil & gas processing system.
- To understand method involving platform installation.
- To learn about material used in design and construction of offshore structure.

Course Content:

UNIT I HISTORICAL DEVELOPMENT OF OFFSHORE STRUCTURES: Introduction – Definition of Offshore Structures – Historical Developments – Deep water challenges, Functions of Offshore Structures, selection of Offshore Structure and its Configurations, Bottom Supported Fixed Structures, Complaint Structures, Floating Structures – Novel offshore design – Field development concepts

UNIT 2 LOAD AND RESPONSES: Introduction, Gravity Load, Hydrostatic Loads, Resistance Loads, Current loads on Structures, Current Drag and Lift Force, Steady and Dynamic Wind Loads on Structures, Wave Loads on Structures, Varying Wind Load, Impulse loads and Introduction to design

UNIT 3 TOPSIDE FACILITIES AND LAYOUT: Introduction - General layout Considerations - Areas and Equipment - Deck Impact Loads - Deck Placement and Configuration - Float over Deck Installation - Helipad - Platform Crane - Living quarters - Oil and gas treatment - Oil and gas storage, offloading and export - Utility and process support systems - Drilling facilities

UNIT 4 OFFSHORE INSTALLATION: Introduction – Installation of Fixed Platform Substructures - Floating Structures – Foundations - Subsea Templates – load outs - transportation - Platform Installation Methods and installation criteria – Installation of Pipelines and Risers.

UNIT 5: MATERIALS FOR OFFSHORE APPLICATIONS: Material for Construction-Structural Steel, Topside Materials, Advanced Composite materials, Corrosion Control, Material Reliability and Monitoring and Fracture Control.

Textbooks:

1. Dawson, T.H., “Offshore Structural Engineering”, Prentice Hall, 1983
2. B.C Gerwick, Jr. “Construction of Marine and Offshore Structures”, CRC Press, Florida, 2000.
3. Subrata K Ckkrabarti, “Handbook of Offshore Engineering”, Vol 1, Vol 2, Elsevier Publishers, 1 st edition, 2005.

Reference Books:

1. API RP 2A., “Planning Designing and Constructing Fixed Offshore Platforms”, API
2. McClelland, B &Reifel, M.D., “Planning & Design of fixed Offshore Platforms”, VanNostrand, 1986
3. Graff, W.J., “Introduction to Offshore Structures”, Gulf Publ. Co. 1981.
4. Reddy, D.V &Arockiasamy, M., “Offshore Structure” Vol.1 & 2,

Course Outcomes:

- To classify types of offshore structure and know its basic fundamental knowledge.
- To analyze various loads and their response on the structure.
- To describe process involving deck layout and oil & gas treatment.
- To outline key feature of platform, foundation and pipelines installation.
- To identify and select appropriate material for construction.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE01D	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Water and Air Quality Modelling	3	0	0	15	15	30			

Course Objectives:

- Understand the idea, methodology and basic tools of water and air quality modelling
- Understand the different modelling approaches, their scope and limitations.
- Understand the fate and transport of pollutants in different water bodies and ambient air.
- Become mindful of a wide range of applications of modelling for the water quality and air pollution.
- Understand Water quality indexing parameters and its application.

COURSE CONTENT:

UNIT I MODELING CONCEPTS: Casual and statistical models- Characteristics- Steps in model development - Importance of model building. - conservation of mass and mass balance – calibration and verification of models; Transport phenomena – Advection, diffusion, dispersion, simple transport models; chemical reaction kinetics – Law of mass action, Rate constants, reaction order, types of reactions, equilibrium principles.

UNIT II WATER QUALITY MODELING: Water quality models – Historical development – Mass balance equation – Streeter - Phelps Equation – Modification to Streeter – Phelps Equation – Waste load allocations – Dissolved oxygen in Rivers and estuaries; Lake Water Quality Models; Models for Nitrogen, Bacteria, Phosphate and toxicants - Ground Water Quality Modeling - Contaminant solute transport equation, Numerical methods.

UNIT III AIR POLLUTION MODELING: Chemistry of air Pollutants - Atmospheric reactions, sinks for air pollution –Transport of air Pollutants - Meteorological settling for dispersal of air pollutants – Vertical structure of temperature and stability, atmospheric motions, Wind and shear, self-cleaning of atmosphere; transport and diffusion of stack emissions – atmospheric characteristics significant to transport and diffusion of stack emission – stack plume characteristics.

UNIT IV AIR QUALITY MODELS: Types of modeling technique, modeling for non-reactive pollutants, single source, short term impact, multiple sources

and area sources, Fixed box models- diffusion models – Gaussian plume derivation- modifications of Gaussian plume equation- long term average-multiple cell model- receptor oriented and source-oriented air pollution model performance, accuracy and utilization.

UNIT V Water Quality Index: Categories of water quality index. Determination of water quality index (WQI): Industrial and municipal effluent index, ambient water quality index, combined water quality index and Delphi method. Air Quality Index: Categories of air quality index. Determination of air quality index (AQI): National AQI, Extreme value indices, regional indices.

Reference Books:

1. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I, Academic Press, 2006.
2. Chapra, S.C. Surface Water-Quality Modelling, McGraw-Hill, International Edition, 2008
3. Deaton and Wine Brake, Dynamic Modeling of Environmental Systems, Wiley & Sons, 2002
4. E.V. Thomason, Principles of Surface Water Quality Modeling and Control, Happer and Row Publishers New York, 1987.
5. Hadlock, C.R., Mathematical Modelling in the Environment. The Mathematical Association of America.
6. J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
7. Lohani B. N. and North A. M. Environmental Quality Management, South Asian Publishers Pvt. Ltd., New Delhi, 1984.
8. Rastogi A.K. (2008) Numerical Groundwater Hydrology, Penram International Publishing Pvt. Ltd., Bombay.
9. Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
10. Thomann, R.V. and Mueller, J.A. (1987). Principles of Surface Water Quality Modelling and Control, Harper &
11. Wainwright, J and Mulligan, M., Environmental Modelling Finding simplicity in complexity, John Wiley and Sons Inc., New York, 2013.

Course outcomes:

CO1: To provide basic knowledge on mathematical and statistical concepts required for mode development.

CO2: To Develop models based on the mass-balance approach

CO3: To Perform data exploration and visualization

CO4: To Predict the impact of the of external waste loading on different water bodies

CO5: To Design and model of air & water quality and its applicability in the Control of pollution

CO6: To Determine and evaluate the water quality index

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE01E									
<i>Subject:</i>	Construction Equipment & Automation	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

- To understand the factor for equipment selection and cost of owning and operating.
- To expertise in evaluation and analysis of different equipment life.
- To learn the engineering fundamentals of excavating equipments.
- To learn fundamentals of the pile driving and lifting equipments.
- To understand the concreting equipments and techniques and the advanced instruments like GIS etc. In construction.

Course Content:

UNIT 1: Introduction to course & Planning Process of Equipment Factors affecting equipment selection. Cost of Owning and Operating Construction Equipment Elements of ownership cost, Depreciation accounting methods, Cost Estimation using Average Annual Investment method. Use of compounding factors in Equipment cost estimation based on time value method, Operating cost components, Caterpillar method and Peurifoy method.

