UNIVERSITY VISION AND MISSION

VISION

B.S. Abdur Rahman Institute of Science & Technology aspires to be a leader in Education, Training and Research in Engineering, Science, Technology and Management and to play a vital role in the Socio-Economic progress of the Country.

MISSION

- To blossom into an internationally renowned University
- To empower the youth through quality education and to provide professional leadership
- To achieve excellence in all its endeavors to face global challenges
- To provide excellent teaching and research ambience
- To network with global Institutions of Excellence, Business, Industry and Research Organizations
- To contribute to the knowledge base through Scientific enquiry, Applied Research and Innovation.

VISION AND MISSION OF THE DEPARTMENT OF CIVIL ENGINEERING

VISION

To be a leading school for Education, Training and Research in Civil Engineering for a better future and over-all Socio-Economic progress of the Country in a sustainable manner

MISSION

- To nurture Civil Engineers into ethically strong and responsible leaders to address Global challenges through Quality Education, Application oriented research, innovation, inspiration, motivation and sustainable growth.

- To enrich and enhance knowledge for the best practices in various disciplines of Civil Engineering through Collaborations with Global Institutions of Excellence, Industries and Research Organizations.

PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES

B.Tech. (Civil Engineering)

PROGRAMME EDUCATIONAL OBJECTIVES

- To provide fundamental knowledge in science and mathematics to understand civil engineering concepts.
- To equip with knowledge to plan, design, analyze, construct, maintain and manage civil engineering systems.
- To provide understanding of various codes and standards in the field of design and construction.
- To impart knowledge in theory and skills in practice on structural, geo-technical, geo-informatics, water resources, environmental and transportation engineering in solving civil engineering problems.
- To inculcate knowledge of sustainability in various aspects of civil engineering.
- To provide broad exposure on managerial, economic and ethical issues.

PROGRAMME OUTCOMES

On successful completion of the programme, the graduates will have

- Ability to apply knowledge of mathematics, science and engineering to solve problems related to civil engineering.
- Ability to design components of civil engineering systems to meet the requirements within constraints like economic, environmental, social, health & safety and sustainability.
- Ability to apply the techniques, skills and modern engineering tools necessary for civil engineering practice.
- Ability to communicate and function effectively in multi-disciplinary teams.
- Ability to understand the importance of professional and ethical responsibilities of engineers.

B.S.ABDUR RAHMAN
UNIVERSITY
B.S. ABDUR RAHMAN INSTITUTE OF SCIENCE & TECHNOLOGY
(Estd.u/s 3 of the UGC Act, 1956)
(FORMERLY B.S.ABDUR RAHMAN CRESCENT ENGINEERING COLLEGE)
Seethakathi Estate, G.S.T. Road, Vandalur, Chennai - 600 048.

REGULATIONS 2013
FOR
B.TECH. DEGREE PROGRAMMES

(WITH AMENDMENTS INCORPORATED TILL JUNE 2015)

REGULATIONS - 2013 FOR
B.TECH. DEGREE PROGRAMMES
(With Amendments Incorporated Till June 2015)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) **"Programme"** means B.Tech. Degree Programme.

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

iii) **"Course"** means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, Engineering Graphics, Computer Practice, etc.,

iv) **"University"** means B.S.Abdur Rahman University.

v) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of B.S. Abdur Rahman University.

vi) **"Dean (Student Affairs)"** means the Dean (Students Affairs) of B.S.Abdur Rahman University.

vii) **"Controller of Examinations"** means the Controller of Examination of B.S. Abdur Rahman University, who is responsible for conduct of examinations and declaration of results.

2.0 ADMISSION

2.1a) Candidates for admission to the first semester of the eight semester B.Tech. degree programme shall be required to have passed the Higher Secondary Examination of the (10+2) curriculum (Academic stream) prescribed by the appropriate authority or any other examination of any university or authority accepted by the University as equivalent thereto.

2.1b) Candidates for admission to the third semester of the eight semester B.Tech. programme under lateral entry scheme shall be required to have passed the Diploma examination in Engineering / Technology of the Department of Technical Education, Government of Tamil Nadu or any other examination of any other authority accepted by the University as equivalent thereto.

2.2 Notwithstanding the qualifying examination the candidate might have passed, the candidate shall also write an entrance examination prescribed by the University for admission. The entrance examination shall test the proficiency of the candidate in Mathematics, Physics and Chemistry on the standards prescribed for plus two academic stream.

2.3 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the University from time to time.

3.0 BRANCHES OF STUDY

3.1 Regulations are applicable to the following B.Tech. degree programmes in various branches of Engineering and Technology, each distributed over eight semesters with two semesters per academic year.

B.TECH. DEGREE PROGRAMMES:

1. Aeronautical Engineering
2. Automobile Engineering
3. Civil Engineering
4. Computer Science and Engineering
5. Electrical and Electronics Engineering
6. Electronics and Communication Engineering
7. Electronics and Instrumentation Engineering
8. Information Technology
9. Manufacturing Engineering
10. Mechanical Engineering
11. Polymer Engineering
12. Biotechnology
13. Cancer Biotechnology
14. Food Biotechnology

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every Programme will have a curriculum with syllabi consisting of theory and practical courses such as,

i) Basic Sciences (BS)

ii) Humanities & Social Sciences (HS)

iii) Management Sciences (MS)

iv) Engineering Sciences Fundamentals (ESF)

v) Engineering Core Courses (EC)

vi) Professional Electives (PE)

vii) General Electives (GE)

viii) Workshop practice, laboratory work, industrial training, seminar presentation, project work, etc.

4.2 Each course is normally assigned certain number of credits : one credit per lecture period per week

one credit per tutorial period per week

one credit for two to three periods and two credits for four periods of laboratory or practical courses

one credit for two periods of seminar / project work per week

one credit for two weeks of industrial training

4.3 Each semester curriculum shall normally have a blend of lecture courses not exceeding seven and practical courses not exceeding four.

4.4 For the award of the degree, a student has to earn a minimum total credits specified in the curriculum of the relevant branch of study. This minimum will be between 175 and 185 credits, depending on the program.

4.5 The medium of instruction, examinations and project report shall be English, except for courses on languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is ordinarily expected to complete the B.Tech. programme in eight semesters (six semesters in the case of a lateral entry scheme), but in any case not more than 14 continuous semesters reckoned from the date of first admission (12 semesters in the case of lateral entry student).

5.2 Each semester shall consist of a minimum of 90 working days or 450 periods.

5.3 Semester end examination will normally follow immediately after the last working day of the semester.

6.0 CLASS ADVISOR AND FACULTY ADVISOR

6.1 CLASS ADVISOR

A faculty member will be nominated by the HOD as Class Advisor for the whole class (2nd to 8th semester).

He/she is responsible for maintaining the academic, curricular and co-curricular records of all students throughout their period of study.

However, for the first semester alone the class advisors and faculty advisors will be nominated by first year coordinator.

6.2 FACULTY ADVISOR

To help the students in planning their courses of study and for general counseling on the academic programme, the Head of the Department of the students will attach a certain number of students to a faculty member of the department who shall function as Faculty Advisor for the students throughout their period of study. Such Faculty Advisor shall offer advice to the students on academic and personal matters, and guide the students in taking up courses for registration and enrolment every semester.

7.0 COURSE COMMITTEE

Common course offered to more than one discipline or group, shall have a "Course Committee", comprising all the faculty members teaching the common course with one of them nominated as Course Coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs), depending on whether all the faculty members teaching the common course belong to the same department / different departments.

8.0 CLASS COMMITTEE

During first semester, a common Class Committee will be constituted for all branches by the Dean (Academic Affairs). During other semesters, separate Class Committees will be constituted by the respective Head of the Department of the students

8.1 The first semester Class Committee composition will be as follows:

i) The first semester Coordinator shall be the Chairman of the class committee

ii) Course coordinators of all common courses.

iii) Faculty members of all individual courses.

iv) One male and one female first semester student of each class of B.Tech, program to be nominated by the first semester coordinator

v) All first semester class advisors and faculty advisors

8.2 The composition of the class committee for each branch of B.Tech, from 2nd to 8th semester, will be as follows:

i) One senior faculty member preferably not teaching to the concerned class, appointed as Chairman by the Head of the Department

ii) Faculty members of individual courses

iii) Two students, (preferably one male and one female) of the class per group of 30 students or part thereof, to be nominated by the Head of the Department, in consultation with the faculty advisors.

iv) All faculty advisors and the class advisor of the class

v) Head of the Department

8.3 The class committee shall meet at least thrice during the semester. The first meeting will be held within two weeks from the date of commencement of classes, in which the nature of continuous assessment for various courses and the weightages for each component of assessment will be decided for the first, second and third assessments. The second meeting will be held within a week after the date of first assessment report, to review the students' performance and for follow up action. The third meeting will be held within a week after the second assessment report, to review the students' performance and for follow up action.

8.4 During these three meetings the student members representing the entire class, shall meaningfully interact and express opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

8.5 The class committee, excluding the student members, shall meet within 10 days from the last day of the semester end examination to analyze the performance of the students in all the components of assessments and decide the grades for students in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

9.0 REGISTRATION AND ENROLMENT

9.1 Except for the first semester, every student shall register for the ensuing semester during a specified week before the semester end examination of the current semester. Every student shall submit a completed Registration form indicating the list of courses intended to be enrolled during the ensuing semester. Late registration with the approval of the Dean (Academic Affairs) along with a late fee will be permitted up to the last working day of the current semester.

9.2 From the second year onwards, all students shall pay the prescribed fees for the year on a specific day at the beginning of the semester confirming the registered courses. Late enrolment along with a late fee will be permitted up to two weeks from the date of commencement of classes. If a student does not enroll, his/her name will be removed from rolls.

9.3 The students of first semester shall register and enroll at the time of admission by paying the prescribed fees.

9.4 A student should have registered for all preceding semesters before registering for a particular semester.

10.1 CHANGE OF A COURSE

A student can change an enrolled course within 15 days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

10.2 WITHDRAWAL FROM A COURSE

A student can withdraw from an enrolled course at any time before the second assessment for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

11.0 TEMPORARY BREAK OF STUDY FROM A PROGRAMME

A student can avail a onetime temporary break of study covering the current semester and/or next semester period with the approval of the Head of the Institution at any time before the start of third assessment of current semester, within the maximum period of 14 or 12 semesters as the case may be. If any student is debarred for want of attendance or suspended due to any act of indiscipline it will not be considered as break of study.

A student availed break of study has to rejoin only in the same semester from where he left.

12.0 CREDIT LIMIT FOR ENROLMENT & MOVEMENT TO HIGHER SEMESTER

12.1 A student can enroll for a maximum of 30 credits during a semester including redo courses.

12.2 The minimum credit requirement to move to the higher semester is

- Not less than a total of 20 credits, to move to the 3rd semester
- Not less than a total of 40 credits, (20 for lateral entry) to move to the 5th semester
- Not less than a total of 60 credits, (40 for lateral entry) to move to the 7th semester

13.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

13.1 Every theory course shall have a total of four assessments during a semester as given below:

Assessment No.	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 4	1.5 hours	15%
Assessment 2	5 to 8	1.5 hours	15%
Assessment 3	9 to 12	1.5 hours	15%
Attendance #	-	-	5%
Semester End Exam	Full course	3 hours	50%

\# 76-80% - 1 Mark ; 81-85 – 2 Marks ; 86-90 – 3 Marks ; 91-95 – 4 Marks and 96-100 – 5 Marks

13.2 Appearing for semester end examination for each course is mandatory and a student should secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

13.3 Every practical course will have 60% weightage for continuous assessment and 40% for semester end examination. However, a student should have secured a minimum of 50% marks in the semester end practical examination.

13.4 In the case of Industrial training, the student shall submit a report, which will be evaluated along with an oral examination by a committee of faculty members, constituted by the Head of the department. A progress report from the industry will also be taken into account for evaluation.

13.5 In the case of project work, a committee of faculty members constituted by the Head of the Department will carry out three periodic reviews. Based on the project report submitted by the student(s), an oral examination (viva-voce) will be conducted as the semester end examination, for which one external examiner, approved by the Controller of Examinations, will be included. The weightage for periodic review will be 50% and remaining 50% for the project report and Viva Voce examination.

13.6 Assessment of seminars and comprehension will be carried out by a committee of faculty members constituted by the Head of the Department.

13.7 The continuous assessment marks earned for a course during his/her first appearance will be used for grading along with the marks earned in the semester-end examination / arrear examination for that course until he/she completes.

14.0 SUBSTITUTE EXAMINATIONS

14.1 A student who has missed, for genuine reasons, a maximum of one of the four assessments of a course may be permitted to write a substitute examination. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accident, admission to a hospital due to illness, etc. by a committee constituted by the Dean of School for that purpose.

14.2 A student who misses any assessment in a course shall apply in a prescribed form to the Head of the department / Dean within a week from the date of missed assessment. However the substitute tests and examination for a course will be conducted within two weeks after the last day of the semester-end examinations.

15.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

15.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% (for genuine reasons such as medical grounds or representing the University in approved events etc.) to become eligible to appear for the semester-end examination in that course, failing

which the student shall be awarded "I" grade in that course. If the course is a core course, the candidate should register for and repeat the course when it is offered next.

15.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in that course to the class advisor. The class advisor will consolidate and furnish the list of students who have earned less that 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department. Thereupon, the Dean (Academic Affairs) shall announce, course-wise, the names of such students prevented from writing the semester end examination in each course.

15.3 A student should register to re-do a core course wherein "I" or "W" grade is awarded. If the student is awarded, "I" or "W" grade in an elective course either the same elective course may be repeated or a new elective course may be taken.

15.4 A student who is awarded "U" grade in a course will have the option of either to write semester end arrear examination at the end of the subsequent semesters, or to redo the course during summer term / regular semester. Marks earned during the redo period in the continuous assessment for the course, will be used for grading along with the marks earned in the semester-end (redo) examination. If any student obtained "U" grade during summer term course, the marks earned during the redo period for the continuous assessment for that course will be considered for further appearance as arrears.

15.5 If a student with "U" grade prefers to redo any particular course fails to earn the minimum 75% attendance while doing that course, then he/she will be awarded "I" grade in that course.

15.6 The students who have not attended a single hour in all courses in a semester and awarded 'I' grade are not permitted to write the examination and also not permitted move to next higher semester. Such students should repeat all the courses of the semester in the next Academic year.

16.0 SUMMER TERM COURSES

16.1 A student can register for a maximum of three courses during summer term, if such courses are offered by the concerned department during the summer term. Students may also opt to redo such courses during regular semesters.

16.2 The Head of the Department, in consultation with the department consultative committee may arrange for the conduct of a few courses during the summer term, depending on the availability of faculty members during summer and subject to a specified minimum number of students registering for each of such courses.

16.3 However, in the case of students who have completed eighth semester, but having arrears in the earlier semesters in a maximum of two courses, summer courses may be offered, even if less than minimum students may register for the course.

16.4 The number of contact hours and the assessment procedure for any course during summer term will be the same as those during regular semesters except that there is no provision either for withdrawal from a summer term course or for substitute examination.

17.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

17.1 All assessments of a course will be made on absolute marks basis. However, the Class Committee without the student members shall meet within 10 days after the semester-end examination and analyze the performance of students in all assessments of a course and award letter grade. The letter grades and the corresponding grade points are as follows:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
W	--
I	--
AB	--

"W" denotes withdrawal from the course.

"I" denotes inadequate attendance and hence prevention from semester-end examination

"U" denotes unsuccessful performance in the course. "AB" denotes absence for the semester-end examination.

17.2 A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student.

17.3 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department and declared by the Controller of Examinations.

17.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester-end theory examination answer scripts of courses, on payment of prescribed fee, through proper application to Dean (Academic Affairs), who shall constitute a revaluation committee consisting of Chairman of the class committee as convener, the faculty member of the course and a senior member of faculty knowledgeable in that course. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

17.5 After results are declared, grade sheets shall be issued to each student, which will contain the following details. The list of courses enrolled during the semester including Summer term (redo) courses, if any, and the grade scored, the Grade Point Average (GPA) for the semester and the Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards. GPA is the ratio of the sum of the products of the number of credits of courses registered and the points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester, including summer courses if any.

If Ci, is the number of credits assigned for the i^{th} course and GPi is the Grade Point in the i^{th} course

$$GPA = \frac{\sum_{i=1}^{n}(C_i)(GPi)}{\sum_{i=1}^{n} C_i} \qquad Where\ \ n = number\ of\ courses$$

The Cumulative Grade Point Average CGPA shall be calculated in a similar manner, considering all the courses enrolled from first semester.