UNIT 2: Equipment life and replacement analysis determination of economic life of equipment. Minimum cost method, Maximum profit method, Time value concept

UNIT 3: Engineering Fundamentals of Moving Earth Machine Performance- Required power, Available power, Usable power, Performance chart. Earthmoving and Excavating equipment Bull Dozers, Scrapers, Front end loaders, Excavators, Trucks, Productivity estimation and balancing of interdependent machines

UNIT 4 Piles and Pile driving equipment Pile types, pile hammers, principle of pile hammer, factors affecting pile hammer selection, Types of pile hammer: Drop hammer, Single acting and double acting steam hammers, Diesel hammers, Vibratory pile drivers.

Lifting equipment Cranes, Principles of lifting mechanism of crane, types of cranes-lattice boom crawler crane, lattice boom truck mounted cranes, telescopic boom crane, Tower cranes, Factors affecting lifting capacity of crane, Range diagram.

UNIT 5 Concreting equipment Steps in concrete making process, types of concrete mixer machines, Methods of handling and transporting concrete, Consolidation of concrete, Methods of finishing and curing of concrete.

Aerial and Satellite Surveying: GIS and GPS in Construction; use of Drones for spread out sites; Use of robots for repetitive activities.

Reference Books:

1. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi
2. Construction Equipment & Planning and Application. - Mahesh VermaArtec Publication.
3. GPS satellite surveying- Alfred Leick,.Wiley

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

- To apply the knowledge in equipment selection and able to find cost of owning and operating.
- To find the equipment life, which help in comparisons of different equipments.
- To select the earth excavating equipment on the basis of output and different selection factors.
- To decide the pile driving equipment and lifting equipment based on safe working load determination
- To decide the concreting equipment based on the construction project and relate the knowledge on Surveying to the new frontiers of science like GIS, GPS and Remote Sensing.

SYLLABUS	(SEMESTER-VIII)							
<i>Subject Code:</i>	CE08TPE02X	CREDITS:3			SESSIONAL - TA			ESE
<i>Subject:</i>	Professional Elective -7X	L	T	P	CT-I	CT-II	TOTAL	
		3	0	-	15	15	30	70
Professional Elective-7A or Professional Elective-7B or Professional Elective-7C or Professional Elective-7D or Professional Elective-7E		Any one subject to be Selected from the Professional Electives						
Professional Electives Group -7								
CE08TPE02A		Infrastructure Planning and Design						
CE08TPE02B		Traffic Engineering						
CE08TPE02C		Repair and Rehabilitation of Structures						
CE08TPE02D		Finite Element Analysis						
CE08TPE02E		Urban Hydrology and Hydraulics						

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE02A	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Infrastructure Planning and Design	3	0	0	15	15	30			

Course Learning Objectives:

1. To introduce the various infrastructure sector role in India
2. To explain the effect of Infrastructure Privatization with case studies.
3. To introduce the risks in successful infrastructure planning and implementation.
4. To impart the strategies for successful infrastructure project implementation.
5. To explain Innovative Design and Maintenance of Infrastructure Facilities.

Course Content:

UNIT 1: An overview of Basic Concepts Related to Infrastructure: Introduction to Infrastructure, an overview of the Power Sector in India., an Overview of the Water Supply and Sanitation Sector in India., an overview of the Road, Rail, Air and Port Transportation Sectors in India., an overview of the Telecommunications Sector in India. , an overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India, an Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an overview of Infrastructure Project Finance

UNIT 2: Private Involvement in Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study, Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

UNIT 3: Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects,

Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

UNIT 4: Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects, Sustainable Development of Infrastructure, Information Technology and Systems for Successful Infrastructure Management.

UNIT 5: Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

Text Books/References:

1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).
2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).
3. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
4. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment Proceedings of a Conference Held in June (1990).
5. World Development Report 1994: Infrastructure for Development (1994).
6. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000).

Course Outcomes:

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

- a. Design an integrated framework for infrastructure planning and management.
- b. Analyse the strategies for Infrastructure Project implementation.
- c. Perform Infrastructure modelling and Life Cycle Analysis Techniques.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE02B							70	100	03
<i>Subject:</i>	Traffic Engineering	3	0	0	15	15	30			

Course Objectives:

1. To develop the basic knowledge of Traffic Engineering.
2. To define Traffic flow characteristic.
3. To develop knowledge about traffic control system.
4. To understand the parking and highway lighting
5. To develop the knowledge of different pollution occurring and its remedial measures.

Course Content:

UNIT 1: Introduction To Traffic Engineering-Definition and Scope of Traffic Engineering, Functions, Organization and Importance of Traffic Engineering. Elements of Traffic Engineering: Vehicular, Driver and Road Characteristics.

UNIT 2: Traffic Flow Parameters -Traffic flow parameters: volume, density, speed and related terms, Relationship between various parameters, Study and analysis of vehicle arrivals, headways, and gap acceptance in traffic flow. Highway Capacity and Level of Service.

UNIT 3: Traffic Control-Definition, functions and importance of traffic control. Methods of traffic control: Traffic signs, Road Markings, and other traffic controls aids. Traffic Regulation. Intersection control and design of traffic signals.

UNIT 4: Parking- Parking survey, types of parking, design of parking places. Lighting-Lantern arrangement, Types of lamp

UNIT 5: Traffic and Environment- Pollution problems of cities, Detrimental effects of traffic on environment, Noise pollution, Air pollution, Vibration, Environmental Impact Assessment.

Text Books:

1. Kadialy L.R., “Traffic Engg. and Transport Planning”, 8th edition, Khanna Publishers.
2. Partha chakrobarty & Animesh Das, “Principles of Transportation Engineering”, PHI.
3. C. Jotin Khisty, B. Kent Lal, “Transportation Engineering – An Introduction”, PHI.

Course Outcomes:

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

1. estimate the basic characteristics of traffic stream
2. conduct traffic flow studies and analyze traffic data
3. design traffic signal systems
4. analyse the parking and highway lighting
5. manage controlling the different pollution occurring in road.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE02C									
<i>Subject:</i>	Repair and Rehabilitation of Structures	3	0	0	15	15	30	70	100	03

Course learning objectives:

- To learn about various distress and damages in concrete and steel structures.
- To learn about assess the damage to structures using various methods.
- To study the various methods of rehabilitation.
- To study the various methods of repairs of structures.
- To learn importance of repair and maintenance of structures.

Course Content:

UNIT 1: Aging of structures – performance of structures – need for rehabilitation.

Distress in concrete / steel structures – damage – source – cause – effects – case studies.

UNIT 2: Damage assessment and Evaluation models – Damage testing methods – NDT – Core samples.

UNIT 3: Rehabilitation methods – grouting – detailing – imbalance of structural stability – case studies.

UNIT 4: Methods of repairs – shotcreting – guniting – epoxy – cement mortar injection – crack ceiling.

UNIT 5: Repair and maintenance of buildings – IS standards – Bridge repairs – Seismic strengthening.

Reading/Textbooks:

1. Diagnosis and treatment of Structures in Distress – R N Raikar.
2. Bridge Rehabilitation – V K Raina.
3. Building Failures – Diagnosis and Avoidance – W H Ranson.
4. Forensic Engineering – Kennethe and Carper.

Course outcomes:

Upon completion of this course students will be able to:

- Analyze distress and damages in concrete and steel structures.
- Understand about assess the damage to structures using various methods.
- Classify the various methods of rehabilitation.
- Classify the various methods of repairs of structures.
- Understand the importance of repair and maintenance of structures.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE02D	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Finite Element Analysis	3	0	0	15	15	30			

Course Objectives:

1. To learn basic principles of finite element analysis procedure.
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To learn and apply finite element solutions to structural and dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses

Course Content:

UNIT 1: Matrix Methods of Structural Analysis – Review of concepts – Actions and displacements – compatibility – indeterminacy – Member and joint loads – Flexibility Matrix formulation - Stiffness Matrix formulation.

UNIT 2: Analysis of Beams- Finite Element formulation and Analysis of beams by Finite Element method.

UNIT 3: Analysis of Rigid Jointed Plane Frame- Finite Element formulation and Analysis of rigid jointed plane frame by Finite Element method.

UNIT 4: Analysis of Pin Jointed Plane Frame- Finite Element formulation and Analysis of pin jointed plane frame by Finite Element method.

UNIT 5: Introduction to Plate and Shell Elements- Analysis of plane stress / strain and ax symmetric solids-triangular, quadrilateral and isoperimetric elements, Analysis of plate bending, basic equations of thin plate theory, Reissinner-Mindlin theory, plate elements and applications. Analysis of shells, degenerated shell elements.

Text Books:

1. Chandrupatla T.R., Belegundu A.D., Introduction to Finite Elements in Engineering, Prentice Hall of India Private Limited, New Delhi.
2. Desai C.S., Abel J.F., Introduction to the Finite Element Method, CBS Publishers & Distributors, Delhi.

Reference Books:

1. Krishnamurthy, C.S., Finite Element Analysis – Theory and Programming, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Finite Element Analysis – Theory and Programming by Cook R.D. et.al., Concepts and Applications of Finite Element Analysis, John Wiley

Course outcomes:

Upon successful completion of this course, you should be able to:

1. Understand the concepts behind formulation methods in FEM.
2. Identify the application and characteristics of FEA elements such as bars, beams, plane.
3. Analyze the rigid and pin jointed plane frame using finite element method.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE02E	L	T	P	CT-1	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Urban Hydrology and Hydraulics	3	0	0	15	15	30			

Course Objectives:

1. To describe physical properties of urban area.
2. To understand the elements of drainage systems.
3. To study about urban water supply
4. To know about the measures to control storm water pollution
5. To learn urban watershed software.

Course Content:

UNIT 1: Urbanisation: Process of urbanisation, Trends of urbanisation and industrialisation, influence on hydrologic cycle, effects and consequences for drainage, Rainfall analysis in urban environment, design storm. Urban Runoff computations: Empirical, Time-area and unit hydrograph approaches. Urban storm water runoff: overland flow.

UNIT 2: Design of drainage system elements: Hydraulic fundamentals, infiltration and on-site detention of storm water, design of sewerage and drainage channels, design of appurtenances, road drainage, design of pumping stations

UNIT 3: Urban water supply: Estimate of demand, sources in surface and groundwater, Reservoir, capacity estimation.

UNIT 4: Control of storm water pollution: Pollution build-up and wash off process with reference to urban drainage systems. Source control in commercial and industrial complexes, storage options - dry and wet ponds, biological treatment of wastewater, chemical treatment of storm water

UNIT 5: Introduction to urban watershed software - Hydrologic Cistern, water conservation and ecological aspects, Water harvesting.

TEXT BOOKS:

1. Chow V T, Handbook of Applied Hydrology: A Compendium of Water resources technology, McGraw Hill, New York, 1964.

2. Gupta R S, Hydrology and Hydraulic Systems, Prentice Hall Publishers, New Jersey, 1989.
3. Geiger W F, Marsalek J Z, and Rawls G J, Manual on Drainage in Urban Areas, 2 Volumes, UNESCO, Paris, 1987
4. Hall M J, Urban Hydrology, Elsevier Applied Science Publishers, New York, 1984.
5. Stahre P, and Urbonas B, Stormwater Detention for Drainage, water quality and CSO Management, Prentice Hall Publishers, New Jersey, 1983.
6. Wanielista M P, and Yousef Y A, Stormwater Management, JohnWiley and Sons, New York, 1993.

Course Outcome: At the end of the course students shall be able to:

1. Understand and explain the effects of urbanization on rainfall and runoff.
2. Design various urban drainage system elements.
3. Estimate the demand of urban areas
4. Identify and apply the control required for storm water pollution
5. Use urban watershed software for simulation purpose.

SYLLABUS		(SEMESTER-VIII)					
<i>Subject Code:</i>	CE08TOE01X	CREDITS: 3			SESSIONAL - TA		
<i>Subject:</i>	Open Elective -3X	L	T	P	CT-I	CT-II	TOTAL
		3	-	-	15	15	30
Open Elective-3A or Open Elective-3B or Open Elective-3C or Open Elective-3D		Any one subject to be Selected from the Open Electives Group 3					
Open Electives Group 3							
CE08TOE01A		Management Information System					
CE08TOE01B		Enterprise Resource Planning					
CE08TOE01C		Engineering Risk-Benefit Analysis					
CE08TOE01D		Human Resources Development and Organizational Behaviour					

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TOE01A	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Management Information System	3	0	0	15	15	30			

Course objectives:

- To study about the role of management information technology in organizations.
- To study about the fundamental principles of computer-based information system analysis.
- To learn about the design and develop an understanding of the principles and techniques used.
- To study about concept of data moulding and data flow diagrams of information system.
- To learn about the fundamental principles and concept of decision-making process and security system.

Course Content:

UNIT 1: Management and System- Advance in management, the process of MIS development, MIAS organization, Information dynamics.

UNIT 2: Planning, Design and implementation of MIS, Strategic planning, MIS design- Group design concepts, Acquiring information system.

UNIT 3: System life cycle-Information flow, Entity relationship modelling, data modelling, detailed process analysis, data flow diagrams.

UNIT 4: Decision making system with MIS, System concepts for MIS.

UNIT 5: Data information and communication, problem solving and decision making, security, control and failure, Future trends in MIS.

TEXT BOOKS:

1. Management Information Systems, by S. Sadagopan, PHI Learning Pvt. Ltd
 Management Information Systems By. Chatterjee, PHI Learning Pvt. Ltd
 Management Information Systems (11th Edition), by Ken Laudon and Jane Laudon

Course outcomes:

Upon completion of this course students will be able to:

- To understand the role of management information technology in organizations.
- To understand the fundamental principles of computer-based information system analysis.
- To design and develop an understanding of the principles and techniques used.
- To understand the concept of data moulding and data flow diagrams of information system.
- To understand the fundamental principles and concept of decision-making process and security system.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TOE01B	L	T	P	CT-1	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Enterprise Resource Planning	3	0	0	15	15	30			

Course objectives:

1. To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
2. To focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
3. To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
4. To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills

Course Content:

UNIT 1: Conceptual foundation of Business Process reengineering: Role of information Technology and BPR; Process improvement and Process redesign, Process identification and mapping; Role/Activity diagrams, Process Visioning, and benchmarking.

UNIT 2: Enterprise Resource Planning: Evolution of ERP- MRP and MRP II, structure of ERP- two tier architecture, three tier architectures, electronic data processing, management information system, Executive information system, ERP as an integrator of information needs at various Levels.

UNIT 3: Typical Business Processes: Core processes, Product control, Sales order processing, Purchases, Administrative processes, Human resource, Finance support processes, Marketing, Strategic planning, Research and development, Problems in traditional view.