“I” and **"W"** grades will be excluded for calculating GPA .

"U", **“I”**, **"AB"** and **"W"** grades will be excluded for calculating CGPA

17.6 After successful completion of the programme, the Degree will be awarded with the following classifications based on CGPA.

Classification	**CGPA**
First Class with Distinction	8.50 and above and passing all the courses in first appearance an completing the programme within the normal 8 or 6 (for lateral entry) semesters
First Class	6.50 and above and completing the programme within a maximum of 10 or 8 (for lateral entry) semesters.
Second Class	All others

However, to be eligible for First Class with Distinction, a student should not have obtained U and I grade in any course during his/her study and should have completed the U.G. programme within a minimum period covered by the minimum duration plus authorized break of study, if any (clause 11). To be eligible for First Class, a student should have passed the examination in all courses within the specified minimum number of semesters reckoned from his/her commencement of study plus two semesters. For this purpose, the authorized break of study will not be counted. The students who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to two decimal places. For the purpose of comparison of performance of students and ranking, CGPA will be considered up to three decimal places.

18.0 ELECTIVE CHOICE: OPTION TO DO PROJECT ALONE IN FINAL SEMESTER

18.1 Apart from the various elective courses listed in the curriculum for each branch of specialization, the student can choose a maximum of two electives from any other specialization under any department, during the entire period of study, with the approval of the Head of the parent department and the Head of the other department offering the course.

18.2 In the curriculum of eighth Semester, along with the project work, if two elective courses alone are listed, then the Dean (Academic Affairs) may permit a student, as per approved guidelines, on the recommendation of the Head of the department, to do a full semester major industrial project work. In such a case, the above two elective courses or any other two elective courses in lieu thereof have to be enrolled during any semester preceding or succeeding the project work, if offered.

19.0 PERSONALITY AND CHARACTER DEVELOPMENT

19.1 All students shall enroll, on admission, in any of the personality and character development programmes, NCC / NSS / NSO / YRC / Rotaract and undergo practical training.

- **National Cadet Corps (NCC)** will have to undergo specified number of parades.
- **National Service Scheme (NSS)** will have social service activities in and around Chennai.
- **National Sports Organization (NSO)** will have sports, games, drills and physical exercises.
- **Youth Red Cross (YRC)** will have social service activities in and around Chennai.
- **Rotaract** will have social service activities in and around Chennai.

20.0 DISCIPLINE

20.1 Every student is required to observe disciplined 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 University.

20.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean will be referred to a Discipline and Welfare Committee, nominated by the Vice-Chancellor, for taking appropriate action.

21.0 ELIGIBILITY FOR THE AWARD OF DEGREE

21.1 A student shall be declared to be eligible for the award of B.Tech. degree provided the student has:

i) successfully completed all the required courses specified in the programme curriculum and earned the number of credits prescribed for the specialization, within a maximum period of 14 semester (12 semesters for lateral entry) from the date of admission, including break of study.

ii) no dues to the Institution, Library, Hostels

iii) no disciplinary action pending against him/her.

21.2 The award of the degree must have been approved by the University.

22.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.

CURRICULUM AND SYLLABI FOR
B.TECH. CIVIL ENGINEERING
(Eight Semesters / Full Time)

CURRICULUM

SEMESTER I

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	BS	MAB1181	Algebra, Geometry and Calculus	3	1	0	4
2	HS	ENB1181	English*				
		FRB1181	French*				
		ISB1181	Arabic*	3	0	0	3
3	BS	PHB1181	Physics	3	0	0	3
4	BS	CHB1181	Chemistry	3	0	0	3
5	ESF	GEB1101	Engineering Graphics	2	0	3	3
6	HS	SSB1182	Sociology, Ethics and Human Values	3	0	0	3
7	BS	PHB1182	Physics Lab	0	0	2	1
8	BS	CHB1182	Chemistry Lab	0	0	2	1
9	ESF	GEB1102	Basic Engineering Practices Laboratory	0	0	2	1
10	ESF	GEB1103	Computer Programming & Applications	2	0	2	3
							25

* Any one language

SEMESTER II

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	BS	MAB1282	Advanced Calculus	3	1	0	4
2	BS	CHB1283	Chemistry of Building Materials	3	0	0	3
3	HS	SSB1181	Introduction to Economics	3	0	0	3
4	ESF	GEB1211	Basic Engineering Mechanics	3	1	0	4

5	EC	CEB1211	Engineering Geology	3	0	0	3
6	EC	CEB1212	Construction Materials and Practices	3	0	0	3
7	HS	ENB1282	Written Communication	0	0	2	1
8	ESF	CEB1213	Computer Practice Laboratory	0	0	2	1
9	BS	CHB1284	Chemistry of Building Materials Laboratory	0	0	2	1
							23

SEMESTER III

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	MAB2181	Transforms and Applications	3	1	0	4
2.	BS	LSB2181	Biology for Engineers	3	0	0	3
3.	EC	CEB2101	Mechanics of Solids	3	1	0	4
4.	EC	CEB2102	Mechanics of Fluids	3	1	0	4
5.	EC	CEB2103	Concrete Technology	3	0	0	3
6.	EC	CEB2104	Surveying	3	0	0	3
7.	HS	ENB2181	Oral Communication	0	0	2	1
8.	EC	CEB2105	Surveying Laboratory I	0	0	3	1
9.	EC	CEB2106	Construction Materials Laboratory	0	0	3	1
10.	EC	CEB2107	Civil Engineering Drawing	0	0	3	1
							25

SEMESTER IV

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	BS	MAB2283	Applied Numerical Methods	3	1	0	4
2	EC	CEB2211	Strength of Materials	3	0	0	3
3	EC	CEB2212	Hydraulic and Hydraulic Machinery	3	1	0	4

4	EC	CEB2213	Water and Waste Water Engineering	3	1	0	4
5	EC	CEB2214	Transportation Engineering I	3	0	0	3
6	HS	SSB2181	Law for Engineers	3	0	0	3
7	HS	ENB2282	Confidence Building & Behavioral Skill	0	0	2	1
8	EC	CEB2215	Surveying Laboratory II	0	0	3	1
9	EC	CEB2216	Strength of Materials Laboratory	0	0	3	1
10	EC	CEB2217	Hydraulic Engineering Laboratory	0	0	3	1
							25

SEMESTER V

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	EC	CEB3101	Structural Analysis I	3	0	0	3
2	EC	CEB3102	Design of Steel Structures	3	1	0	4
3	EC	CEB3103	Geotechnical Engineering I	3	0	0	3
4	EC	CEB3104	Transportation Engineering II	3	0	0	3
5	BS	GEB3201	Environmental Science & Engineering	3	0	0	3
6	PE		Professional Elective I	3	0	0	3
7	HS	ENB3181	Career Building & People Skill	0	0	2	1
8	EC	CEB3105	Concrete and Highway Laboratory	0	0	3	1
9	EC	CEB3106	Geotechnical Engineering Laboratory	0	0	3	1
10	EC	CEB3107	Environmental Engineering Laboratory	0	0	3	1
							23

SEMESTER VI

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	EC	CEB3211	Structural Analysis -II	3	1	0	4
2	EC	CEB3212	Design of RCC	3	1	0	4

3	EC	CEB3213	Geotechnical Engineering II	3	0	0	3
4	MS	MSB3181	Management of Business Organization	3	0	0	3
5	PE		Professional Elective II	3	0	0	3
6	PE		Professional Elective III	3	0	0	3
7	EC	CEB3214	Computer Modeling and Structural Design Laboratory	0	0	3	1
8	EC	CEB3215	Seminar	0	0	2	1
9	EC	CEB3216	Survey & Soil Investigation Camp	0	0	3	1
							23

SEMESTER VII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	EC	CEB4101	Prestressed Concrete	3	0	0	3
2	EC	CEB4102	Estimation & Costing	3	0	0	3
3	EC	CEB4103	Construction Management	3	0	0	3
4	EC	CEB4104	Remote Sensing & GIS	3	0	0	3
5	EC	CEB4105	Irrigation Engineering	3	0	0	3
6	PE		Professional Elective IV	3	0	0	3
7	GE		General Elective I	3	0	0	3
8	EC	CEB4106	Design Project	0	0	3	1
9	EC	CEB4107	Irrigation & Environmental Engineering Drawing	0	0	3	1
10	EC	CEB4108	Geographic Information Systems Laboratory	0	0	3	1
11	EC	CEB4109	Industrial Internship	0	0	*	2**
							26

*30 days

** Industrial training will be undertaken during third year summer vacation. The credit will be awarded in the 7th Semester.

SEMESTER VIII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	PE		Professional Elective V	3	0	0	3
2	GE		General Elective II	3	0	0	3
3	EC	CEB4211	Project	0	0	18	9
							15

Total Credits : 185

PROFESSIONAL ELECTIVES

Sl. No.	Course Group	Course Code	Course Title
			STRUCTURAL ENGINEERING & GEOTECHNICAL ENGINEERING
1.	PE	CEBX01	Bridge Engineering
2.	PE	CEBX02	Earthquake Engineering
3.	PE	CEBX03	Spatial Structures
4.	PE	CEBX04	Industrial Structures
5.	PE	CEBX05	Repair and Rehabilitation of Structures
6.	PE	CEBX06	Tall Structures
7.	PE	CEBX07	Advanced Concrete Design
8.	PE	CEBX08	Offshore Structures
9.	PE	CEBX09	Ground Improvement Techniques
10.	PE	CEBX10	Design of Machine Foundation
			WATER RESOURCES & ENVIRONMENTAL ENGINEERING
1.	PE	CEBX11	Hydrology
2.	PE	CEBX12	Hydraulic Structures
3.	PE	CEBX13	Coastal Engineering
4.	PE	CEBX14	Dam Engineering
5.	PE	CEBX15	Air Pollution and Control
6.	PE	CEBX16	Solid Waste Management
7.	PE	CEBX17	Industrial Waste Treatment
8.	PE	CEBX18	Hazardous Waste Management
9.	PE	CEBX19	Environmental Impact Assessment
10.	PE	CEBX20	Environmental Geotechnology
			TRANSPORTATION ENGINEERING & GIS
1.	PE	CEBX21	Traffic Engineering
2.	PE	CEBX22	Pavement Design
3.	PE	CEBX23	Modern Surveying
4.	PE	CEBX24	GIS and its Applications
5.	PE	CEBX25	Geodesy

OTHER ELECTIVES

1.	PE	CEBX31	Housing, Planning and Management
2.	PE	CEBX32	Building Services
3.	PE	CEBX33	Urban Engineering and Architecture
4.	PE	CEBX34	Principles of Architecture
5.	PE	CEBX35	Engineering Ethics
6.	PE	CEBX36	Entrepreneurship for Infrastructure Engineers

GENERAL ELECTIVES

Sl. No.	Course Group	Course Code	Course Title	Offering Department
1.	GE	GEBX01	Disaster Management	Civil
2.	GE	GEBX02	Nano Technology	Physics
3.	GE	GEBX03	Control Systems	EEE
4.	GE	GEBX04	Green Design and Sustainability	Civil
5.	GE	GEBX05	Knowledge Management	CSE
6.	GE	GEBX06	Appropriate Technology	Civil / Mechanical
7.	GE	GEBX07	System Analysis and Design	Mechanical
8.	GE	GEBX08	Value Analysis and Engineering	Mechanical
9.	GE	GEBX09	Optimization Techniques	Mathematics
10.	GE	GEBX10	Engineering System Modeling and Simulation	Mechanical
11.	GE	GEBX11	Supply Chain Management	CBS
12.	GE	GEBX12	Total Quality Management	Mechanical
13.	GE	GEBX13	Energy Studies	Mechanical
14.	GE	GEBX14	Robotics	Mechanical
15.	GE	GEBX15	Cyber Security	IT
16.	GE	GEBX16	Usability Engineering	CSE
17.	GE	GEBX17	Industrial Safety	Mechanical
18.	GE	GEB X18	Transport Management	AUTO
19.	GE	GEBX19	Advanced Optimization Techniques	Mechanical
20.	GE	GEB X20	Plant Engineering	EIE
21.	GE	GEBX21	Project Management System	CBS
22.	GE	GEBX22	National Service Scheme	

SEMESTER I

MAB1181	ALGEBRA, GEOMETRY AND CALCULUS	L	T	P	C
		3	1	0	4

OBJECTIVES:

The course is aimed at

- developing the skills of engineering students in the basics of chosen topics of Mathematics that are imperative for effective understanding of engineering subjects.
- laying the foundation for learning further topics of Mathematics in higher semesters in a graded manner.
- enabling the learners to appreciate the important role of mathematical concepts in engineering applications.

MODULE I MATRICES **8**

Eigen value Problems – Eigen values and Eigenvectors of a real matrix, Engineering Applications –Properties of Eigen values and Eigenvectors – Cayley Hamilton Theorem (without proof) – Orthogonal matrices – orthogonal transformations of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

MODULE II VECTOR ALGEBRA **6**

Operations on vectors – Scalar Product, Vector Product, Projection of Vectors - Angle between two vectors - Gradient, divergence and curl.

MODULE III THREE DIMENSIONAL ANALYTICAL GEOMETRY **8**

Direction cosines & ratios – angle between two lines – equations of a plane – equations of a straight line - coplanar lines - shortest distance between skew lines – sphere – tangent plane – plane section of a sphere – orthogonal spheres.

MODULE IV DIFFERENTIAL GEOMETRY **7**

Curvature – Cartesian and polar coordinates – centre and radius of curvature– circle of curvature – involutes & evolutes – envelopes – properties of envelopes and evolutes.

MODULE V MULTI-VARIATE FUNCTIONS 8

Functions of two variables – partial derivatives – total differential – Implicit Functions – Jacobians - Taylor's series expansion – maxima and minima – Lagrange's multiplier method.

MODULE VI ORDINARY DIFFERENTIAL EQUATIONS 8

Linear equations of second order with constant and variable coefficients – Simultaneous first order linear equations with constant coefficients – homogeneous equations of Euler's type – method of undetermined co-efficients, method of variation of parameters.

L – 45; T – 15; Total Hours– 60

TEXT BOOKS:

1. Veerarajan.T., "Engineering Mathematics" (5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012.
2. Grewal B.S., "Higher Engineering Mathematics" (42nd edition), Khanna Publishers, New Delhi, 2012.

REFERENCES:

1. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
3. Dennis G. Zill, Warren S. Wright, "Advanced Engineering Mathematics", 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4. Alan Jeffrey, "Advanced Engineering Mathematics", Academic Press, USA, 2002.
5. Ramana, B.V, "Higher Engineering Mathematics" Tata Mc Graw Hill Publishing Co. New Delhi, 2006.
6. Venkataraman, M.K., "Engineering Mathematics", Volume I, 2nd edition, National Publishing Co., Chennai, 2003.

OUTCOMES:

On completion of the course the students will be able to

- solve Eigen value and Eigen vector problems
- solve three dimensional geometry problems.
- use differential calculus for solving problems pertaining to engineering applications.

ENB1181	ENGLISH	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To expose students to the concept of flipped learning.
- To discuss a range of vocabulary and enable students to use it in academic and technical contexts.
- To facilitate students' effective use of speaking skill while exchanging ideas and making presentations.
- To help students develop listening skill for identifying accent and intonation and comprehending and analyzing the information.
- To develop reading comprehension skill and help them to infer explicit and implicit meanings.
- To hone their creative and academic writing skills.
- To expose them to the correct usage of language and help them to apply it appropriately.

MODULE I **8**

L: Listening for specific information – Note-taking

S: Self introduction – Introducing one another

R: Skimming Technical passages

W: Process of writing – Writing short paragraphs

Language focus: Use of prefixes and suffixes ,Simple tense forms

MODULE II **8**

L: Guessing the meaning through Intonation

S: Exchanging opinions & Agreeing and disagreeing

R: Scanning – reading news paper articles for specific information

W: Argumentative writing – Letter to the editor

Language focus: Modals, Continuous and perfect tenses, Framing questions & Question tags

MODULE III **7**

L- Listening to a specific topic & predicting the content

S – Getting into conversation- Gathering information

R - Reading between lines

W - Letter inviting a dignitary-Expository Writing

Language Focus: Homonyms & Collocation

MODULE IV **7**

L: Listening to telephonic conversation, listening for specific information (Intensive)

S: Short presentations

R: Referential and Inferential reading

W:– Letter seeking permission for industrial visit

Language focus: Subject, Verb agreement & Euphemism

MODULE V **8**

L: Listening to scientific podcasts – Cloze exercises

S: Personal narrations

R: Intensive reading – Interpreting graphical data.

W: Describing a process, Flow chart, Bar chart

Language focus: Passive forms, Connectives & Prepositions

MODULE VI **7**

L: Appreciation and critical review of popular movie--The Incredibles

S: Discussion in groups - Three Idiots

R: Extensive reading – APJ Abdul Kalam's Wings of Fire - Reading for critical appreciation

W: Writing slogans – Rewriting a story with a different ending

Language focus: If clause, Phrasal verbs & Idiomatic expressions

Total Hours: 45

REFERENCES:

1. Carol Rosenblum Perry (2011). The Fine Art of Technical Writing. Create Space Independent Publishing Platform, New Delhi.
2. Dutt,P.K Rajeevan.G and Prakash,C.L.N (2007). A Course in Communication Skills. Cambridge University Press, India.
3. Kalam,Abdul &Arun Tiwari (2004). Wings of Fire: An Autobiography (Simplified and Abridged by Mukul Chowdhri). Hyderabad University Press.
4. Sen, Leena (2004). Communication Skills. Prentice Hall, New Delhi.
5. Matt Firth, Chris Sowton et al. (2012). Academic English: An Integrated Skills Course for EAP. Cambridge University Press, Cambridge.

OUTCOMES:

After completion of the course, students will have the ability to

- Explore new information from various sources and perform communicative tasks.
- Demonstrate their range of vocabulary in academic and technical contexts.
- Exchange ideas and make presentations.
- Identify, comprehend and respond to different intonation patterns.
- Infer meaning from reading texts.
- Create and construct different kinds of academic documents.
- Communicate effectively using grammatically correct expressions.

FRB1181	FRENCH	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To improve their proficiency in French language.
- To empower them for successful communication in their professional contexts.

DOSSIER 0 FENÊTRE SUR… 7

Contenus –l'alphabet - se presenter – les langues – les nationalités – les nombres de 0 à 60 – les adjectifs de nationalités – les verbes : s'appeler, être.

L'acte de parole

DOSSIER 1 LES UNS, LES AUTRES…. 12

Contenus - Les salutations (formelles et informelles) - les jours de la semaine – Les articles définis – les adjectifs possessifs – la négation (ne…..pas) – les verbes : avoir.

Demander quelque chose – les mois de l'année – les nombres de 70 à 99 – les articles indéfinis – l'adjectif interrogatif (quel, quelle)

Quelques événements culturels – donner des informations personnelles – indiquer ses gouts – l'expression des gouts – les prépositions (les noms de pays).

L'acte de parole

DOSSIER 2 ICI /AILLEURS 12

Contenus – Parler de sa ville – Donner/ Demander des explications – les prépositions de lieu – articles contractés – pourquoi / parce que

Auberges de jeunesse et hôtels – s'informer sur un hébérgement- quelques verbes et indications de direction – quelques formules de politesse.

Le code postal et les départements le libellé d'une adresse en France – Ecrire une carte postale – Dire le temps qu'il fait – les adjectifs démonstratifs - Formules pour commencer / terminer.

L'acte de parole

DOSSIER 3 SOLO OU DUO **14**

Contenus – Les animaux de compagnie les animaux préférés des Français - parler de sa profession – les professions - les activités sportifs - les noms animaux – les verbes : aimer , adorer, détester, faire, aller.

Nouveaux mode de rencontres – caractériser une personne (physique et psychologique) – les adjectifs qualificatifs – les pronoms toniques.

Les sorties – proposer, refuser, accepter une sortie – fixer un rendez-vous – inviter – Donner des instructions – L'impératif : 2e personne – Le pronom on=nous – Les verbes : Pouvoir, vouloir, devoir.

L'acte de parole

L'examen oral

Total Hours: 45

TEXT BOOK:

1. Alter EGO I – Goyal – Langers (0 – 5 Lessons)

OUTCOMES:

On completion of the course,

- The students will be able to deal with their clients effectively at global level.
- Their proficiency in French Language will have improved.

ISB1181	ARABIC	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To read and write in Arabic language.
- To learn vocabulary of different fields
- To develop situational communication skills.

MODULE I PREPARATORY ARABIC **7**

Introducing Arabic Alphabets.

Listening and Reading.

Audio & Video aided listening, Tajweed listening,

Writing Arabic Alphabets (connected & unconnected).

Introducing words.

Reading simple sentences.

Learning names of the things in and around the class room.

Exercises.

MODULE II FUNCTIONAL ARABIC **7**

Listening Arabic texts, stories and action verbs

Communicating Simple sentences.

Jumla' Ismiyya and Jumla' Fi'liyya

Situational Conversation:

Greetings, Introduction.

Classroom, College, Picnic.

Dining and Kitchen.

Reading skills.

Exercises

MODULE III FUNCTIONAL ARABIC **8**

Implication of effective listening.

Audio aids.

Writing Simple sentences.

Communicating ordinal and cardinal numbers.

Situational communication:

Playground, library.

Forms of plural – Sample sentences.

Introduction to tenses.

Exercises.

MODULE IV FUNCTIONAL ARABIC **8**

Communication:

Family, travel

Market, Prayer hall

Writing skills:

Note making.

Sequencing of sentences.

Developing answers from the questions.

Exercises.

MODULE V TECHNICAL ARABIC **8**

Importance of technical communication.

Reading and writing skills.

Audio & Video aided listening.

Introduction to Arabic terms related to administration.

Situation communication:

Air travel, Office administration, passport, visa.

Exercises.

MODULE VI TECHNICAL ARABIC **7**

Situation communication:

Contractual work, machineries and equipments..

Computer, internet browsing.

Banking,

Exercises.

Total Hours: 45

TEXT BOOK:

1. Arabic for professionals and employees, Kilakarai Bukhari Aalim Arabic College, Chennai, India, 2013.

REFERENCES:

1. Arabic Reader for Non Arabs (Ummul Qura University, Makkah), Kilakarai Bukhari Aalim Arabic College, 2005.

OUTCOMES:

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

- Write correct sentences in Arabic.
- Communicate in Arabic at primary level in working situations in the fields of engineering and administration.

PHB1181	PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce basic physics concepts relevant to Engineering and Technology students.
- To get familiarize with solving problems in basic physics.
- To acquaint applications of physics for Engineering issues.

MODULE I PROPERTIES OF MATTER 7

Elasticity – Stress strain diagram – Factors affecting elasticity – Twisting couple on a wire – Shaft – Torsion pendulum – Depression on a cantilever – Young's modulus by cantilever – Uniform and non-uniform bending – Viscosity.

MODULE II CRYSTAL PHYSICS 6

Introduction – Space lattice – unit cell – Bravais lattices – Miller Indices for cubic crystals – Inter planar spacing in cubic lattice – Simple crystal structures – SC, BCC, FCC and HCP structures – Atomic radius, coordination number, Packing factor calculation – Crystal imperfections.

MODULE III QUANTUM PHYSICS 7

Black body radiation – Planck's theory of radiation – Deduction of Wien's displacement law and Rayleigh – Jeans law from Planck's theory – Compton effect – Theory and experimental verification – Dual nature of matter – de Broglie's wavelength- Physical significance of wave function – Schroedinger wave equation – Time independent and time dependent wave equation – Particle in one dimensional box.

MODULE IV WAVE OPTICS 9

Interference theory – Air wedge – Michelson interferometer – Diffraction – Fresnel and Fraunhofer diffraction - Polarization – Double refraction – Theory of plane polarized, circularly polarized and elliptically polarized light – Quarter wave plate, Half wave plate – Production and detection of plane, circularly and elliptically polarized lights – Photoelasticity – Photo elastic effect – Stress optic law – Effect of stressed model in a plane polariscope (qualitative) – Photo elastic bench.

MODULE V LASER & FIBRE OPTICS **9**

Principle of spontaneous emission and stimulated emission - Characteristics of laser light -Einstein's A & B coefficients (derivation) – Population inversion - pumping - Nd:YAG laser – CO2 laser – Applications – Material processing and holography (construction and reconstruction of hologram)- Optical fibre – Principle and propagation of light in optical fibers – Numerical aperture and acceptance angle – Types of optical fibers - applications – Fibre optic communication system (block diagram only)- Fibre optic sensors (displacement and pressure sensors (qualitative), Medical endoscope.

MODULE VI ULTRASONICS AND NDT **7**

Ultrasonics – Production – Magnetostriction and piezo electric methods – Properties of ultrasonic waves – Detection of ultrasonic waves – Applications –Ultrasonic interferometer- Acoustical grating – SONAR – Depth of sea – Measurement of velocity of blood flow – Non Destructive Testing (NDT) methods – Ultrasonic flaw detector – A,B & C scanning methods.

Total Hours: 45

TEXT BOOKS:

1. Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.
2. Palanisamy P.K., Physics for Engineers, Vol1 & Vol2, 2nd Edition, Scitech Publications, 2003.

REFERENCES:

1. Uma Mukherji, "Engineering Physics", Narosa Publishing House, New Delhi, 2007.
2. Charles Kittel, "Introduction to solid state physics", 7th Edition, John Wiley & sons (ASIA) Pvt. Ltd, 2008.
3. Avadhanulu M.N., "Engineering Physics", 1st Edition, S.Chand & Company Ltd., New Delhi, 2007.
4. Schiff, "Quantum Mechanics", 3rd Edition, Tata McGraw-Hill Education, 2010.
5. Rajendran V. and Marikani A., "Applied Physics for Engineers", 3rd Edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2003.

6. William T. Silfvast, “Laser Fundamentals”, 2nd edition, Cambridge University Press, 2004.

7. Arumugam M., “Engineering Physics”, 5th Edition, Anuradha Agencies, 2003.

OUTCOMES:

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

- Apply the knowledge of properties of matter in Engineering Mechanics and Fluid Dynamics.
- Characterize Engineering materials
- Use Lasers for Fiber Optics Technology and Material Processing
- Do non-destructive testing using Ultrasonic Techniques

CHB1181	CHEMISTRY	L	T	P	C
	(Common to all branches)	3	0	0	3

OBJECTIVES:

To make students conversant with the

- Water specification for potable and industrial purposes and various treatment methods.
- Different engineering materials, their physico-chemical properties and specific applications.
- Concept of electrochemistry, corrosion and theories of corrosion.
- Principles of spectroscopy and applications.
- Basic principles of green chemistry and the need for green processes in industries.

MODULE I WATER TECHNOLOGY 8

Introduction – Impurities present in water – Hardness, Types of Hardness, Estimation of Hardness (EDTA method) (Problems) – Alkalinity, Estimation of Alkalinity – Disadvantages of hard water in industries – Conditioning methods: external treatment method: Ion exchange method – internal treatment: colloidal, phosphate, calgon, carbonate methods – drinking water standards (BIS) – treatment of domestic water: screening, sedimentation, coagulation, filtration, disinfection: by chlorination, UV treatment, ozonization – desalination and reverse osmosis (principle only).

MODULE II ENGINEERING MATERIALS 8

Abrasives: Moh's scale of hardness – natural abrasives: diamond, corundum, emery, garnets and quartz – artificial abrasives: silicon carbide, boron carbide.

Refractories: characteristics, classification – acid, basic and neutral refractories, properties – refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling – general method of manufacture of refractories, properties and uses of high alumina bricks, magnesite and zirconia bricks.

Nanomaterials: Definition – types of Nanomaterials; nanofilms, nanowires, carbon nanotubes, quantum dots and fullerenes (C60) – Size and shape

dependent optical, electrical, thermal and mechanical properties; Synthesis of nanomaterials – Top down and bottom up approach; Applications of nanomaterials – Catalysis, Electronics and Telecommunication, Medicines, Composites and Energy.

MODULE III ELECTROCHEMISTRY AND CORROSION 9

Construction of a cell – Standard and single electrode potential – electrochemical series – EMF and its measurement – Nernst equation, application and problems – Types of electrodes: standard hydrogen electrode, calomel electrode, ion selective electrode - glass electrode and determination of pH using glass electrode – polarization, overvoltage, decomposition potential (statements only) – Conductometric and potentiometric titrations.

Corrosion: Definition – Dry corrosion and Wet corrosion with mechanisms – Factors influencing corrosion.

MODULE IV CHEMISTRY OF POLYMERS 6

Monomers – functionality – polymer – degree of polymerization – classification – Polymerization techniques: addition, condensation and co-polymerization with example – mechanism of polymerization: free radical, cationic and anionic mechanism – thermoplastics and thermosetting plastics with examples – compounding and moulding of plastics: injection moulding and compression moulding.

MODULE V SPECTROSCOPY 9

Electromagnetic spectrum – absorption of radiation – electronic, vibrational, translational and rotational – intensities of spectral lines – Beer-Lambert's Law (Problems) – Colorimetric analysis: estimation of concentration of a solution – Flame photometry: theory, instrumentation (block diagram only) and application – UV-Visible spectroscopy: Principle, instrumentation (block diagram only) and simple applications – IR spectroscopy – simple applications only.

MODULE VI GREEN CHEMISTRY 5

Introduction – Significance – Industrial applications of green chemistry; Green technology – Latest green laboratory technique for saving experimental resources and infrastructural framework; Principles of green chemistry – R4M4

model (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking, Multi-tracking) – Life cycle analysis technique (cradle to grave approach)

Total Hours: 45

TEXT BOOKS:

1. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai and Sons, New Delhi. 2001.
2. Paul T. Anastas, John C. Warner, Green Chemistry: Theory and Practice, Oxford University Press, 1998.

REFERENCES:

1. Bahl B.S., Tuli and Arun Bahl, Essentials of Physical Chemistry, S. Chand and Company Ltd., New Delhi, 2004.
2. Kuriacose J.C. and Rajaram J, Chemistry in Engineering and Technology, Volume1, Tata McGraw- Hill publishing company, New Delhi, 1996.
3. Puri B.R., Sharma L.R. and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., Jalandhar, 2000.

OUTCOMES:

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

- estimate the degree of hardness and alkalinity in water and describe treatment methods for potable water.
- summarise the properties and uses of various engineering materials and choose the appropriate material for a given application.
- illustrate the different types of electrodes, calculate the emf and apply the electrochemistry principles to explain the mechanism of corrosion.
- describe the mechanism of polymerization and moulding techniques.
- explain the principles and instrumentation of various analytical techniques and adopt the suitable techniques for analysis of compounds / elements.
- outline the principles and significance of green chemistry.

GEB1101	ENGINEERING GRAPHICS	L	T	P	C
		2	0	3	3

OBJECTIVES:

- To introduce the students of all engineering programs, the basic concepts of engineering drawing, which is the basic communication medium for all engineers
- To provide an exposure to the appropriate standards for technical drawings
- To provide practical exposure on important aspects like drawing analytic curves, orthographic projections, section of solids, development of surfaces, pictorial views and free hand drawing
- To introduce computerized drafting

MODULE I BASICS AND ENGINEERING CURVES 10

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions.

Conic sections: ellipse, parabola, hyperbola

Special curves: Cycloid, epicycloid, hypocycloid, involutes, helix

MODULE II ORTHOGRAPHIC PROJECTION 8

Orthographic projection – first angle, third angle projection methods, free hand sketching of orthographic views of simple machine parts as per first angle projection. Projection of points. Commands and demonstration of drafting packages.

MODULE III PROJECTION OF STRAIGHT LINES AND PLANES 10

Straight lines in first quadrant – true length and true inclinations, traces – rotating line and trapezoidal methods. Projection of plane lamina in first quadrant – trace of plane.

MODULE IV PROJECTION OF SOLIDS 10

Projection of solids: Axis inclined to one reference plane only - prism, pyramid, cone, cylinder – change of position and auxiliary projection methods.

MODULE V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 10

Section of solids: prism, pyramid, cone, cylinder, and sphere – sectional views – true shape of sections - solids in simple position and cutting plane inclined to one reference plane only.

Development of surfaces: truncated solids - prism, pyramid, cone, cylinder, frustum of cone and pyramid.

MODULE VI PICTORIAL PROJECTIONS 12

Isometric projection: isometric scale - isometric projection and view of prism, pyramid, cylinder, cone, frustums and truncated solids.

Perspective projection: prism, pyramid, cylinder, frustums – visual ray and vanishing point methods.