UNIT 4: ERP models/functionality: Sales order processing, Production scheduling, forecasting, distribution, finance, features of each of the models, description of data flow across each module, overview of supporting databases & packages.

UNIT 5: ERP implementation issues: Opportunities and problems in ERP selection, and implementation; ERP implementation: identifying ERP benefits, team formation, Consultant intervention, Selection of ERP, Process of ERP.

TEXT BOOKS:

1. V.K. GARG & N.K. VENKATKRISHNAN: ERP, Concepts and Practices, PM
2. Rahul V. Altekar, Enterprise-wide Resource Planning-theory and practice, PHI

REFERENCES:

ALEXIS LEON: Enterprise Resource Planning, TMH S. SADAGOPAN: MIS, PMV. RAJARAMAN: Analysis and Design of Information Systems, PHIMONK' & BRADY: Concepts in ERP, Vikas pub, Thomson

Course outcomes:

After completing this course, student will be able to

1. Make basic use of Enterprise software, and its role in integrating business functions
2. Analyze the strategic options for ERP identification and adoption.
3. Design the ERP implementation strategies.
4. Create reengineered business processes for successful ERP implementation.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TOE01C	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Engineering Risk-Benefit Analysis	3	0	0	15	15	30			

Course Learning Objectives:

1. Understand the basic concepts of risk analysis and the relationship between probability theory and modeling, risk analysis, and decision analysis
2. Understand how to interpret probability and probabilistic modeling, in the evaluation of risk
3. Learn how to understand and interpret the basic tools of risk analysis – fault trees, event trees, and simulation models
4. Understand the issues surrounding the use of risk analysis in decision making

Course Content:

UNIT 1: Introduction- Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model

UNIT 2: System Definition and Structure: System Definition Models, Hierarchical definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems

UNIT 3: Consequence Assessment-Types, Cause-Consequence Diagrams, Microeconomic Modelling, Value of Human Life, Flood Damages, and Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence

UNIT 4: Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models

UNIT 5: Data Needs for Risk Studies: Elicitation Methods of Expert Opinions, Guidance

Text Books:

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.

Reference Books:

1. Probability, Statistics, and Reliability for Engineers and Scientists, Ayyub & Mc Cuen, 2003.
2. Probabilistic Risk Assessment and Management for Engineers and Scientists, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.
3. Bedford, T. and Cooke, R. Probabilistic Risk Analysis: Foundations and Methods. New York: Cambridge University Press, 2001.
4. Normal Accidents, Living with High-Risk Technologies, C. Perrow, Princeton University Press, 1999.
5. Accident Precursor Analysis and Management - Reducing Technological Risk Through Diligence, National Academy of Engineering, the National Academies Press, Washington, DC, 2004.

Course Outcomes:

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

1. Understand and apply engineering risk analysis in several fields.
2. Evaluate the Reliability Analysis of Systems.
3. Formulate a decision analysis for models and systems
4. Propose the data requirements for risk analysis in simulation models.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TOE01D	L	T	P	CT-I	CT-II	TOTAL	70	100	03
<i>Subject:</i>	Human Resources Development and Organizational Behavior	3	0	0	15	15	30			

Course Content:

UNIT 1: HRD-Macro Perspective: HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD; Human Development and HRD; HRD at Macro and Micro Climate.

UNIT 2: HRD–Micro Perspective: Areas of HRD; HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance Coaching, Training, Career Planning, OD or Systems Development, Rewards, Employee Welfare and Quality of Work Life and Human Resource Information; Staffing for HRD: Roles of HR Developer; Physical and Financial Resources for HRD; HR Accounting; HRD Audit, Strategic HRD

UNIT 3: Instructional Technology for HRD: Learning and HRD; Models and Curriculum; Principles of Learning; Group and Individual Learning; Transactional Analysis; Assessment Centre; Behaviour Modeling and Self-Directed Learning; Evaluating the HRD

UNIT 4: Human Resource Training and Development: Concept and Importance; Assessing Training Needs; Designing and Evaluating T&D Programmes; Role, Responsibilities and challenges to Training Managers.

UNIT 5: Training Methods: Training with in Industry (TWI): On the Job & Off the Job Training; Management Development: Lecture Method; Role Play; In-basket Exercise; Simulation; Vestibule Training; Management Games; Case Study; Programmed Instruction; Team Development; Sensitivity Training; Globalization challenges and Strategies of Training Program, Review on T&D Programmes in India.

Reference Books:

1. Nadler, Leonard: Corporat Human Resource Development, Van Nostrand Reinhold, ASTD, New York.

2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems, Oxford IBH Pub. Pvt.Ltd., New Delhi, 2005.
3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi, 2004.
4. Viramani, B.R and Seth, Parmila: Evaluating Management Development, Vision Books, New Delhi.
5. Rao, T.V. (et.al): HRD in the New Economic Environment, Tata McGraw-Hill Pub.Pvt, Ltd., New Delhi, 2003.
6. Rao, T.V: HRD Audit, Sage Publications, New Delhi.
7. ILO, Teaching and Training Methods for Management Development Hand Book, McGraw-Hill , New York .
8. Rao, T.V: Human Resource Development, Sage Publications, New Delhi.
9. Kapur, Sashi: Human Resource Development and Training in Practice, Beacon Books, New Delhi.

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08PPC11	L	T	P	CT-I	CT-II	TOTAL	80	200	07
<i>Subject:</i>	Major Project	0	0	14	-	-	120			

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08PPC12	L	T	P	CT-I	CT-II	TOTAL	20	50	1.5
<i>Subject:</i>	Structural Detailing Lab	0	0	3	-	-	30			

Course Learning Objective:

- To learn detailing of structural steel members (tension & compression member, steel connection)
- To study in detail and draw components of industrial building.
- To understand reinforcement detailing of RCC beams and column footings.
- To know about distribution of reinforcement in slab, stair case, water tank and retaining wall.

Course Content:

Part A: (Steel Structures)

1. Detailing of Tension Members.
2. Detailing of Built-up Compression Members.
3. Detailing of Column Bases.
4. Detailing of connections.
5. Detailing of an Industrial shed.
6. Detailing of a Plate girder/Gantry girder.

Part B: (Reinforced Concrete Structures)

1. Details of reinforcement in RCC Continuous Beams.
2. Details of reinforcement for RCC column with isolated footings.
3. Details of reinforcement in a one way/two-way slabs.
4. Details of reinforcement in stair cases.
5. Detailing of Combined footings.
6. Detailing of Retaining walls/Water Tanks.

Course Outcome:

- To sketch detailed drawing of structural steel beams, columns and connections.
- To understand design components of industrial shed and gantry girder.
- To sketch reinforcement detailing of RCC member as per IS code provision.
- To draw accurate arrangement of reinforcement in slab, stair case, water tank and retaining wall.

CODE OF CONDUCT FOR STUDENTS

CODE OF CONDUCT FOR STUDENTS

The students are admitted to Guru Ghasidas Vishwavidyalaya to achieve excellence and shape their character to become responsible citizens. They must realize their responsibility towards the Vishwavidyalaya and to its components like faculty, staff and fellow students. Failure to maintain a good standard of conduct shall result in disciplinary action.

Attendance: 75% attendance is compulsory in each subject.

Misconduct: Any of the following activities (but not limited to these only) will be treated as misconduct.