Total Hours: 60

TEXT BOOK:

1. N.D. Bhatt, 'Engineering Drawing' Charotar Publishing house, 46th Edition, (2003)

REFERENCES:

1. K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai.(2006)
2. Venugopal. K, and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd., Publication, Chennai.(2011)

OUTCOMES:

Students who complete this course will be able to:

- draw various views of engineering components
- graphically communicate their concepts and ideas on new designs

SSB1182 SOCIOLOGY, ETHICS AND HUMAN VALUES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To describe the fundamental and basic concepts of Sociology.
- To illustrate how society evolved in India with changes in social strata.
- To explain the importance of groups, teams in industrial spheres.
- To develop the knowledge of social impact of economic liberalization and technology.
- To state some basic concepts on ethics, values and human rights.
- To develop social responsibility &human professional ethics.
- To recognize and determine the role of engineers in the economic and social development of the society.

MODULE I FUNDAMENTALS OF SOCIOLOGY **8**

Sociology - definition, evolution, scope- Basic concepts-Social Process- Sociological theories, Social Institutions – family, economic, politics, religion, education, culture, Social Stratification , Socialization & Social Control.

MODULE II SOCIOLOGY IN INDIAN CONTEXT **7**

Development in India– Caste & Classes – Women and Society – impact of social laws, Social Change in contemporary India – Secularism and Communalism – Social Exclusion and Inclusion.

MODULE III INDUSTRIAL SOCIOLOGY **7**

Definition and perspectives – Industry in India – Social groups in industry – Behaviour pattern, Group Dynamics – team, enhancing group behaviour. Industrial Organization - formal and informal organizations, Line and staff organizations - functions.

MODULE IV INDUSTRIAL – SOCIETY INTERFACE **8**

Perspectives – Social responsibilities – Sociological effect on industrialization – urbanization, child labour, psychological impact, Impact of technology, Modernization – Globalization – challenges, Role of engineers.

MODULE V ETHICS AND HUMAN VALUES 7

Ethics and values – Organizational values – personal worth, ethical behaviour, Professional ethics-professional rights and responsibilities, Whistle blowing, International ethics, Corruption.

MODULE VI ENGINEERS AND SOCIETY 8

Quality of life and society – engineer in economic development, Technology development – invention, innovation and diffusion, Appropriate Technology– Engineer's contribution, Ecology and environment –Sustainable development– Role of engineers.

Total Hours: 45

REFERENCES:

1. Samir Das Gupta and Paulomi Saha, An Introduction to Sociology, Pearson, Delhi, 2012.
2. Narender Singh, Industrial Sociology, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
3. Vidya Bhushan and D.R. Sachdeva, Fundamentals of Sociology, Pearson, Delhi, 2012.
4. Deshpande, Satish, Contemporary India : A Sociological view, Viking (2002)
5. Thopar, Romila, Early India, Penguin (2003).
6. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York, 1996.
7. Haralambos, Heald R.M, Sociology Themes and Perspectives, Oxford, New Delhi-92
8. Ram Ahuja, Social Problems in India,Rawat Publications ,New Delhi

OUTCOMES:

On successful completion of this course,

- Students will have exposure to the fundamentals and the basic concepts of Sociology.
- Students will have gained knowledge about the reality of the society.
- Students will be able to positively respond to the forces of change.

- Students will inculcate common interests of the group and adopt legitimate means to achieve them.
- Students will have knowledge about the impact of technology, modernization, and globalization.
- Students will be able to conform to the rules of the society and communicate effectively with the engineering community and with the society at large
- Students will work effectively as individuals, in teams and in multi-disciplinary settings together with the capacity to undertake holistic development of the society.

PHB1182	PHYSICS LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the basic concepts of properties of matter, wave optics
- To understand the properties of ultrasonic and Laser.
- To understand the crystal growth technique.
- To correlate the experimental results with the theoretical values.

LIST OF EXPERIMENTS:

1. Tensional Pendulum- Determination of rigidity modulus of a given wire.
2. Determination of coefficient of viscosity of a liquid by Poiseuille's method .
3. Determination of Young's modulus of a beam using non – uniform bending method.
4. Determination of a thickness of a given wire – Air wedge.
5. Spectrometer- determination of wavelength of given source by using grating.
6. Determination of velocity of ultra sonic waves – Ultrasonic Interferometer.
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of particle size using Laser.
9. Growth of crystal by slow evaporation technique.
10. Determination of angle of divergence of Laser beam.
11. Photo electric effect experiment.

OUTCOMES:

On completion of this course, the student will know

- Properties of matter, wave optics and quantum physics
- Properties and application of Ultrasonic and Laser
- Principle and concept of crystal growth technique.

CHB1182	CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

To make students conversant with the

- estimation of hardness and TDS in water samples.
- Construction of cell and determination of EMF.
- Estimation of pH of solutions.
- Verification of Beer Lambert's law.

LIST OF EXPERIMENTS:

1. Estimation of hardness in domestic water.
2. Estimation of total dissolved solids (TDS) in domestic water
3. Construction and determination of emf of a cell.
4. Determination of single electrode potential.
5. Estimation of strong acid in the industrial effluents
6. Estimation of Fe2+ present in unknown sample – by Potentiometry
7. Verification of Beer-Lambert's law and estimation of Cu2+ present in unknown sample.
8. Estimation of Na and K present in the agricultural field – by flame photometry.
9. Study of effect of inhibitors in free radical polymerization (Demo)

OUTCOMES:

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

- estimate the degree of hardness and TDS in water samples.
- construct and calculate EMF of cell.
- apply the concept of Beer lamberts law.

GEB1102	BASIC ENGINEERING PRACTICES LABORATORY	L T P C 0 0 2 1

OBJECTIVES:

- To provide a practical exposure to basic engineering practices like carpentry, fitting, plumbing, welding and making of simple electrical and electronic circuits
- To have an understanding on the use of various tools, instruments and methods
- To enable the students to appreciate the practical difficulties and safety issues

CIVIL ENGINEERING PRACTICE

1. Study of plumbing in general household and industrial systems
2. Making a small window frame with Lap and Mortise & Tenon Joints

MECHANICAL ENGINEERING PRACTICE

1. Fabrication of a small Table frame with Butt, Lap and Fillet Joints
2. Machining of a simple component like a table weight using lathe
3. Mould preparation for simple component

ELECTRICAL ENGINEERING PRACTICE

1. Comparison of incandescent, Fluorescent, CFL and LED lamps.
2. Study of Protection Circuits (small relay, fuse, MCB, HRC,MCCB,ECCB).
3. Familiarization of households Electrical Gadgets (Iron Box, Wet Grinder).
4. Understanding of Domestic and Industrial wiring.
5. Earthling and its significance.
6. Troubleshooting in Electrical Circuits.
7. Study of inverter fed UPS/Emergency lamp.

ELECTRONIC ENGINEERING PRACTICE

1. Identifications symbolic representation of active and passive electronic components
2. Soldering and tracing of electronic circuits and checking its continuity
3. Assembling of A.C. to D.C, D.C to A.C. Circuits in bread Board and Mini project

OUTCOMES:

Students who complete this course

- Should be able to appreciate the practical skills needed even in making of simple objects, assemblies and circuits
- Should be able to attend minor defects especially in items used in day to day life
- Should be aware of the safety aspects involved in using tools and instruments

GEB1103	COMPUTER PROGRAMMING & APPLICATIONS	L	T	P	C
		2	0	2	3

OBJECTIVES:

- Expose fundamental concepts and techniques in computer programming
- Give coverage on application logic in programming
- Focus on solving practical problems based on analyzing, designing, and implementing computer programs

MODULE I FUNDAMENTALS OF COMPUTERS **5**

Evolution – Generations - Classifications – Applications – Computer organization –Hardware in a typical computer Identification - Booting – Booting error messages - Number system - Number system conversions

MODULE II BASIC PROGRAMMING AND DEBUGGING **5**

Software types – Types of Operating systems - Software development steps – Information technology and internet - The programming tool - Structure of a basic program - Hello world program – Debugging it – Character set – Delimiters – Keywords, identifiers – Constants – Variables –- Tools and help features – Comments in a program

MODULE III INPUT AND OUTPUT **5**

Data types - Type conversions - Input/output: Formatted functions – Unformatted functions – Library functions – Debugging the code – Systems software: Compiler – interpreter- linker – loader - Finding the correct answer given a code snippet and justifying it

MODULE IV PROBLEM SOLVING **5**

Problem solving techniques: Algorithm, flowchart – Pseudo-code – Examples of simple problems in algorithms and flowcharts – Sorting and Searching - Characteristics of a good program – Generations of programming language

MODULE V OPERATORS AND DECISION STATEMENTS **5**

Properties of operators – Priority of operators – Arithmetic relational logical and bitwise operators – If –if else- nested if else- go to- switch case – nested switch case – for loops – nested for loops – while loop – do-while loop – break and continue statement

MODULE VI ARRAYS AND LOOP CONTROL STATEMENTS 5

Arrays – Initialization – Definition – Characteristics – One dimensional array – Two dimensional arrays - Multi dimensional arrays – Predefined streams - Operation with arrays – Sorting and searching – Structures – Operations on structures

LIST OF EXPERIMENTS: 30

1. Computer organization –Hardware in a typical computer Identification – Booting - error messages and what it means
2. Types of Operating systems – Windows and Linux
3. Structure of a basic program - Hello world program – Debugging it
4. Data types Type conversions
5. Input/output: Formatted functions – Unformatted functions – Library functions
6. Properties of operators – Priority of operators – Arithmetic relational logical and bitwise operators
7. If – if else- nested if else- go to- switch case – nested switch case – for loops – nested for loops – while loop – do-while loop – break and continue statement
8. Arrays – Operation with arrays
9. Sorting and searching

Total Hours: 60

TEXTBOOKS:

1. Ashok N Kamthane, “Computer Programming”, 2nd Edition, Pearson Education, 2012.
2. Paul J. Deitel, Deitel & Associates, “C How to Program”, 7th Edition, Pearson, Education, 2012.

OUTCOMES:

Students who complete this course will be able to:

- Apply Modular design, logic flow and data abstraction in programming paradigm.
- Use the concepts of constructs, functions, I/O and algorithms in the programming environment.
- Develop simple real time applications using the programming constructs and algorithms

SEMESTER II

MAB1282	**ADVANCED CALCULUS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVE:

The aim of the course is to

- train the students in additional areas of Engineering Mathematics, necessary for grooming them into successful engineers. The topics will serve as basic tools for specialized studies in many engineering fields, significantly in fluid mechanics, field theory and communication engineering.

MODULE I DOUBLE INTEGRALS **7**

Double integration – Cartesian and Polar coordinates – change of order of integration – area as a double integral –– change of variables between Cartesian and polar coordinates.

MODULE II TRIPLE INTEGRALS AND SPECIAL FUNCTIONS **7**

Triple integration in Cartesian coordinates - change of variables between cartesian, cylindrical and spherical polar coordinates - Beta and Gamma functions.

MODULE III VECTOR INTEGRATION **7**

Line, surface and volume integrals – Green's, Gauss Divergence and Stoke's theorems (without proof) – verification and evaluation of integrals using them.

MODULE IV ANALYTIC FUNCTION **8**

Analytic function - Necessary and Sufficient condition (Proof not included) – Cauchy-Riemann equations in polar coordinates - properties of analytic function – determination of analytic function – conformal mapping (w = z+a, az and 1/z) and bilinear transformation.

MODULE V COMPLEX INTEGRATION **8**

Statement and application of Cauchy's integral theorem – Cauchy's integral formula – Taylor's series and Laurent's series expansion – singularities - classification – residues - Cauchy's residue theorem – contour integration – Unit circle and semi circular contours (excluding poles on the real axis).

MODULE VI PARTIAL DIFFERENTIAL EQUATIONS 8

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Veerarajan.T., "Engineering Mathematics "(5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012.
2. Grewal B.S., "Higher Engineering Mathematics" (42nd edition), Khanna Publishers, New Delhi, 2012.

REFERENCES:

1. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
3. Dennis G. Zill, Warren S. Wright, "Advanced Engineering Mathematics", 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4. Alan Jeffrey, "Advanced Engineering Mathematics", Academic Press, USA, 2002.
5. Ramana, B.V., "Higher Engineering Mathematics" Tata Mc Graw Hill Publishing Co. New Delhi, 2006.
6. Venkataraman, M.K., "Engineering Mathematics", Volume 2, 2nd edition, National Publishing Co., Chennai, 2003.

OUTCOMES:

On completion of the course the students will be able to

- solve integrals of higher orders.
- apply vector calculus for solving engineering problems.
- solve complex differentiation and integration problems related to engineering.
- formulate practical problems in terms of partial differential equations, solve them and physically interpret the results.

CHB1283	CHEMISTRY OF BUILDING MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To make the student conversant with the concept of corrosion, types and prevention
- To introduce the sources of energy need for future
- To learn the different building materials and the chemistry involved in it
- To know the different polymeric materials and their classifications and applications
- To learn the concept of bonding and chemical kinetics

MODULE I CHEMICAL BONDING AND KINETICS 8

Types of bonds-ionic, covalent, dative, metallic, hydrogen bonds and van der Waals forces. VB theory - hybridization - VSEPR model and molecular shapes. MO theory - Energy levels - bond order - bond energy - bonding in homonuclear diatomic molecules.

Kinetics – introduction - basic concept - rate of the reactions - rate equation - rate constant – order – molecularity. Kinetic equations (1st and 2nd order reactions only) - Arrhenius equations - effect of temperature on rate (and problems) - Collision theory

MODULE II CORROSION 7

Chemical corrosion – types - difference between chemical and electrochemical corrosion - different oxides - pilling-Bedworth rule - Electrochemical corrosion - types: galvanic, differential aeration corrosion (crevice, pitting, pipeline and wire fence) - stress corrosion - microbial corrosion - corrosion control: Cathodic protection - sacrificial anode and impressed current cathodic methods - selection of metals and design - corrosion inhibitors

MODULE III PROTECTIVE COATING 8

Treatment of metal surface-inorganic coating-metallic coating-hot dipping-clading-cementation-electroplating-electrolessplating-chemical conversion coatings-chromate,phosphate,oxide coatings-anodising-organic coating-paint-constituents and functions of paints-mechanism of drying oil and paints-

varnishes-lacquiers-special paints-fire retardant-water proof-temperature indicator-luminous paints

MODULE IV ENERGY SOURCES 8

Batteries-primary and secondary batteries-dry cell-alkaline battery-lead acid,Ni-Cd and Li-TiS2 batteries-fuel cells-hydrogen oxygen fuel cells-nuclear fission process-process-characteristics of nuclear fission-chain reaction-nuclear energy-components and functions of nuclear reactor-solar cells-dye sensitized solar cells-wind,tidal and geothermal energy(Introduction only)

MODULE V BUILDING MATERIALS 7

Lime – Classification, manufacturing – setting and hardening – Cement – manufacturing process – chemical composition setting and hardening-concrete, weathering of cement and concrete and prevention-special cement-high alumina, soral cement, white Portland cement, water proof cement

MODULE VI POLYMERS 7

Classification of polymers on usage (plastic, elastomers, fibres and resins) – Plastics – types - advantages - effect of polymer structure on properties - effect of heat on polymers - mechanical properties of polymers - preparation and properties and uses of bakelite and epoxy resins - polymer blends and alloys – fibre reinforced concrete - polymer reinforced concrete - Rubber – constituent – vulcanization - blended plastics - Laminated plastics - thermocol Composites - definition of composites – characteristics – constituents – types - fibre reinforced plastics - properties and applications

Total Hours: 45

TEXT BOOKS:

1. Jain P. C. and Renuka Jain, Engineering Chemistry, Thanpat Rai Publication Co. (P) Ltd., New Delhi, 2002.
2. Puri B. R., Sharma C. R. and Madan S. Pathania, Principles Physical Chemistry, Shoban Lal Nagin Chand and Co., 2000.

REFERENCES:

1. Wang M. N., Polymer for electronic and photonic applications, Wiley New York, 1994.

2. Bahl B. S., Tuli G. D. and Arun Bhal, Essentials of Physical Chemistry, S. Chand & Co. Ltd.,New Delhi 2003.

3. G.D.Rai,Non-conventional energy sources, Khanna publishers,2004.

OUTCOMES:

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

- analyse the concepts of corrosion, types of corrosion and their prevention methods
- explore the renewable sources for future usage
- classify the different building materials and chemical reactions involved in the process.
- process electroplating over metals and electroless plating over non metals.
- construct a simple cell.
- synthesize thermosetting and thermo plastic polymers.

SSB1181	INTRODUCTION TO ECONOMICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To identify and present the basic concepts of demand, supply and equilibrium.
- To explain the types and concepts of national income and inflation.
- To illustrate the fundamental concepts of money, banking and exchange.
- To create an awareness about the industrial sector, markets and trade and their contribution to economic development.
- To describe the five year plans, budget, fiscal policy and taxation.
- To discuss Indian economy and justify the role of engineers in economic development.