1. Disruption of teaching activities or disturbing the learning process of other students on the campus.
2. Any act on the part of the students, which disrupts functioning of the university, endangers health and safety of campus residents and damages Vishwavidyalaya properties.
3. Cheating in examination and supplying of false documents / information in order to seek any consideration / favor from the University.
4. Possession or consumption of intoxicating beverages on the campus.
5. Failure to return back loaned material, settle University dues.
6. Possession of weapons.
7. Use of unparliamentary language while in conversation with Vishwavidyalaya Staff and fellow students.

Disciplinary Actions:

Failure to adhere to good conduct may result in disciplinary actions like:

1. A warning by the authorities.
2. Suspension from a particular class.
3. Suspension / expulsion from the University.
4. Suspension of campus privileges e.g. hostel, accommodation etc.
5. Withholding of examination result or withdrawal of awarded diploma / degree certificate.
6. Any other disciplinary action deemed appropriate by the University authorities.

ABOUT RAGGING

ABOUT RAGGING

UGC DRAFT REGULATIONS ON CURBING THE MENACE OF RAGGING IN HIGHER EDUCATIONAL INSTITUTIONS, 2009

In exercise of the power conferred by Clause (g) of Sub-Section (1) of Section 26 of the University Grants Commission Act, 1956, the University Grants Commission hereby makes the following Regulations, namely-

1. Title, commencement and applicability:-

- 1.1. These regulations shall be called the “UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009”.
- 1.2. They shall come into force with immediate effect.
- 1.3. They shall apply to all the universities established or incorporated by or under a Central Act, a Provincial Act or a State Act, to all institutions deemed to be university under Section 3 of the UGC Act, 1956, to all other higher educational institutions, including the departments, constituent units and all the premises (academic, residential, sports, canteen, etc) of such universities, deemed universities and other higher educational institutions, whether located within the campus or outside, and to all means of transportation of students whether public or private.

2. Objective:-

To root out ragging in all its forms from universities, colleges and other educational institutions in the country by prohibiting it by law, preventing its occurrence by following the provisions of these Regulations and punishing those who indulge in ragging in spite of prohibition and prevention as provided for in these Regulations and the appropriate law in force.

3. Definitions:-

For the purposes of these Regulations:-

- 3.1 “college” means any institution, whether known as such or by any other name, which provides for a programme of study beyond 12 years of schooling for obtaining any qualification from a university and which, in accordance with the rules and regulations of such university, is recognized as competent to provide for such programmes of study and present students undergoing such programmes of study for the examination for the award of such qualification.
- 3.2 “Head of the institution” means the ‘Vice-Chancellor’ in case of a university/deemed to be university, ‘Principal’ in case of a college, ‘Director’ in case of an institute.
- 3.3 “institution” means a higher educational institution (HEI), like a university, a college, an institute, etc. imparting higher education beyond 12 years of schooling leading to a degree (graduate, postgraduate and/or higher level).
- 3.4 “Ragging” means the following: Any disorderly conduct whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness any other student, indulging in rowdy or undisciplined activities which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in a fresher or a junior student or asking the students to do any act or perform something which such student will not in the ordinary course and which has the effect of causing or generating a sense of shame or embarrassment so as to adversely affect the physique or psyche of a fresher or a junior student.

3.5 “University” means a university established or incorporated by or under a Central Act, a Provincial Act or a State Act, an institution deemed to be university under Section 3 of the UGC Act, 1956, or an institution specially empowered by an Act of Parliament to confer or grant degrees

4 Punishable ingredients of Ragging:-

- Abetment to ragging;
- Criminal conspiracy to rag;
- Unlawful assembly and rioting while ragging;
- Public nuisance created during ragging;
- Violation of decency and morals through ragging;
- Injury to body, causing hurt or grievous hurt;
- Wrongful restraint;
- Wrongful confinement;
- Use of criminal force;
- Assault as well as sexual offences or even unnatural offences;
- Extortion;
- Criminal trespass;
- Offences against property;
- Criminal intimidation;
- Attempts to commit any or all of the above mentioned offences against the victim(s);
- All other offences following from the definition of “Ragging”.

5 Measures for prohibition of ragging at the institution level:-

- 5.1 The institution shall strictly observe the provisions of the Act of the Central Government and the State Governments, if any, or if enacted, considering ragging as a cognizable offence under the law on a par with rape and other atrocities against women and ill- treatment of persons belonging to the SC/ST, and prohibiting ragging in all its forms in all institutions.
- 5.2 Ragging in all its forms shall be totally banned in the entire institution, including its departments, constituent units, all its premises (academic, residential, sports, canteen, etc.) whether located within the campus or outside and in all means of transportation of students whether public or private.
- 5.3 The institution shall take strict action against those found guilty of ragging and/or of abetting ragging.

6 Measures for prevention of ragging at the institution level:-

6.1 Before admissions:-

- 6.1.1 The advertisement for admissions shall clearly mention that ragging is totally banned in the institution, and anyone found guilty of ragging and/or abetting ragging is liable to be punished Appropriately (for punishments, ref. section 8 below).
- 6.1.2 The brochure of admission/instruction booklet for candidates shall print in block letters these Regulations in full (including Annexures).
- 6.1.3 The ‘Prospectus’ and other admission related documents shall incorporate all directions of the Supreme Court and / or the Central or State Governments as applicable, so that the candidates and their parents/ guardians are sensitized in respect of the prohibition

and consequences of ragging. If the institution is an affiliating university, it shall make it mandatory for the institutions under it to compulsorily incorporate such information in their 'Prospectus'.

- 6.1.4 The application form for admission/ enrolment shall have a printed undertaking, preferably both in English/Hindi and in one of the regional languages known to the institution and the applicant (English version given in Annexure I, Part I), to be filled up and signed by the candidate to the effect that he/she is aware of the law regarding prohibition of ragging as well as the punishments, and that he/she, if found guilty of the offence of ragging and/or abetting ragging, is liable to be punished appropriately.
- 6.1.5 The application form shall also contain printed undertaking, preferably both in English/Hindi and in one of the regional languages known to the institution and the parent/ guardian (English version given in Annexure I, Part II), to be signed by the parent/ guardian of the applicant to the effect that he/ she is also aware of the law in this regard and agrees to abide by the punishment meted out to his/her ward in case the latter is found guilty of ragging and/or abetting ragging.
- 6.1.6 The application for admission shall be accompanied by a document in respect of the School Leaving Certificate/ Character Certificate which shall include a report on the behavioral pattern of the applicant, so that the institution can thereafter keep intense watch upon a student who has a negative entry in this regard.
- 6.1.7 A student seeking admission to the hostel shall have to submit another undertaking in the form of Annexure I (both Parts) along with his/ her application for hostel accommodation.
- 6.1.8. At the commencement of the academic session the Head of the Institution shall convene and address a meeting of various functionaries/agencies, like Wardens, representatives of students, parents/ guardians, faculty, district administration including police, to discuss the measures to be taken to prevent ragging in the Institution and steps to be taken to identify the offenders and punish them suitably.
- 6.1.9. To make the community at large and the students in particular aware of the dehumanizing effect of ragging, and the approach of the institution towards those indulging in ragging, big posters (preferably multicolored with different colours for the provisions of law, punishments, etc.) shall be prominently displayed on all Notice Boards of all departments, hostels and other buildings as well as at vulnerable places. Some of such posters shall be of permanent nature in certain vulnerable places.
- 6.1.10 The institution shall request the media to give adequate publicity to the law prohibiting ragging and the negative aspects of ragging and the institution's resolve to ban ragging and punish those found guilty without fear or favour.
- 6.1.11 The institution shall identify, properly illuminate and man all vulnerable locations.
- 6.1.12 The institution shall tighten security in its premises, especially at the vulnerable places. If necessary, intense policing shall be resorted to at such points at odd hours during the early months of the academic session.
- 6.1.13 The institution shall utilize the vacation period before the start of the new academic year to launch wide publicity campaign against ragging through posters, leaflets, seminars, street plays, etc.
- 6.1.14 The faculties/ departments/ units of the institution shall have induction arrangements (including those which anticipate, identify and plan to meet any special needs of any

specific section of students) in place well in advance of the beginning of the academic year with a clear sense of the main aims and objectives of the induction process.