MODULE I INTRODUCTION **8**

Classification of economy – open and closed economy – Sectors of economy – Basic principles of Microeconomics – supply, demand and equilibrium, Elasticity of demand – Pricing models.

MODULE II NATIONAL INCOME DETERMINATION **7**

National income concepts – GNP, GDP, disposable income; Aggregate demand and aggregate supply, Macroeconomic equilibrium - Concepts of MPS, APS, MPC APC, Inflation – Price indices - WPI, CPI and Inflation control.

MODULE III MONEY AND BANKING **7**

Role and functions of money - Monetary System - Money market - Role of Central Bank - Monetary policy - Commercial banks - Development banks - Capital market and Debt market.

MODULE IV INDUSTRY, LABOUR MARKET AND TRADE **7**

Public and Private sectors, Contribution to the National economy - Industrial policy - Labour market - Trade: Domestic and International trade.

MODULE V BUDGET, POLICIES AND INDICATORS **8**

Economic development – Five year plans, Macroeconomic indicators - Central budget - Government tax- revenue and non-tax revenue, Government

expenditures - plan and non-plan expenditures – Fiscal policy – The impact of the budget on the economy.

Module VI ECONOMIC GROWTH AND THE ROLE OF ENGINEERS 8

Indian Economy – Development in the post independence era – Growth of the economy, Economic reforms – Liberalization, Privatization and Globalization - challenges and opportunities, Engineers – Contribution of engineers to the economic growth.

Total Hours: 45

REFERENCES:

1. Vanitha Agarwal, Macroeconomics: Theory and Practice, Pearson, 2010.
2. Dwivedi D.N, Macroeconomics: Theory and Policies, 3rd edn; McGraw Hill, 2010.
3. Samuelson,Paul A., Macroeconomics, 19th edn., TMH, 2009.
4. Gupta G.S, Macroeconomics: Theory and Applications, 3rd edn; TMH, 2007.
5. R.K. Lekhi, Public Finance, Kalyani Publishers.
6. D. M. Mithani, Money, Banking, International Trade and Public Finance, Himalaya Publishing House.
7. R.R. Paul, Monetary Economics, Kalyani Publishers.
8. Benson Kunjukunju and S. Mohanan, Financial System and Financial Institutions in India, New Century Publications.
9. Raddar Datt, K.P.M. Sundharam, Indian Economy, S. Chand.
10. Gregory Mankiw, Principles of Economics, Cengage Learning.
11. Gregory Mankiw, Principles of Microeconomics, Cengage Learning.
12. Uma Kapila, Indian Economy since Independence, Academic Foundation.
13. Andrew Gillespie, Business Economics, Oxford University Press.
14. Pindyck, Rubinfeld and Mehta, Microeconomics, Pearson.
15. C.B. Gupta, Business Environment, Sultan Chand and Sons.

OUTCOMES:

On successful completion of this course,

- Students will have an exposure to the basic concepts of microeconomics and macroeconomics.
- Students will be able to identify the concepts of national income and inflation.
- Students will be able to apply the knowledge of money, banking and exchange in their real life situations.
- Students will have gained knowledge in government budget, economic planning and its implementation.
- Students will have an overview of the economic reforms introduced in Indian economy.
- Students will be able to analyze the importance of economics and apply the knowledge they have gained in their professional pursuits.

GEB1211	BASIC ENGINEERING MECHANICS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To impart knowledge about the basic laws of statics and dynamics and their applications in problem solving
- To acquaint with scalar and vector approaches for representing forces and moments acting on particles and rigid bodies and their equilibrium
- To give an exposure on inertial properties of surfaces and solids
- To provide an understanding on the concept of work energy principle, friction, kinematics of motion and their relationship

MODULE I VECTOR APPROACH TO MECHANICS 7

Introduction - Units and Dimensions - Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments –Vector Algebra and its Physical relevance in Mechanics -Coplanar Forces – Resolution and Composition of forces- Equilibrium of a particle

MODULE II EQUILIBRIUM OF PARTICLE 6

Forces in space - Equilibrium of a particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force

MODULE III EQUILIBRIUM OF RIGID BODY 6

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

MODULE IV PROPERTIES OF SURFACES 8

Determination of Areas – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section by using standard formula – second and product moments of plane area – Physical relevance - Rectangle, triangle, circle from integration

- T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia.

MODULE V LAWS OF MOTION 10

Review of laws of motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

MODULE VI FRICTION 8

Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force – simple contact friction – Rolling resistance –ladder friction

L – 45; T – 15; Total Hours- 60

REFERENCES:

1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers, Dynamics & Statics", Third SI Metric Edition, Tata McGraw-Hill International Edition, 2001.
2. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
3. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition Pearson Education Asia Pvt. Ltd., 2003.

OUTCOMES:

On completion of this course students:

- should be able to resolve forces, moments and solve problems using various principles and laws
- should be able to understand the concept of equilibrium, kinetics and kinematics and capable of formulating the governing equations to practical problems and provide solutions for those equations entice Hall, 1996.

CEB1211 ENGINEERING GEOLOGY L T P C
3 0 0 3

OBJECTIVE :

- The objective of the course is to equip the students with fundamental knowledge in Geology. It enables the civil engineers to identify the minerals & rocks in the field and understand engineering implications of certain conditions related to the area of construction which is essentially geological in nature.

MODULE I PHYSICAL GEOLOGY 7

Branches and scope of geology – Earth Internal structure – Earth processes -Weathering, volcanism, earthquake and plate tectonics

MODULE II MINERALOGY 8

Elements of Crystallography and Mineralogy –Properties – Physical properties of minerals – Study of the minerals and their uses – Quartz, Feldspar, Hypersthene, Augite, Hornblende, Muscovite, Biotite, etc.

MODULE III PETROLOGY 8

Rocks- Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Engineering properties of different types of rocks

MODULE IV STRUCTURAL GEOLOGY 7

Attitude of beds - Outcrops – Types of structures, classification and their effect on civil engineering projects. Geological mapping – Groundwater and occurrence, investigations, quality.

MODULE V GEOLOGY FOR CIVIL ENGINEERING 7

Geological conditions necessary for construction of Tunnels, dams, reservoirs, bridges, runways, roads and buildings – Geophysical investigations

MODULE VI MISCELLANEOUS APPLICATIONS 8

Landslides – Causes and Preventions - Remote sensing applications Study of air photos and satellite images – Interpretation for Civil Engineering Projects – Coastal erosion and coastal preventions

Total Hours : 45

TEXT BOOKS:

1. Parbin Sing, “Engineering and General Geology”, Katson Publication House, 2009.
2. P.C.Varghese, “Engineering Geology for Civil Engineers”, PHI Learning Private Ltd, New Delhi, 2012.
3. P.C.Rao & D.B.Rao, “A Text Book of Geology”, Discovery Publishing House, New Delhi, 2010.
4. N.Chenna Kesavalu, “Text book of Engineering Geology”, Macmillian Publishers India Ltd, New Delhi, 2009.
5. P.T.Sawant, “Engineering & General Geology”, New India Publishing Agency, 2011.
6. Alan.E.Kehew, “General Geology for Engineers”, Prentice Hall, 2000.

REFERENCES:

1. Thomas.M. Lillesand and Ralph.W.Keifer,”Remote sensing and Image Interpretation”, 2005
2. Todd D K., “Groundwater Hydrology”, John Wiley & Sons, New York ,2006.
3. Tyrrel, GW.,”The Principles of Petrology”, Asia Publishing House, Bombay, 1970.

OUTCOME :

- At the end of the course, the students will be able to determine the existence of hard bed rocks, depth and inclination with the surface and the mechanical properties of the bed rocks along and across the proposed site. The students will also be able to detect presence, nature and frequency of the weak structures.

CEB1212 CONSTRUCTION MATERIALS AND PRACTICES **L T P C**

3 0 0 3

OBJECTIVE :

- To impart the students, overview knowledge of various construction materials such as stone, brick, timber, bitumen, cement, steel etc with respect to type, mechanical properties and applications in Industry. The students also gain knowledge about different construction practices adopted in the site.

MODULE I STONE AND CLAY PRODUCTS **7**

Stones - Classification of rocks - Properties – Selection of stones for different uses. - Clay products - Bricks - Manufacture - IS classifications -Properties and testing - Types of bricks. - Tiles - Manufacture, properties and uses - Types of tiles ; Ceramic products

MODULE II TIMBER AND BITUMINOUS MATERIALS **7**

Timber - Defects - Seasoning - Decay - Preservation - Plywood, fibre board , particle board- bituminous materials –Types and Properties of Bitumen - Bituminous concrete for pavement application

MODULE III CEMENT, STEEL AND MISCELLANEOUS MATERIALS **8**

Cement - Ingredients - Manufacture - Types of cement - Properties and testing - Uses ; Mortar - Sand - Properties – Grades of mortar and uses ; Concrete – mix ratio - Properties of fresh concrete - Properties of hardened concrete – Iron and Steel - Structural sections - Properties and uses of structural steel - Miscellaneous materials - Glass - Plastics – Polymers – composites and Smart materials.

MODULE IV BUILDING CONSTRUCTION - OVERVIEW **8**

Structure – Types of structures – Load Bearing – Framed structures – Components – Foundation – superstructure – columns – beams –lintels and arches – floors, roof and stairs - Bearing capacity of soil – Shallow and Deep foundations –settlements of buildings - improvement in bearing capacity.

MODULE V CONSTRUCTION PRACTICES **8**

Brick and stone masonry - Types of stone masonry - Cavity walls - Concrete

construction - Batching, mixing, placing, compacting and curing of concrete - form work - Precast concrete - Prestressed concrete - Self compacting concrete

MODULE VI BUILDING COMPONENTS **7**

Floors and flooring – Types of floors –Roofs and roofings – Types of roofs – roofing materials ; Doors, windows and ventilators – Different types ; Finishing works – Plastering, pointing, painting.

Total Hours : 45

TEXT BOOKS:

1. Rangwala S.C, “Engineering Materials”, Charotar Publishing House, 1992.
2. Punmia B.C, “Building Construction”, Laxmi Publlications, New Delhi,1999.
3. Rangwala S.C, “Building Construction”, Charotar Publishing House, 1992.
4. Huntington W.C,” Building Construction”, John Wiley, New York,1959.
5. Shetty M.S, “Concrete Technology”, S.Chand & Co.,, New Delhi,1992.
6 S.P. Arora & Binda, “Building Construction”, Dhanpat Rai Publication (P) Ltd., New Delhi, 2007.

REFERENCES:

1. R. Chudley, “Construction Technology” - Volume 1 & 2, 2nd Edition, Longman, U.K 1987.
2. Michael S. Mamlouk and John P. Zaniewski, “Materials for Civil and Construction Engineers”, Pearson Prentice Hall, 2006.

OUTCOME :

- At the end of the course, the students will acquire appreciable knowledge on various construction materials used in the industry and their properties including application areas. They also possess sufficient knowledge about various construction practices adopted in the Industry.

ENB1282	WRITTEN COMMUNICATION	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To help students identify content specific vocabulary and learn its usage.
- To teach them formal and informal expressions in business communication.
- To expose them to reading for specific purposes, especially in business contexts.
- To expose them to the process of different kinds of formal writing.
- To train them in using the nuances of writing in corporate correspondence.
- To train them in writing effective applications with résumé and reports.

MODULE I **4**

Introduction - process of writing – ABC of academic and professional writing –Instructions and recommendations - Reading business related texts for specific information.

MODULE II **4**

Format and conventions of writing email, memo & fax.

Writing email (Case study), memo, fax, agenda and minutes of the meeting (using mobile applications)

MODULE III **6**

Format and conventions of writing agenda and minutes of the meeting Letter Writing--Calling for an interview & letter of inquiry

MODULE IV **6**

Writing letter of application and Résumé - Different types – Functional, Chronological Writing one's résumé using Wikispaces

MODULE V **6**

Reporting an incident, writing a feasibility report, and progress report & discipline specific reports

Reading a case study (industry specific) – collaborative writing using Wikispaces

MODULE VI **4**

Writing Statement of purpose– Assessing one's strengths and weaknesses & self and peer evaluation of strengths.

Total Hours: 30

REFERENCES:

1. Riordan,D (2013). Technical Report Writing Today. Cengage Learning, 10th edition. USA.
2. Oliu, W. E., Brusaw, C.T., & Alred, G.J.(2012). Writing that Works: Communicating Effectively on the Job . Bedford/St. Martin's. Eleventh Edition.
3. Garner, B.A. (2013). HBR Guide to Better Business Writing (HBR Guide Series). Harvard Business Review Press. USA.
4. Sharma, R.C. & Krishna M. (2002). Business Correspondence and Report Writing. Tata MacGraw – Hill Publishing Company Limited, New Delhi.
5. Macknish, C. (2010). Academic and Professional Writing for Teachers. McGraw-Hill Education. USA.
6. Whitby, Norman (2014). Business Benchmark: Pre-Intermediate to Intermediate. Cambridge University Press, UK.

OUTCOMES:

On completion of the course, the students will have the ability to

- Create different types of academic and professional documents by using the three stages of writing.
- Identify content specific vocabulary and also use them in appropriate contexts.
- Use formal and informal expressions in real life situations.
- Demonstrate reading skills with reference to business related texts.
- Compose written correspondence effectively in work place contexts.
- Write effective letter of applications, résumé and reports.

CEB1213 COMPUTER PRACTICE LABORATORY

L	T	P	C
0	0	2	1

OBJECTIVE:

The objective of the laboratory course is to make the student understand the fundamental and basic principles of Engineering drawing and also the basic commands of a popular drafting package.

MODULE I COMPUTER AIDED DRAFTING (2-D) 5

Study of capabilities of software for Drafting and Modeling – Coordinate systems (Absolute, Relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures. Drawing of a simple steel truss.

MODULE II TEXTS, SYMBOLS & DIMENSIONS 5

Text – Multiline Text – Text Properties – Symbols – Dimensioning – Linear, Angular etc. Drawing of a Title Block with necessary text and projection symbol.

MODULE III LINES & CURVES 5

Lines – Curves – Different methods of drawing curves
Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
Drawing of curves like parabola, spiral, Square involutes using spline or cubic spline.

MODULE IV SECTIONAL VIEWS 5

Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
Drawing front view, top view and side view of objects from the given pictorial views
(e.g. Simple and 2-storied Building views, Objects with hole and curves).
Drawing sectional views of prism, pyramid, cylinder, cone, etc,

MODULE V PROJECTIONS 5

Drawing isometric projection of simple objects.

Creation of a Perspective view of building for given position of an observer

MODULE VI INTRODUCTION TO CAD 3-D **5**

Basic 3D software commands - Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Total Hours : 30

TEXT BOOKS:

1. K. Venugopal, “Engineering Drawing And Graphics”, 5th Edition, New Age International (P) Ltd. Publishers, New Delhi.(2011)
2. Gurcharan Singh, “Civil Engineering Drawing”, Standard Publishers Distributors(2009)
3. N. Kumara Swamy and A. Kameswara Rao ,“Building Planning and Drawing”, 6th Edition , Charotar Publishing House (P) Ltd, Gujarat, India,2012.

REFERENCES:

1. IS 962 : 1989, Code of Practice For Architectural and Building Drawings
2. Gurcharan Singh, “Building Planning and Scheduling”, Standard Publishers Distributors.
3. M. G. Shah, C. M. Kale, S. Y. Patki, “Building Drawing: With an Integrated Approach to Built Environment”, Tata McGraw-Hill Publishing Company (P) Ltd., New Delhi.

OUTCOME:

- At the end of the course, students will be able to draw simple drawings in CAD software applying the basic rules of Engineering drawing.

CHB1284	CHEMISTRY OF BUILDING MATERIALS LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To learn to estimate the amount of metal ion present in the soil
- To learn the corrosion, prevention and the kinetics
- To learn to measure the cell potential
- To learn to estimate the alkalinity of the cement
- To learn to synthesize the polymers and to study the properties

LIST OF EXPERIMENTS:

1. Estimation of copper in the given ore
2. Electroplating (Cu, Ni, etc.)
3. Electrolessplating
4. Determination of corrosion rate in the presence and absence of the inhibitors
5. Determination of half cell potential.
6. Determination of cell potential by Pogendorf method
7. Preparation of polymers (Urea formaldehyde, Nylon-6,6, etc.)
8. Determination of molecular weight and the degree of polymerization of given polymer
9. Measurement of the thickness of the coating.
10. Determination of alkalinity of cement.

OUTCOMES:

- The student learnt to analyze the quality of water and soil involved in the construction
- The student learnt the types of corrosion and their prevention
- The student learnt to synthesize the thermoplastic and thermosetting polymers and to study the properties.

SEMESTER - III

MAB2181	TRANSFORMS AND APPLICATIONS	L	T	P	C
		3	1	0	4

OBJECTIVES:

The course aims to

- develop the skills of the students in the areas of boundary value problems and transform techniques .
- acquire knowledge on different transforms like Laplace Transform, Fourier Transform and Z Transform.

MODULE I LAPLACE TRANSFORM 8

Laplace transform – sufficient condition – Transforms of elementary functions - Properties – Transforms of Derivatives and Integrals – Initial and Final Value Theorem - Transform of Periodic functions - Inverse transforms - Convolution Theorem.

MODULE II FOURIER SERIES 7

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

MODULE III BOUNDARY VALUE PROBLEMS 8

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

MODULE IV FOURIER TRANSFORM 7

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

MODULE V Z-TRANSFORM AND DIFFERENCE EQUATIONS 7

Z-transform - properties – Inverse Z–transform – Convolution theorem - Formation of difference equations.

MODULE VI APPLICATIONS OF TRANSFORMS 8

Applications of Laplace Transform in solving linear ordinary differential equations - Second order with constant coefficients, Simultaneous First order equations– Applications of Z–transform in solving difference equations using Z–transform.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Veerarajan, T., “Engineering Mathematics”, 5th edition, Tata Mc Graw Hill Publishing Co. New Delhi, 2012.
2. Grewal, B.S.,“Higher Engineering Mathematics”, 42nd edition, Khanna Publishers, New Delhi, 2012.

REFERENCES:

1. Kreyszig, E., “Advanced Engineering Mathematics“, 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
2. Peter V. O'Neil, “Advanced Engineering Mathematics”, 7th edition, Cengage Learning, 2011.
3. Dennis G. Zill, Warren S. Wright, “Advanced Engineering Mathematics”, 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4. Alan Jeffrey, “Advanced Engineering Mathematics”, Academic Press, USA, 2002.
5. Ramana, B.V, “Higher Engineering Mathematics” Tata Mc Graw Hill Publishing Co. New Delhi, 2006.

OUTCOMES:

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

- solve Engineering problems in the area of heat conduction, communication systems, electro-optics and electromagnetic theory using different Transforms.
- solve Boundary value problems encountered in engineering practices.

LSB2181	BIOLOGY FOR ENGINEERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to introduce basic biological concepts to the engineering students to promote cross-breeding of ideas. In particular,

- To provide an overview of cell structure and function.
- To give basic idea on biochemistry related to biological aspects.
- To introduce genes, their structure, inheritance and about living organisms.
- To give an understanding on metabolism, respiration, etc.
- To inform students of engineering about the interface of biology and engineering.

MODULE I BASICS OF CELL STRUCTURE AND FUNCTION 7

Cells as unit of life – basic chemistry of cell – cell structure and functions – Prokaryotic and Eukaryotic cells, cell wall, plasma membrane, endoplasmic reticulum, nucleus, chromosomes- cell division – mitosis, meiosis.

MODULE II BIOCHEMISTRY 8

Biomolecules – introduction – pH and biological buffers – carbohydrates-mono, di, oligo and polysaccharides, lipids- phospholipids, glycolipids, sphingolipids, cholesterol, steroids, prostaglanin – proteins – types – glycoproteins, lipoproteins – structures - primary, secondary, tertiary and quarternary – Nucleic acids – RNA – Types – tRNA, mRNA, giRNA, miRNA, DNA – rDNA, gDNA, cDNA.

MODULE III GENETICS 7

Genes – structure and functions – behavior, dominance and epigenetics, evolution – inheritance – reproduction and gene distribution – genome of living organisms – plants – bacteria and viruses – animals – humans, genetic engineering and cloning.

MODULE IV MICROBIOLOGY 8

Microbiology – basis of microbial existence – microbial diversity – classification and nomenclature of micro-organisms- impact of microorganisms in industry,

agriculture and health, industrial microbiology – primary and secondary screening of micro-organisms, fermentation processes, bioreactors, microbial ecology – microbial bio-remediation – epidemiology and public health.

MODULE V METABOLISM 7

Metabolic processes – bio-membranes, diffusion, absorption, osmo-regulation, photosynthesis, respiration, digestion and excretion.

MODULE VI BIOLOGY AND ENGINEERS 8

Application of biology in engineering– living things as the solutions (bionics) – living things as models (biometrics) – bio-technology – biomedical engineering – effect of human action on living things – right balance – bioinformatics – bionanotechnology – sensors, biosensors, biochips-ethics in biology.

Total Hours : 45

REFERENCES:

1. Johnson, Arthur T., “Biology for Engineers”, CRC Press, FL, 2011.
2. Campbell and Recee, “Biology”, Pearson, Benjamin Cummins Pub. 8th edition, 2008.
3. Scott Freeman, “Biological Sciences”, Prentice Hall, 2002.

OUTCOMES:

After finishing this course students will be able to

- understand basics of biological processes, composition of cell contents
- understand applications of microbes in industrial manufacturing of proteins, antibodies and antibiotics.
- understand cloning and genetic engineering
- identify the genes in different genome (plants, microbes, animals, human) and compare the genes by bioinformatics approaches

CEB2101	MECHANICS OF SOLIDS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To provide knowledge on the basics of material strength and its behaviour.
- To enrich understanding of stress-strain behaviour for various loading conditions and stress development in structural elements.
- To impart knowledge to analyse the two dimensional plane trusses.

MODULE I STRESS, STRAIN AND DEFORMATION OF SOLIDS 8

Rigid and deformable bodies - Stress and Strain – Hooke's Law – Elastic constants and their relationship – Deformation of simple and compound bars - Bar with uniform and varying section - Thermal Stresses.

MODULE II STRESSES IN BEAMS 8

Beams – Types of transverse loading on beams– Shear force and Bending moment in Cantilever beams, Simply supported beams and Over hanging beams – Theory of simple bending – Bending stress distribution - Shear stress distribution.

MODULE III DEFLECTION OF BEAMS 8

Double Integration method – Macaulay's method – Area moment method - Conjugate Beam method for computation of slopes and deflection in determinate beams.

MODULE IV TORSION 7

Theory of simple torsion – Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at both ends – Stresses and deflection of Leaf springs and helical springs.

MODULE V BIAXIAL STRESSES 7

Principal Stresses, strain and maximum shear stresses - Analytical and Graphical methods - Stresses in thin circular cylinder under internal pressure – Volumetric Strain - Combined loading.

MODULE VI ANALYSIS OF PLANE TRUSS **7**

Stability and equilibrium of trusses – Types of trusses – Analysis of forces in truss members - Method of joints - Method of sections - Method of tension coefficients.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Egor Popov, P., "Engineering Mechanics of Solids", 2nd Edition, PHI Learning, New Delhi, 2009.
2. William N., Nash Patter Merk, C., "Strength of Materials", 5th Edition, McGraw-Hill, India, 2010
3. Timoshenko, S. and Young, D.H., "Elements of Strength of Materials", Vol. I and Vol. II, 5th Edition, East West Press, New Delhi, 2011.
4. Vazirani, V.N., Ratwani, M.M., "Analysis of Structures", Volume 1, 9th reprint Edition, Khanna Publishers, New Delhi, 2010.
5. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Theory of Structures", Vol. II, 12th Edtion, Lakshmi publications, New Delhi, 2004.

REFERENCES:

1. Bedi, D.S., "Strength of Materials", 5th Edition, Khanna Book Publishing, New Delhi, 2011.
2. Shames Irwing, H. and Pitarresi James, M., "Introduction to Solid Mechanics", 3rd Edition, Prentice Hall of India, New Delhi, 2002.
3. Roger T. Fenner, "Mechanics of Solids", Blackwell Scientific Publishing, Oxford, 1993.
4. Malhotra, D.R., Gupta, H.C., "The Strength of Materials", Tech. India Publications, New Delhi, 1995.

OUTCOMES:

At the end of the course, the student will

- be able to draw bending moment, shear force and axial force diagrams for statically determinate beams.
- have the capability to determine the stresses and member forces for plane frames.
- be able to solve the practical problems using relevant concepts.

CEB2102	MECHANICS OF FLUIDS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To impart understanding of key concepts and fundamental principles pertaining to fluid behavior, both in static and flowing conditions.
- To provide sufficient knowledge to analyze and design engineering systems and devices involving fluids and flow.
- To enhance student's interest in fluid phenomena and its applications.

MODULE I FLUID PROPERTIES AND PRESSURE MEASUREMENT 8

Dimensions and units - Properties of Fluids - ideal and real fluid - Definition of pressure - Pressure at a point- Pascal's law- Absolute and Gauge pressure - Measurement of pressure - Simple and differential Manometer theory and problems - pressure gauges.

MODULE II FLUID STATICS 8

Hydrostatic law - Definition of total pressure, Center of pressure, Metacentric height, buoyant force - Equation for hydrostatic force and depth of center of pressure on plane surfaces (vertical and inclined) - Problems on hydrostatic force on vertical, inclined and curved submerged surfaces.

MODULE III FLUID KINEMATICS 7

Fluid Kinematics – velocity and acceleration- Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – flow nets and its properties.

MODULE IV FLUID DYNAMICS AND FLOW THROUGH PIPES 8

Euler and Bernoulli's equations – Application of Bernoulli's equation – Venturimeter–Orifice meter- Laminar flow through pipes– Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Major and minor losses of flow in pipes – Pipes in series and in parallel – Moody diagram.

MODULE V BOUNDARY LAYER 7

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Separation of boundary layer – Development of laminar and turbulent flows in circular pipes.

MODULE VI SIMILITUDE AND MODEL STUDY 7

Dimensional Analysis – Rayleigh's method, Buckingham's Pi-theorem – Similitude and models-dimensionless numbers – Scale effect and distorted models.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Bansal, R.K., "Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications Ltd., New Delhi, 2005.
2. Modi, P.N. and Seth, S.M., "Hydraulics and Fluid Mechanics including Hydraulics Machines", Standard Book House, New Delhi, 2002.
3. Molykutty, M.V., "Fluid Mechanics and Machinery", D1 Publications, Chennai, 2008.
4. Nagaratnam, S., "Fluid Mechanics", Khanna Publishers, New Delhi,1989.
5. Kumar, K.L., "Engineering Fluid Mechanics", 7th Edition, Eurasia Publishing House (P) Ltd., New Delhi, 1995.

REFERENCES:

1. Streeter Victor, L., Benjamin Wylie, E. and Bed Ford Keith, W., "Fluid Mechanics", 9th Edition, McGraw-Hill Ltd., 1997.
2. Jain, A.K., "Fluid Mechanics", Khanna Publishers, New Delhi, 1996.
3. Pernard Messay, "Mechanics of Fluids", 7th Edition, Nelson Thornes Ltd., U. K., 1998.
4. Lal Jagdish, "Hydraulics Machines", Metropolitan Book Co. Pvt. Ltd, New Delhi, 1973.

OUTCOMES:

At the end of the course, the students will

- Be able to identify and formulate governing equations to practical problems related to fluid mechanics.
- Have the ability to apply the basic principles of fluid mechanics to fluid flow analysis and fluid flow measurement techniques.

CEB2103	CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart adequate knowledge on concrete constituent materials, fresh and hardened properties of concrete and durability of concrete.
- To make students understand the concepts involved in concrete mix design as per Indian Standards and ACI Method.
- To give exposure to quality control procedures, testing of concrete specimens, special concretes and concreting methods.

MODULE I CONCRETE CONSTITUENT MATERIALS 7

Cement – Grades and types as per IS and ASTM Classification – Testing of cement for quality assurance – Chemical compounds - Hydrated structure – Special cements. Coarse aggregates – Properties, classification and IS recommendations. Fine aggregate – Properties, classification and IS provisions – Water – Quality and IS recommendations. Mineral admixtures and chemical admixtures for concrete.

MODULE II PROPERTIES OF CONCRETE 7

Fresh Concrete properties - Workability and its measurement, Factors affecting workability-Hardened concrete properties – Strength – Elasticity, shrinkage and creep of concrete.

MODULE III DURABILITY OF CONCRETE 8

Strength and durability relationship – Volume change in concrete – Permeability – Cracks in concrete - Joints in concrete – Concrete subjected to high temperature – fire resistance, freeze-thaw, deicing effects of salts – Chemical Action – sulphate attack, alkali-aggregate reaction, acid attack- Concrete in Marine Environment – carbonation, chloride attack.

MODULE IV CONCRETE MIX DESIGN & QUALITY CONTROL 8

Principles of concrete mix design – Properties of concrete related to mix design-Methods of concrete mix design – Indian standard – ACI - Mix design for High Strength and High performance concrete – Ready mix concrete. Quality control

of concrete – Sampling and acceptance criteria – Tools for quality management – Quality management system for construction.

MODULE V TEST METHODS AND EQUIPMENT 8

Inspection testing of fresh concrete – acceptance testing of hardened concrete –partially destructive and non-destructive testing.

MODULE VI SPECIAL CONCRETES & CONCRETING METHODS 7

Light weight concrete – High strength and High performance concrete – High density concrete – Sulphur-infiltrated concrete - Ferrocement – Fibre reinforced concrete - Polymer concrete composites – Underwater concrete - Mass concrete – Cold weather concrete – Hot weather concrete – Shotcrete - Self compacting concrete – Reactive powder concrete - Extreme weather concreting. Special concreting methods - Vacuum dewatering - underwater concrete - special form work.

Total Hours: 45

TEXT BOOKS:

1. Neville, A.M., “Properties of Concrete”, Prentice Hall, 5th Edition, London, 2011.
2. Santhakumar, A.R., “Concrete Technology”, 1st Edition, Oxford University Press, New Delhi, 2006.
3. Shetty, M.S. , “Concrete Technology”, S. Chand and Company Ltd., New Delhi, 2003.
4. Gambhir, M.L., “Concrete Technology - Theory and Practice”, 5th Edition, Tata McGraw-Hill, New Delhi, 2013.

REFERENCES:

1. Mehta, P.K., and Paulo Monteiro, J.M., “Concrete: Microstructure, Properties, and Materials”, McGraw-Hill Professional, USA, 2005.
2. Nayak, N.V. and Jain, A.K., “Handbook on Advanced Concrete Technology”, Narosa Publishing House Pvt. Ltd., New Delhi, 2012.
3. Krishnaraju, N., “Design of Concrete Mixes”, 4th Edition, CBS Publishers, New Delhi, 2010.

OUTCOMES:

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

1. perform concrete mix design as per Indian Standards and ACI Method.
2. determine fresh concrete and hard concrete properties as per procedures outline in Indian standards.
3. recognise various parameters influencing durability performance of RCC structure .
4. apply the knowledge gained on special concrete in different civil engineering applications and appreciate various connecting method adopted in site.

CEB2104	SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge about the nature of surveying data, possible errors and the need for error control.
- To offer knowledge on surveying project fundamentals such as referencing systems, horizontal and vertical control and topographic mapping.
- To impart understanding on surveying data analysis, methods of data recording, display and storage.

MODULE I INTRODUCTION TO SURVEYING 7

Basic definitions, objectives, divisions and Importance of Surveying to Engineers; Concept of Geoid and reference spheroids, coordinate systems, plane and geodetic surveys; Classification and principles of Surveying; Output of Survey – Maps, Plans, Scales, Conventional Signs and Symbols; Projections and Coordinate system

MODULE II LINEAR MEASUREMENTS 7

Direct and indirect methods of Linear measurement; Tape and Compass – Basic Principles, types of instruments, Errors, Precautions, Chain and tape measurements, Ranging, Errors – Types, Precautions and Corrections; Field problems and their solutions.

MODULE III ANGULAR MEASUREMENTS - HEIGHTS AND DISTANCES 8

Angular Measurements - Basic Definitions- meridians, declination-variations, local attraction, Theodolite – Different types and their salient parts, basic terms, fundamental lines, Temporary and Permanent Adjustments, Errors and Mistakes, Methods of Repetition and reiteration, Errors and mistakes, corrections and Accuracy. Tacheometry - Introduction, Basic definitions, Methods, Tacheometers, sub tense bar, fundamental principles; Stadia System-fundamentals, Anallactic lens; Subtence bar method, Errors Motion of Sun and Stars, Azimuth, Calculation of Azimuth using sun observations.