6.2 On admission:-

- 6.2.1 Every fresher admitted to the institution shall be given a printed leaflet detailing when and to whom he/she has to turn to for help and guidance for various purposes (including Wardens, Head of the institution, members of the anti-ragging committees, relevant district and police authorities), addresses and telephone numbers of such persons/ authorities, etc., so that the fresher need not look up to the seniors for help in such matters and get indebted to them and start doing things, right or wrong, at their behest. Such a step will reduce the fresher's dependence on their seniors.
- 6.2.2 The institution through the leaflet mentioned above shall explain to the new entrants the arrangements for their induction and orientation which promote efficient and effective means of integrating them fully as students.
- 6.2.3 The leaflet mentioned above shall also tell the fresher's about their rights as bona fi de students of the institution and clearly instructing them that they should desist from doing anything against their will even if ordered by the seniors, and that they have nothing to fear as the institution cares for them and shall not tolerate any atrocities against them.
- 6.2.4 The leaflet mentioned above shall contain a calendar of events and activities laid down by the institution to facilitate and complement familiarization of juniors with the academic environment of the institution.
- 6.2.5 The institution shall also organize joint sensitization programmes of 'fresher's' and seniors.
- 6.2.6 Fresher's shall be encouraged to report incidents of ragging, either as victims, or even as witnesses.

6.3 At the end of the academic year:-

- 6.3.1 At the end of every academic year the Vice-Chancellor/ Dean of Students Welfare/ Director/ Principal shall send a letter to the parents/ guardians who are completing the first year informing them about the law regarding ragging and the punishments, and appealing to them to impress upon their wards to desist from indulging in ragging when they come back at the beginning of the next academic session.
- 6.3.2 At the end of every academic year the institution shall form a 'Mentoring Cell' consisting of Mentors for the succeeding academic year. There shall be as many levels or tiers of Mentors as the number of batches in the institution, at the rate of 1 Mentor for 10 fresher and 1 Mentor of a higher level for 10 Mentors of the lower level.

6.4 Setting up of Committees and their functions:-

- 6.4.1 The Anti-Ragging Committee: - The Anti-Ragging Committee shall be headed by the Head of the institution and shall consist of representatives of faculty members, parents, students belonging to the fresher's category as well as seniors and non-teaching staff. It shall consider the recommendations of the Anti-Ragging Squad and take appropriate decisions, including spelling out suitable punishments to those found guilty.
- 6.4.2 The Anti-Ragging Squad:- The Anti-Ragging Squad shall be nominated by the Head of the institution with such representation as considered necessary and shall consist of members belonging to the various sections of the campus community. The Squad will have vigil, oversight and patrolling functions. It shall be kept mobile, alert and active at all times and shall be empowered to inspect places of potential ragging and make surprise raids on hostels and other hot spots. The Squad shall investigate incidents of ragging and make

recommendations to the Anti-Ragging Committee and shall work under the overall guidance of the said Committee.

6.4.3 Monitoring Cell on Ragging:- If the institution is an affiliating university, it shall have a Monitoring Cell on Ragging to coordinate with the institutions affiliated to it by calling for reports from the Heads of such institutions regarding the activities of the Anti-Ragging Committees, Squads, and Mentoring Cells, regarding compliance with the instructions on conducting orientation programmes, counseling sessions, etc., and regarding the incidents of ragging, the problems faced by wardens and other officials, etc. This Cell shall also review the efforts made by such institutions to publicize anti-ragging measures, cross-verify the receipt of undertakings from candidates/students and their parents/guardians every year, and shall be the prime mover for initiating action by the university authorities to suitably amend the Statutes or Ordinances or Bye-laws to facilitate the implementation of anti-ragging measures at the level of the institution.

6.5 Other measures:-

6.5.1 The Annexure mentioned in 6.1.4, 6.1.5 and 6.1.7 shall be furnished at the beginning of each academic year by every student, that is, by fresher as well as seniors.

6.5.2 The institution shall arrange for regular and periodic psychological counseling and orientation for students (for fresher's separately, as well as jointly with seniors) by professional counselors during the first three months of the new academic year. This shall be done at the institution and department/ course levels. Parents and teachers shall also be involved in such sessions.

6.5.3 Apart from placing posters mentioned in 6.1.9 above at strategic places, the institution shall undertake measures for extensive publicity against ragging by means of audio-visual aids, by holding counseling sessions, workshops, painting and design competitions among students and other methods as it deems fit.

6.5.4 If the institution has B.Ed. and other Teacher training programmes, these courses shall be mandated to provide for anti-ragging and the relevant human rights appreciation inputs, as well as topics on sensitization against corporal punishments and checking of bullying amongst students, so that every teacher is equipped to handle at least the rudiments of the counseling approach.

6.5.5 Wardens shall be appointed as per the eligibility criteria laid down for the post reflecting both the command and control aspects of maintaining discipline, as well as the softer skills of counseling and communicating with the youth outside the class-room situations. Wardens shall be accessible at all hours and shall be provided with mobile phones. The institution shall review and suitably enhance the powers and perquisites of Wardens and authorities involved in curbing the menace of ragging.

6.5.6 The security personnel posted in hostels shall be under the direct control of the Wardens and assessed by them.

6.5.7 Private commercially managed lodges and hostels shall be registered with the local police authorities, and this shall be done necessarily on the recommendation of the Head of the institution. Local police, local administration and the institutional authorities shall ensure vigil on incidents that may come within the definition of ragging and shall be responsible for action in the event of ragging in such premises, just as they would be for incidents within the campus. Managements of such private hostels shall be responsible for not reporting cases of ragging in their premises.