MODULE IV DETERMINATION OF ELEVATION 8

Basic Definitions, Curvature & Refraction, Methods; Level – Types and salient

parts, working principle, Temporary and Permanent Adjustments, Errors and Mistakes, Leveling Staff, Differential leveling and field book note, Reciprocal Leveling; Profile leveling; Trigonometric leveling, Errors & Mistakes in leveling, Error propagation; Contouring- definition, characteristics, methods and applications.

MODULE V TRAVERSING, TRIANGULATION AND TRILATERATION 10

Plane Tabling - Merits and demerits, accessories; orientation and resection; methods of plane tabling; three point problem and solutions; errors in plane tabling Traversing, Triangulation and Trilateration - Purpose and classification of each; Horizontal and vertical control methods, balancing of traverses, adjustment of traverses and coordinate computation, Triangulation- network, strength of figures, field work, selection of stations, inter-visibility, satellite stations, measurements and computations; trigonometrical leveling. Errors, accuracy and adjustment of each.

Electronic distance Measurement (EDM) - Measuring principle, Working principle, Sources of Error, Types of EDM Instruments.

MODULE VI PROJECT AND ENGINEERING SURVEYS 5

General requirements and specifications for engineering project surveys; Reconnaissance, preliminary location and surveys for highway, railway and canals; Setting out works – buildings, culverts and simple circular curves, correlation of underground and surface surveys

Total Hours: 45

TEXT BOOKS:

1. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain “Surveying”, Vol. I, II and III, 15th Edition, Laxmi Publications, New Delhi, 2005.
2. Kanetkar, T.P., “Surveying and Levelling”, Vol. I and II, Standard Publication, 2008.
3. Arora, K.R., “Surveying”, Vol. I & II, Standard Book House, New Delhi, 1996.

REFERENCES:

1. Clark, D., “Plane and Geodetic Surveying”, Vol. I and II, 6th Edition, C.B.S. Publishers and Distributors, New Delhi, 1983.
2. James M. Anderson and Edward M. Mikhail " Introduction to Surveying”, 7th Edition, McGraw Hill, 1997.
3. Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
4. Bannister, A., Raymond, S. and Raymond Baker, “Surveying”, 7th Edition, Prentice Hall, 1998.

OUTCOMES:

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

- explain nature of surveying data, identify errors and the need for error control.
- work on surveying project fundamentals involving referencing systems, establishment of horizontal and vertical control and topographic mapping.
- to the necessary correction and calculation for the surveying data.
- analyze surveying data by adopting systematic data recording, display and storage methods.

ENB2181	ORAL COMMUNICATION	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To empower students with soft skills for employability.
- To help students speak effectively.
- To expose them to a range of business contexts through podcasts for learning appropriate expressions and using them effectively.
- To enable them to make effective presentations.
- To help them learn persuasive and negotiating skills.
- To train them in deliberating on current affairs efficiently by participating in group discussions.
- To prepare them for job interviews.

MODULE I **4**

Training in soft skills-Importance of Oral Communication, rubrics for evaluation, Verbal and non-verbal communication, One-minute presentations & Just a minute (JAM)

Paralinguistic features - Listening to short conversations and monologues for relevant information.

MODULE II **6**

Role-play, Selling a product , marketing skills (Case study on advertisements) Listening to Business English podcast, Negotiation, persuasion and marketing skills

MODULE III **4**

Deliberation on social and scientific issues & Debates (Peer and Faculty feedback)
Viewing video samples on debates, TED Talks

MODULE IV **4**

Pair work- Think, pair and share activity-analyzing & Problem solving Listening for specific information and taking short notes

MODULE V **6**

Discussion etiquette -Assigning different roles in a GD (Peer and Faculty feedback)
Goal setting, Assessing one's strengths and weaknesses & SWOC Analysis

MODULE VI **6**

Mock interview (Peer and Faculty feedback) –
Types of Job Interview – Telephone Interview, Stress Interview (Case study)
Listening to interviews for understanding speakers' opinions

Total Hours: 30

REFERENCES:

1. Hancock, Mark (2012). English Pronunciation in Use. Cambridge University Press, UK.
2. Anderson, Kenneth & et.al (2007). Study Speaking: A Course in Spoken English for Academic Purposes (Second Edition). Cambridge University Press, UK.
3. Hurlock, B.Elizabeth (2011). Personality Development. Tata McGraw Hill, New York.
4. Dhanavel,S.P (2015). English and Soft Skills. Orient Blackswan, Chennai.
5. Whitby, Norman (2014). Business Benchmark: Pre-Intermediate to Intermediate. Cambridge University Press, UK.

OUTCOMES:

On completion of the course, students will be able to

- Apply various soft skills to deal with any professional situation.
- Speak English intelligibly, fluently and accurately.
- Use a range of expressions appropriate to the situations.
- Make effective presentations.
- Use persuasive and negotiating skills for marketing products.
- Deliberate on current affairs with confidence.
- Participate effectively in group discussions and interviews.

CEB2105	SURVEYING LABORATORY - I	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To enable students to understand and apply the basic principles of surveying
- To impart students training in the usage of various survey instruments such as chain, compass, plane table, leveling and theodolite for different application areas.

MODULE I CHAIN SURVEYING **9**

Study of chain and its accessories - Ranging, chaining and Pacing - Chain traversing without cross staff - Chain traversing with cross staff.

MODULE II COMPASS SURVEYING **9**

Study of Prismatic and Surveyor's Compass - Triangulation problem- Compass traversing.

MODULE III PLANE TABLING **12**

Plane Table – radiation method, Intersection Method, Three Point Problem, Mechanical Method, Three Point Problem and Trial and Error Method

MODULE IV LEVELLING **12**

Fly Leveling - Longitudinal Sectioning - Cross Sectioning

MODULE V INTRODUCTION TO THEODOLITE **3**

Demonstration of theodolite

Total Hours: 45

TEXT BOOKS:

1. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain "Surveying", Vol. I, II and III, 15th Edition, Laxmi Publications, New Delhi, 2005.
2. Kanetkar, T.P., "Surveying and Levelling", Vol. I and II, Standard Publication, 2008.
3. Arora, K.R., "Surveying", Vol. I & II, Standard Book House, New Delhi, 1996.

REFERENCES:

1. Clark, D., “Plane and Geodetic Surveying”, Vol. I and II, 6th Edition, C.B.S. Publishers and Distributors, New Delhi, 1983.
2. James Anderson, M., and Edward Mikhail, M.,” Introduction to Surveying”, 7th Edition, McGraw Hill Book Company,1997.
3. Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
4. Bannister, A., Raymond, S. and Raymond Baker, “Surveying”, 7th Edition, Prentice Hall,1998.

OUTCOMES:

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

- undertake different surveying works and identify the proper instruments for execution.
- execute surveying for different application needs by identifying and controlling errors.

CEB2106 CONSTRUCTION MATERIALS LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- To provide adequate knowledge on properties of various construction materials such as cement, fine aggregate, coarse aggregate, bricks and tiles through conducting tests as per Indian Standards.
- To impart knowledge on validation of materials for construction application.

MODULE I STANDARDS AND TEST PROCEDURE **6**

Relevant Indian Standards for testing cement, steel, fine aggregate, coarse aggregate, bricks and tiles.

MODULE II TESTS ON CEMENT **12**

Type of cement - grade of cement - fineness and standard consistency - initial and final setting time - specific gravity - soundness test.

MODULE III TESTS ON FINE AGGREGATE **9**

Particle size distribution (Sieve analysis) - classification as per Indian standards - silt content - specific gravity - water absorption - density.

MODULE IV TESTS ON COARSE AGGREGATE **9**

Particle size distribution (Sieve analysis) - specific gravity - density - water absorption - flakiness index

MODULE V TESTS ON BRICKS AND TILES **9**

Classification of bricks - size of brick - compressive strength - water absorption - efflorescence. Compressive strength and abrasion resistance of tiles.

Total Hours: 45

REFERENCES:

1. IS 4031-Part 4-1988 Methods of Physical Tests for Hydraulic Cement – Determination of Consistency of Standard Cement Paste, Bureau of Indian Standards.
2. IS 4031-Part 5-1988 Methods of Physical Tests for Hydraulic Cement – Determination of Initial and Final Setting Times, Bureau of Indian Standards.

3. IS 383-1970 Specification for Coarse and Fine Aggregates from Natural Sources for Concrete, Bureau of Indian Standards.

4. IS 2386-Part I-1963 Methods of Test for Aggregates for Concrete – Particle Size and Shape, Bureau of Indian Standards.

5. IS 2386-Part 3-1963 Methods of Test for Aggregates for Concrete – Specific Gravity, Density, Voids, Absorption and Bulking, Bureau of Indian Standards

6. IS 3495 (Part 1-4): 1992, Methods of Tests of Burnt Clay Building Bricks, Bureau of Indian Standards.

7. Haji Sheik Mohammed, M.S., "Construction Materials Laboratory - Manual", B.S. Abdur Rahman University, Chennai, 2012.

OUTCOMES:

At the end of course, students will be able to

- determine various properties of cement, steel, fine aggregate, course aggregate, bricks and tiles by conducting test as per Indian standards.
- able to recommend the suitability of construction material for different civil engineering applications.

CEB2107	CIVIL ENGINEERING DRAWING	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To enable the students to understand the fundamental and basic principles of building drawing
- To impart knowledge in basic commands of a drafting package.
- To provide training to plan and draw different views of buildings according to building rules.

MODULE I INTRODUCTION TO BUILDING COMPONENTS 6

Building components – Substructure – Footings & Pedestals - Superstructure – Columns and Beams - Floors and Roofs - Walls - Lintels - Sunshades - Joineries etc.

MODULE II SIGN CONVENTIONS & MANUAL DRAWINGS 6

Drawing of conventional signs and symbols for basic engineering materials as per B.I.S - Methods of development of sectional views from building plans – Drawing of simple house plans.

MODULE III LOAD BEARING STRUCTURES 9

Buildings with load bearing walls – Plan , Elevation & Section of a Residential Building with masonry walls (Manual & CAD)

MODULE IV R.C.C. FRAMED STRUCTURES 9

Different types of residential buildings – Plan & Sectional views of a RCC building using CAD

MODULE V INDUSTRIAL BUILDING 9

Drawing sectional View of an Industrial Building using CAD – North light roof Structure.

MODULE VI SERVICE PLANS 6

Electrical, plumbing, gas lines for a residential building as per B.I.S

Total Hours: 45

TEXT BOOKS:

1. Venugopal, K., "Engineering Drawing And Graphics", 5th Edition, New Age International (P) Ltd., New Delhi, 2011.
2. Gurcharan Singh, "Civil Engineering Drawing", Standard Publishers and Distributors, 2009.
3. Kumara Swamy, N. and Kameswara Rao, A., "Building Planning and Drawing", 6th Edition, Charotar Publishing House (P) Ltd, Gujarat, India, 2012.

REFERENCES:

1. IS 962 : 1989 (R 2001), Code of Practice For Architectural and Building Drawings, Bureau of Indian Standards, New Delhi.
2. Gurcharan Singh, "Building Planning and Scheduling", Standard Publishers and Distributors, 2012.
3. Shah, M.G., Kale, C.M., Patki, S.Y., "Building Drawing: With an Integrated Approach to Built Environment", Tata McGraw-Hill Publishing Company (P) Ltd., New Delhi, 2002.

OUTCOME:

- At the end of the course, students will be able to plan and draw different views of building according to building rules manually and by using software packages.

SEMESTER – IV

MAB2283	**APPLIED NUMERICAL METHODS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVE:

- This course gives a complete procedure to solve problems in engineering numerically, where analytical method fails to give solution.

MODULE I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 7

Linear interpolation methods (method of false position) – Newton's method – Statement of Fixed Point Theorem – Fixed point iteration: x=g(x) method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method.

MODULE II INTERPOLATION AND APPROXIMATION 7

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.- Relations between operators (E, $\nabla, \mu, \Delta, \Delta$)

MODULE III NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 8

Derivatives from difference tables – Divided differences and finite differences –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpson's rules.

MODULE IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 8

Numerical solution of first and second order ordinary differential equations by Taylor series method - Euler Method - Modified Euler's Method - Runge – Kutta Method of order four.

MODULE V NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 8

Millne's Predictor and Corrector Method – Adam's Predictor-Corrector Method

- Finite difference methods for two – point Boundary Value problems for Ordinary Differential Equations.

MODULE VI BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS 7

Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

L – 45; T – 15; Total Hours- 60

TEXT BOOK:

1. Jain, M.K., Iyengar, S.R.K., Jain, R.K., "Numerical methods for Scientific and Engineering Computation", New Age International Publishers, New Delhi, 2003.

REFERENCES:

1. Grewal, B.S., "Numerical methods in Engineering and Science", 7th edition, Khanna Publishers, 2007.
2. Gerald, C.F., Wheatley, P.O., "Applied Numerical Analysis" Pearson Education, New Delhi, 2002.
3. Dechaumphai, P. and Wansophark, N., "Numerical Methods in Engineering", Narosa Publications, 2012.

OUTCOMES:

At the end of the course students will be able to

- solve system of equations and Eigen value problem of a matrix numerically.
- use interpolation and find intermediate values for given data.
- find numerical solution of differential equations in engineering problems.

CEB2211	STRENGTH OF MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the

- Application of energy principles in structures
- Basic concepts of indeterminate beams, columns and struts.
- Various theories of failures, unsymmetrical bending of beams and stresses in cylinders.

MODULE I ENERGY PRINCIPLES 8

Strain energy – strain energy in axial force – flexure, shear and torsion – Castigliano's theorems –Application of energy theorems for computing deflections in beams and trusses – Maxwell's reciprocal theorem – Betti's theorem

MODULE II INDETERMINATE BEAMS 8

Static determinancy and indeterminancy of beams - Fixing moments for a fixed beam of uniform section, slope and deflection. Continuous Beams: Analysis, Reaction at the supports, and Effect of sinking of supports.

MODULE III COLUMNS AND STRUTS 7

Classification of Columns - Euler's theory of long columns – Critical loads for prismatic columns with different end conditions - Rankine-Gordon formula - Eccentrically loaded columns.

MODULE IV THEORIES OF FAILURE 7

Theories of failure – strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity and design of members.

MODULE V BENDING OF CURVED BARS AND UNSYMMETRICAL BENDING 8

Stresses on Curved beams for simple solid sections – Winkler Bach formula- Unsymmetrical bending of beams - Symmetrical and unsymmetrical sections

MODULE VI THICK CYLINDERS AND SPHERICAL SHELLS 7

Stresses in Thick cylinders subjected to internal and external pressure and compound cylinders - Stresses and strains in thin spherical shell

Total Hours: 45

TEXT BOOKS:

1 Bedi, D.S., “Strength of Materials”, Khanna Book Publishing Co. (P) Ltd., New Delhi, 2000.

2. Sadhu Singh, “Strength of materials”, 7th Edition, Khanna Publishers, New Delhi, 1999.

3. Vazirani, V.N., Ratwani, M.M., and Duggal, S.K., “Analysis of Structures”, Vol. I, 17th Edition, Khanna Publishers, New Delhi, 2002.

4. Vazirani, V.N., Ratwani, M.M., and Duggal, S.K., “Analysis of Structures”, Vol. II, 16th Edition, Khanna Publishers, New Delhi, 2002.

5. Rajput, R.K., “Strength of Materials”, S.Chand & Company Ltd., New Delhi, 2006.

REFERENCES:

1. Kazimi, S.M.A., “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 2003.

2. William A .Nash, “Theory and Problems of Strength of Materials”, Schaum’s Outline Series, Tata McGraw Hill Publishing Company Ltd., 2007.

3. Srinath, L.S., “Advanced Mechanics and Solids”, Tata-McGraw Hill publishing company Ltd., 2005.

4. Punmia, B.C.,”Theory of Structures (SMTS)” Vol. I & II, Laxmi Publishing Pvt. Ltd., New Delhi, 2004.

OUTCOMES:

At the end of the course, students will

- be able to explain the various energy principles and theorems.
- be able to analyzed behavior of indeterminate structures

- have the capability to solve axially loaded members for buckling under different boundary conditions.
- be able to demonstrate the development of stresses and strains in thick cylinders and thin spherical shells.

CEB2212 HYDRAULIC AND HYDRAULIC MACHINERY L T P C

3 1 0 4

OBJECTIVES:

- To familiarize the students with the flow through open channels and working of hydraulic machines such as various types of turbines and pumps.

MODULE I FLOW MEASUREMENTS 8

Flow through Orifices, mouthpieces - classification - hydraulic coefficients - problems, Flow over notches and weirs - classification -Equation for discharge over rectangular, trapezoidal notches, V-notch - Cippoletti notch - ventilation of weirs - equation for discharge for Broad crested weirs, narrow crested, submerged weirs – problems – velocity measurement using floats, current meter.