- 6.5.8 The Head of the institution shall take immediate action on receipt of the recommendations of the Anti-Ragging Squad. He/ She shall also take action suo motto if the circumstances so warrant.
- 6.5.9 Fresher's who do not report the incidents of ragging either as victims or as witnesses shall also be punished suitably.
- 6.5.10 Anonymous random surveys shall be conducted across the 1st year batch of students (fresher's) every fortnight during the first three months of the academic year to verify and cross-check whether the campus is indeed free of ragging or not. The institution may design its own methodology of conducting such surveys.
- 6.5.11 The burden of proof shall lie on the perpetrator of ragging and not on the victim.
- 6.5.12 The institution shall file an FIR with the police / local authorities whenever a case of ragging is reported, but continue with its own enquiry and other measures without waiting for action on the part of the police/ local civil authorities. Remedial action shall be initiated and completed within the one week of the incident itself.
- 6.5.13 The Migration / Transfer Certificate issued to the student by the institution shall have an entry, apart from those relating to general conduct and behavior, whether the student has been punished for the offence of committing or abetting ragging, or not, as also whether the student has displayed persistent violent or aggressive behavior or any desire to harm others.
- 6.5.14 Preventing or acting against ragging shall be the collective responsibility of all levels and sections of authorities or functionaries in the institution, including faculty, and not merely that of the specific body/ committee constituted for prevention of ragging.
- 6.5.15 The Heads of institutions other than universities shall submit weekly reports to the Vice-chancellor of the university the institution is affiliated to or recognized by, during the first three months of new academic year and thereafter each month on the status of compliance with anti-ragging measures. The Vice Chancellor of each university shall submit fortnightly reports of the university, including those of the Monitoring Cell on Ragging in case of an affiliating university, to the Chancellor.
- 6.5.16 Access to mobile phones and public phones shall be unrestricted in hostels and campuses, except in class-rooms, seminar halls, library etc. where jammers shall be installed to restrict the use of mobile phones.
- 6.6 Measures for encouraging healthy interaction between fresher's and seniors:-**
- 6.6.1 The institution shall set up appropriate committees including the course-in-charge, student advisor, Warden and some senior students to actively monitor, promote and regulate healthy interaction between the fresher's and senior students.
- 6.6.2 Fresher's welcome parties shall be organized in each department by the senior students and the faculty together soon after admissions, preferably within the first two weeks of the beginning of the academic session, for proper introduction to one another and where the talents of the fresher's are brought out properly in the presence of the faculty, thus helping them to shed their inferiority complex, if any, and remove their inhibitions.
- 6.6.3 The institution shall enhance the student-faculty interaction by involving the students in all matters of the institution, except those relating to the actual processes of evaluation and of faculty appointments, so that the students shall feel that they are responsible partners in managing the affairs of the institution and consequently the credit due to the institution for good work/ performance is due to them as well.

6.7 Measures at the UGC/ Statutory/ Regulatory bodies' level:-

- 6.7.1 The UGC and other Statutory /Regulatory bodies shall make it mandatory for the institutions to compulsorily incorporate in their 'Prospectus' the directions of the Supreme Court and/or the Central or State Governments with regard to prohibition and consequences of ragging, and that noncompliance with the directives against ragging in any manner whatsoever shall be considered as lowering of academic standards by the erring institution making it liable for appropriate action.
- 6.7.2 The UGC (including NAAC and UGC Expert Committees visiting institutions for various purposes) and similar Committees of other Statutory/Regulatory bodies shall cross-verify that the institutions strictly comply with the requirement of getting the undertakings from the students and their parents/ guardians as envisaged under these Regulations.
- 6.7.3 The UGC and other funding bodies shall make it one of the conditions in the Utilization Certificate for sanctioning any financial assistance or aid to the institution under any of the general or special schemes that the institution has strictly complied with the anti-ragging measures and has a blemish less record in terms of there being no incidents of ragging during the period pertaining to the Utilization Certificate.
- 6.7.4 The NAAC and other accrediting bodies shall factor in any incident of ragging in the institution while assessing the institution in different grades.
- 6.7.5 The UGC shall constitute a Board for Coordination consisting of representatives of the AICTE, the IITs, the NITs, the IIMs, the MCI, the DCI, the NCI, the ICAR and such other bodies which have to deal with higher education to coordinate and monitor the anti-ragging movement across the country and to make certain policy decisions. The said Board shall meet once in a year in the normal course.
- 6.7.6 The UGC shall have an Anti-Ragging Cell within the Commission as an institutional mechanism to provide secretarial support for collection of information and monitoring, and to coordinate with the State level and university level Committees for effective implementation of anti-ragging measures.
- 6.7.7 If an institution fails to curb ragging, the UGC/ the Statutory/ Regulatory body concerned may stop financial assistance to such an institution or take such action within its powers as it may deem fit and impose such other penalties as provided till such time as the institution achieves the objective of curbing ragging.

7 Incentives for curbing ragging:-

- 7.1 The UGC shall consider providing special/ additional annual financial grants-in aid to those eligible institutions which report a blemish-less record in terms of there being no incidents of ragging.
- 7.2 The UGC shall also consider instituting another category of financial awards or incentives for those eligible institutions which take stringent action against those responsible for incidents of ragging.
- 7.3 The UGC shall lay down the necessary incentive for the post of Warden in order to attract the right type of eligible candidates, and motivate the incumbent.

8 Punishments:-

8.1At the institution level:

Depending upon the nature and gravity of the offence as established by the Anti-Ragging Committee of the institution, the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:

- 8.1.1 Cancellation of admission

- 8.1.2 Suspension from attending classes
- 8.1.3 Withholding/ withdrawing scholarship/ fellowship and other benefits
- 8.1.4 Debarring from appearing in any test/ examination or other evaluation process
- 8.1.5 Withholding results
- 8.1.6 Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc.
- 8.1.7 Suspension/ expulsion from the hostel
- 8.1.8 Rustication from the institution for period ranging from 1 to 4 semesters
- 8.1.9 Expulsion from the institution and consequent debarring from admission to any other institution
- 8.1.10 Fine of Rupees 25,000/-
- 8.1.11 Collective punishment: When the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers.

8.2 At the university level in respect of institutions under it:

If an institution under a university (being constituent of, affiliated to or recognized by it) fails to comply with any of the provisions of these Regulations and fails to curb ragging effectively, the university may impose any or all of the following penalties on it:

- 8.2.1 Withdrawal of affiliation/ recognition or other privileges conferred on it
- 8.2.2 Prohibiting such institution from presenting any students then undergoing any programme of study therein for the award of any degree/diploma of the university
- 8.2.3 Withholding any grants allocated to it by the university
- 8.2.4 Any other appropriate penalty within the powers of the university.

8.3 At the UGC level:

If an institution fails to curb ragging, the UGC may impose any or all of the following penalties on it:

- 8.3.1 Delisting the institution from section 2(f) and /or section 12B of the UGC Act
- 8.3.2 Withholding any grants allocated to it
- 8.3.3 Declaring institutions which are not covered under section 2(f) and or 12B as ineligible for any assistance like that for Major/ Minor Research Project, etc.
- 8.3.4 Declaring the institution ineligible for consideration under any of the special assistance programmes like CPE (College with potential for Excellence), UPE (University with Potential for Excellence) CPEPA (Centre with Potential for Excellence in a Particular Area), etc.
- 8.3.5 Declaring that the institution does not have the minimum academic standards and warning the potential candidates for admission accordingly through public notice and posting on the UGC Website.

**DISCIPLINE AMONG STUDENTS
IN
UNIVERSITY EXAMINATIONS**

DISCIPLINE AMONG STUDENTS IN UNIVERSITY EXAMINATIONS

I UNIVERSITY END SEMESTER EXAMINATIONS

1. The end –semester examination shall be held under the general supervision of the Head of Department by the faculty member concerned. He/she shall be responsible for the fair and orderly conduct of the examination
2. In case of detection of unfair means (as specified in clause 1 of General Guidelines below), the same shall be brought to the notice of the head of the department concerned for further action specified under clause 5 of the General Guidelines below

II ENTRANCE EXAMINATIONS

1. During an entrance examination the candidates shall be under the disciplinary control of the chief Superintendent of the centre who shall issue the necessary instructions. If a candidate disobeys instructions or misbehaves with any member of the supervisory staff or with any of the invigilators at the centre, he/she may be expelled from the examination for that session.
2. The Chief Superintendent shall immediately report the facts of such a case with full details of evidence to the Controller of Examinations who will refer the matter to the Examination Discipline Committee in terms of clause 4 of General Guidelines below. The committee will make recommendations for disciplinary action as it may deem fit to the Vice-Chancellor as provided under clause 7
3. Everybody, before an examination begins, the invigilators shall call upon all the candidates to search their persons, tables, desks, etc. and ask them to hand over all papers, books, notes or other reference material which they are not allowed to have in their possession or accessible to them in the examination hall. Where a late-comer is admitted this warning shall be repeated to him at the time of entrance to the examination hall. They are also to see that each candidate has his/her identification card and hall ticket with him/her.

III GENERAL GUIDELINES

1. Use of Unfair means:

A candidate shall not use means in connection with any examination. The following shall be deemed to unfair means:

- a. Found in possession of incriminating material related/unrelated to the subject of the examination concerned.
- b. Found copying either from the possessed material or from a neighbor.
- c. Inter-changing of answer scripts.
- d. Change of seat for copying.
- e. Trying to help others candidates.
- f. Found consulting neighbors
- g. Exchange of answer sheets or relevant materials.
- h. Writing some other candidate's register number in the main answer paper.
- i. Insertion of pre-written answer sheets (Main sheets or Additional sheets)
- j. Threatening the invigilator or insubordinate behavior as reported by the Chief Superintendent and / or Hall Superintendent.
- k. Consulting the invigilator for answering the questions in the examination.

l. Cases of impersonation

m. Mass copying

n. Using electronic devices for the purpose of malpractice.

The Executive Council may declare any other act of omission or commission to be unfair means in respect of any or all the examination.

2. If the Vice-Chancellor is satisfied that there has been mass-scale copying or use of unfair means on a mass-scale at particular center(s), he may cancel the examination of all the candidates concerned and order re-examination.

3. Where the invigilator in-charge is satisfied that one third (1/3) or more students were involved in using unfair-means or copying in a particular Examination Hall. It shall be deemed to be a case of mass copying.

a) The Chief Superintendent of the examination centre shall report to the Controller of Examinations without delay and on the day of the occurrence if possible, each case where use of unfair means in the examination is suspected or discovered with full details of the evidence in support thereof and the statement of the candidate concerned, if any, on the forms supplied by the Controller of Examination for the purpose.

b) A candidate shall not be forced to give a statement but the fact of his /her having refused to make a statement shall be recorded by the Chief Superintendent and shall be got attested by two other members of the supervisory staff on duty at the time of occurrence of the incident.

c) A candidate detected or suspected of using unfair means in the examination may be permitted to answer the question paper, but on separate answer-book. The answer-book in which the use of unfair means is suspected shall be seized by the Chief Superintendent, who shall send both the answer-books to the Controller of Examination with his report. This will not affect the concerned candidate appearing in the rest of the examinations.

d) All cases of use of unfair means shall be reported immediately to the Controller of the Examination by the Centre Superintendent, examiner, paper-setter, evaluator, moderator, tabulator or the person connected with the University examination as the case may be, with all the relevant material.

4. Examination Discipline Committee

a) All the cases of alleged use of unfair means shall be referred to a committee called the Examination Discipline Committee to be appointed by the Vice-Chancellor.

b) The Committee shall consist of five members drawn from amongst the teachers and officers of the university. One member will be nominated as Chairman from amongst them by the Vice Chancellor.

c) A member shall be appointed for a term of two years, and shall be eligible for re-appointment.

d) Three members present shall constitute the quorum.

e) Ordinarily, all decisions shall be taken by the Committee by simple majority. If the members cannot reach a consensus, the case shall be referred to the Vice-Chancellor, whose decision shall be final.

- f) All decisions taken by the examination discipline committee will be placed before the Vice-Chancellor for approval
- g) A candidate within one month of the receipt of the decision of the university may appeal to the Vice-Chancellor, in writing for a review of the case. If the Vice-Chancellor is satisfied that the representation merits consideration, he/she may refer the case back to the Examination Discipline Committee for reconsideration.

5 The Examination Discipline Committee may recommend one of the following punishments for cases of unfair means

Nature of unfair means	Scale of Punishment
If the candidate has used unfair means specified in sub-clause (a) to (g) of clause 3	Cancel all the University Examinations registered by the candidate in that session.
If the candidate has repeated the unfair means shown at 3(a) to (g) a second time	Cancel the University Examination of all subjects registered by the candidate in that session and debar him/her for the next examination session (i.e. all university Examinations in the subsequent session)
If the candidate has repeated the unfair means shown at 3(a) to (g) third time	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two years from registering and appearing for the university Examination
If the candidate has used unfair means specified in sub-clause (h) of clause	Cancel the University Examination of all subjects registered by the candidate during that semester only.
If the candidate has used unfair means specified in sub-clause (i) of clause	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two subsequent Examination sessions.
If the candidate has used unfair means specified in sub-clause (j) of clause 3	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two years from registering and appearing for the university Examination
If the candidate has used unfair means specified in sub-clause (k) of clause	Cancel the University Examination of all subjects registered by the candidate for that session
If the candidate has used unfair means specified in sub-clause (l) of clause	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two years from registering and appearing for the examination sessions. Moreover, relevant legal action shall be initiated if an outsider is involved.
If the candidate used unfair means in sub-clause (m) of clause 3	ix) a) In the single Hall: Cancel the relevant examination taken by the students of that Hall. Debar the concerned Hall superintendent and other involved directly or

indirectly from the examination work such as invigilation, question paper-setting, valuation, etc. for the next six examination sessions.

b) In a Centre: Cancel the relevant examination taken by the students of the center. Debarred the Hall Superintendents and the Chief Superintendent and other involved directly or indirectly from the examination work such as invigilation, question paper-setting, valuation, etc. for the next six examination sessions and cancel the examination center for two years

Contact Details of Staff And Faculty Members of Civil Engineering Department

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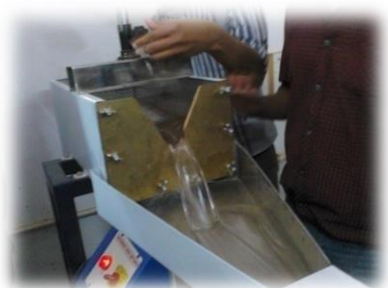
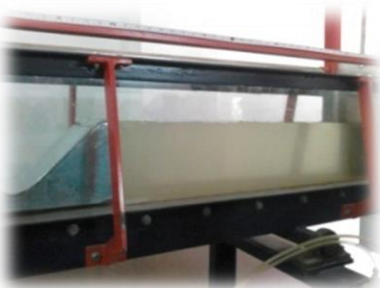
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56	University Engineer	Er. Laxmikant Jaiswal	07752-260491, 093017-85608
57	SC / ST Cell	Mr S kispotta (Nodal officer)	07752-260412

Note: For current/other required contacts numbers of officers/staff refer the concerned dept./section in the university website

WELL EQUIPPED LABS
CIVIL ENGINEERING DEPARTMENT
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR







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