MODULE II FLOW IN OPEN CHANNELS 8

Definition of open channels –classification -types of flow -Geometric properties of open channels- Uniform flow in open channels-Chezy's and Manning's formulae- Most economical open channels- Derivation of conditions for rectangular, triangular, trapezoidal and circular sections -Specific energy- definitions- specific energy curve- conditions for minimum specific energy and maximum discharge- Critical flow calculations.

MODULE III VARIED FLOW 8

Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step method - Hydraulic jump in rectangular channels – applications - derivations with Froude number concept- Problems on Hydraulic Jump, venturi flume.

MODULE IV IMPACT OF JET ON VANES 7

Introduction to Impulse – momentum equation and its applications- Derivation for Force exerted by a jet on a fixed target, moving target,curved vane and on a series of curved vanes- Concept of velocity triangles- Equation for work done & efficiency.

MODULE V PUMPS **7**

Centrifugal pump –work done and efficiency- minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump – working principle - work done-slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done –characteristic curves- Introduction to rotary pumps

MODULE VI TURBINES **7**

Turbines - classification - radial flow turbines - axial flow turbines – Impulse and Reaction turbines - draft tube theory - performance of turbines - similarity laws

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Modi, P.N., and Seth, S.M., “Hydraulics & Fluid Mechanics including Hydraulics Machines”, 14th Edition, Standard Book House, New Delhi, 2002.
2. Bansal, R.K., “A Text Book of Fluid mechanics & Hydraulic Machines”, 9th Edition, Laxmi publications (P) Ltd., New Delhi, 2005
3. Subramanya, K., "Flow in Open channels", 3rd Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2009.
4. Jain, A.K., "Fluid Mechanics (including Hydraulic Machines)", 8th Edition, Khanna Publishers, New Delhi, 1995.
5. Molykutty, M.V., “Fluid Mechanics and Machinery”, D1 Publications, Chennai, 2008.

REFERENCES:

1. Arora, K.R., "Fluid Mechanics, Hydraulics and Hydraulics Machines", 9th Edition, Standard Publishers and Distributers, New Delhi. 2005.
2. Ven Te Chow, “Open Channel Hydraulics”, McGraw-H: Q Book Company, 1996.
3. Ramamirtham, S., “Fluid Mechanics, Hydraulics and Fluid Machines”, Dhanpat Rai & Sons, New Delhi, 1998.
4. Kumar, K.L., "Engineering Fluid Mechanics", 7th Edition, Eurasia Publishing House (P) Ltd., New Delhi, 1995.

OUTCOMES:

At the end of the course, students will

- have the ability to analyze the flow characteristics in open channel.
- be able to analyse the performance of a hydraulic machine.

CEB2213 WATER AND WASTE WATER ENGINEERING

L	T	P	C
3	1	0	4

OBJECTIVES:

- To impart knowledge on quantity, quality, treatment & distribution of drinking water
- To provide understanding on quantity, quality, collection & conveyance, treatment and disposal of domestic sewage.
- To expose students to house plumbing techniques and house sanitation

MODULE I WATER QUANTITY & QUALITY **8**

Water Supply Engineering – Quantity of water, types of water demand, fluctuation in demand, factors affecting consumption, forecasting population – design period. Sources of water – surface water sources, intakes, ground water sources

MODULE II WATER TREATMENT & DISTRIBUTION **8**

Treatment of water (process details and design considerations) – aeration, sedimentation, coagulation & flocculation, filtration, disinfection. Miscellaneous and advanced treatment methods – removal of iron and manganese, fluoridation and defluoridation, water softening, arsenic removal, desalination, membrane filtration. Water Storage & Distribution Networks.

MODULE III WASTEWATER ENGINEERING **8**

Introduction to Sanitary & Sewerage systems, Wastewater flows, and characteristics, Wastewater collection systems, Estimation and variation of wastewater flows. Treated wastewater reclamation and reuse, wastewater preliminary, primary, secondary and tertiary treatment processes. Screens, grit chambers & their design, sedimentation, coagulation, flocculation.

MODULE IV ADVANCED WASTEWATER TREATMENT **7**

Theory of activated sludge process, extended aeration systems, trickling filters, aerated lagoons, stabilization ponds, oxidation ditches etc. Introduction to Duckweed Pond, Vermiculture and root zone technology for wastewater treatment, concept of anaerobic contact process, anaerobic Filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor.

MODULE V WASTE WATER DISPOSAL & SLUDGE HANDLING 7

Disposal of treated waste water on land and in water bodies, ocean discharge, agricultural irrigation, ground water recharge, problems - Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

MODULE VI WATER SUPPLY AND DRAINAGE IN BUILDINGS 7

Principles of design of water supply and drainage in buildings - House service connection - Sanitary fixtures and fittings - Systems of sanitary plumbing - House drainage - House sewer connection.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Modi, P.N., “Sewage Treatment and Disposal and Wastewater Engineering”, Standard Book House, New Delhi, 2008.
2. Garg, S.K., “Environmental Engineering”, Vol. II, Khanna Publications, New Delhi, 2009.
3. Duggal, K.N., “Elements of Environmental Engineering”, S Chand and Co. Ltd., New Delhi, 2008.
4. Birdie, G.S., and Birdie, J.S., “Water Supply and Sanitary Engineering”, Dhanpat Rai and Sons, New Delhi, 2007.

REFERENCES:

1. Mark J. Hammer and Mark J. Hammer Jr., “Water and Waste Water Technology”, Prentice Hall of India Pvt. Ltd., New Delhi, 2009.
2. Metcalf and Eddy, “Wastewater Engineering Treatment, Disposal and Reuse”, Tata McGraw Hill, 2007.
3. Fair, Geyer and Okun, “Water and Waste water Engineering”, John Wiley and sons, Inc., 2010.
4. Kiely, G., “Environmental Engineering”, McGraw Hill, 2009.

OUTCOMES:

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

- plan water supply scheme and sanitation scheme for waste water.
- design house plumbing system and sanitation system.

CEB2214 TRANSPORTATION ENGINEERING I

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart basic knowledge on highway engineering, geometric design of highways, highway materials, hill roads, traffic management and airport engineering.

MODULE I INTRODUCTION TO HIGHWAY ENGINEERING 7

Role of Transportation Engineering; Modes of transportation- Their importance and limitations; Importance of Highway Transportation; Highway Planning- Principle of Highway Planning, Road development and Financing, Privatization of Highways, Highway Alignment Requirements, Engineering Surveys for Highway locations.

MODULE II GEOMETRIC DESIGN OF HIGHWAYS 8

Cross section elements, Width, Camber, Design Speed, Sight distances, Requirements and Design of horizontal and Vertical Alignments; Different type of Road; Pavement construction- Types of Pavement, Earth work, Sub grade, Water bound macadam, Bituminous Macadam, Earthen Roads, Bituminous Surfacing: Rigid Pavement Joints.

MODULE III HIGHWAY MATERIALS 7

Material Characterization, Test of Sub grade soil, Aggregates and Bituminous Materials, Bituminous Mix design; Pavement Design- Flexible and Rigid; Highway Drainage- Surface Drainage and Sub-soil drainage; Maintenance and Strengthening.

MODULE IV HILL ROADS 7

Introduction: Importance of hill roads, problems specific to hill road construction; geometric design, alignment survey, Geometry of hill roads, geometric standards; construction: formation cutting, protective structures, cross drainage works; maintenance: drainage, landslides, snow clearance, Curve layout in hill Road.

MODULE V TRAFFIC ENGINEERING 8

Highway traffic Characteristics, Traffic parameters and inter relationship, traffic

volume, speed, density, capacity, Traffic studies- Volume speed, OD. Traffic operation and management- Traffic congestion, circulation, Planning, control devices, management improvement measures, Speed change Lane- Different types of speed change lane, Street lighting, Level of services, Parking- On street parking, parallel parking and angle parking, Off street parking, Advantages and Disadvantages of on street and off street parking, Accident-Spot map, Collision Map, Condition diagram, Different lane system- One way lane and reversible lane, Advantages and Disadvantages of one way lane and reversible lane, Traffic signal- Different type of traffic signal, Rotary intersection-Advantages and disadvantages of rotary intersection.

MODULE VI AIRPORT ENGINEERING 8

Introduction: Advantages and limitations of air transportation. Aeroplane component parts and important technical terms. Airport planning: Aircraft characteristics, which influence judicious and scientific planning of airports, Selection of sites, survey and drawings to be prepared for airport planning. Airport layout: Characteristics of good layout, runway configuration, airport obstruction, location of terminal buildings, aprons and hangers. Zoning requirements regarding permissible heights of constructions and landing within the airport boundary. Runways and taxiways: Runway orientation, wind coverage, use of wind rose diagram, basic runway length, corrections for elevation, temperature and gradient as per ICAO and FAA recommendation. Airport classification by ICAO.

Total Hours: 45

REFERENCES:

1. Jotin Khisty, C., Kent Lall, B., “Transportation Engineering: An Introduction”, Prentice Hall, 2003.
2. Nicholas J. Garber, Lester A. Hoel, “Traffic and Highway Engineering”, Cengage Learning, 2009.
3. Fred L. Mannering and Walter P. Kilareski, “Principles of Highway Engineering and Traffic Analysis”, Wiley, 1998.
4 Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, “Airport Engineering : Planning, Design and Development of 21st Century Airports”, 2011.
5 IRC-SP: 48-1998, Hill Road Manual, Indian Road Congress, 2003.

OUTCOMES:

At the end of the course student will

- gain knowledge on highway engineering, and geometric design of highways.
- be able to identify suitable materials for highway and perform mix design.

SSB2181	LAW FOR ENGINEERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To describe the Indian Constitution and Governance of our country.
- To explain human rights, local and International and redressal mechanism.
- To discuss the important aspects of corporate laws.
- To state the importance of industrial and labour laws of our country.
- To present the laws on contracts and arbitration.
- To state the importance of laws related to intellectual property.

MODULE I INDIAN CONSTITUTION **7**

Constitution – meaning and history – making of constitution – salient features, Preamble, Citizenship, Fundamental rights, Fundamental duties, Equality and social justice, Directive principles, Constitutional amendments.

MODULE II GOVERNANCE AND POWERS VESTED **7**

Union executive, Legislature – Union – State and union territories, Union and state relations, powers vested with parliament and state legislature, emergency provisions - People's Representations Act – Election Commission – Election for parliament and state legislature, Judiciary.

MODULE III HUMAN RIGHTS **7**

Human rights – meaning and significance, International law on human rights, Covenant on civil and political rights; Covenant on Economic, social and cultural rights – protocol, UN mechanism and agencies, watch on human rights and enforcement – role of judiciary and commission, Right to information Act 2005 – evolution – concept – practice.

MODULE IV CORPORATE AND LABOUR LAWS **7**

Corporate laws – meaning and scope – laws relating to companies, Companies Act 1956 – collaboration agreement for Technology transfer, Corporate liability – Civil and criminal – Industrial employment (standing orders) Act 1946, Industrial Disputes Act, 1947, Workmen's Compensation Act 1923, The Factories Act, 1948 – Industry related other specific laws.

MODULE V CONTRACTS AND ARBITRATION. 9

Types of contract – standard form of contracts - General principles under Indian Contract Act, 1872 – protection against exploitation – judicial approach to contracts, Arbitration and conciliation – meaning, scope and types, model law, judicial intervention, International commercial arbitration – arbitration agreement, arbitration tribunal – powers and jurisdiction, enforcement and revision, Geneva Convention, Awards, Confidentiality.

MODULE VI LAWS RELATED TO IPR 8

IPR – meaning and scope, International Convention – Berne and Parrys Conventions, International organization – WIPO – TRIPS, Major Indian IPR Acts – Copyright laws, Patent and Design Act, Trademarks Act, Trade Secret Act, Geographical Indicator, Securing of International patents.

Total Hours: 45

REFERENCES:

1. Jain M.P, Indian Constitutional Law, Wadhwa & Co., (2005)
2. Subhash G. & Kashyap, Our Constitution : An introduction to India's Constitution and Constitutional Law, National Book Trust, 3rd edn., India (2001)
3. Agarwal H.D., International Law and Human Rights, Central Law Publications, (2008).
4. Meena Rao, Fundamental Concepts in Law of Contract, 3rd edn., Professional offset, (2006).
5. Ramappa, Intellectual Property Rights Law in India, Asia Law House (2010)
6. Avtar Singh, Company Law, Eastern Book Co., (2007).
7. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House.
8. Acts : Right to Information Act, Industrial Employees (standing order) Act, Factories Act, Workmen Compensate Act.

OUTCOMES:

On successful completion of the course

- Students will `be able to apply the basic concepts of Indian Constitution, Governance and power in their real life situation.

- Students will have developed knowledge in judiciary, human rights, cultural, social and political rights.
- Students will have synthesized knowledge about the corporate and labour laws, contracts, arbitration and laws related to Intellectual Property Rights.

ENB2282	CONFIDENCE BUILDING AND BEHAVIORAL SKILLS	L T P C 0 0 2 1

OBJECTIVES:

- To enable the students to develop communication skills for verbal communication in the work place.

TOPICS OUTLINE:

This course is practical oriented one and exercises will be given to the students group users /individually depending upon the aspect considered. The following aspect will form the broad outline content of the syllabi. The exercises will be designed by the faculty member and coordinated by the overall course coordinator.

LAB ACTIVITIES:

- Introduction: Soft skills definition, examples
- Verbal communication: Case study, communication and discussion o Prepared speech
  - o Impromptu speech
  - o Debate: Case studies - Attitude and Behavior: role play and exploration o Ability to ask for help – communication and team work
- Manners and etiquette
  - o Organization and Planning
  - o Time keeping
  - o Conduct in workplace o Conscientiousness o Work output
  - o Professionalism
  - o Motivation
- Ownership of tasks
- Adaptability/flexibility

ASSESSMENT:

The assessment will be continuous and portfolio based. The students must produce the record of the work done through the course of the semester in

the individual classes. The portfolio may consist of a) the individual task outline and activities, b) worked out activities c) Pre-designed sheets which may be provided by the Faculty member. The portfolio will be used by the Faculty member for assessment. The course coordinator in consultation with the course committee shall decide at the beginning of the semester, the number of exercises, method of assessment of each and the weightage for the end semester assessment.

OUTCOMES :

The students should be able to:

- develop verbal communication skills
- debate with other students confidently
- communicate effectively their ideas

CEB2215	SURVEYING LABORATORY II	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To impart training in making precise measurements using theodolite, by different methods.
- To offer training to measure heights and distances of various features by different methods using theodolite and tacheometer surveying.
- To expose students in setting out works, field astronomy and EDM.

MODULE I THEODOLITE SURVEYING **15**

1. Introduction to Surveying Lab II
2. Measurement of Horizontal Angle by Direct Method
3. Measurement of Horizontal Angle by the Method of Repetition
4. Measurement of Horizontal Angle by Method of Reiteration
5. Measurement of Vertical Angles – Direct Method

MODULE II HEIGHTS AND DISTANCES **15**

1. Measurement of Distances – Single Plane Method
2. Measurement of Distances – Double Plane Method
3. Determination of Constants of a Tacheometer
4. Determination of Distance using a Tacheometer – Stadia System – at an Angle of Elevation or Depression
5. Determination of Distance using a Tacheometer – Tangential System

MODULE III SETTING OUT WORKS **9**

1. Foundation Marking
2. Simple Curves
3. Transition Curves

MODULE IV FIELD ASTRONOMY **3**

1. Study of Motion of the Sun
2. Determination of Azimuth

MODULE V EDM **3**

1. Demonstration of working of EDM
2. Demonstration of working of GPS

Total Hours: 45

TEXT BOOKS:

1. Bannister, A. and Raymond, S., "Surveying", 6th Edition, ELBS Publishers,1992.
2. Kanetkar, T.P., "Surveying and Leveling", Vol. I and II, United Book Corporation, Pune, 1994.
3. Punmia, B.C., "Surveying", Vol. I, II and III, Laxmi Publications, New Delhi, 2007.

REFERENCES:

1. Clark, D.,"Plane and Geodetic Surveying", Vol. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
2. James M. Anderson and Edward M. Mikhail, "Introduction to Surveying", McGraw- Hill Book Company, 1985.
3. Heribert Kahmen and Wolfgang Faig, "Surveying", Walter de Gruyter, 1995.

OUTCOMES:

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

- use the theodolite and tacheometer surveying for various field applications such as horizontal angles, vertical angles, distance and height measurements.
- set out simple curves and perform foundation marking.
- use field astronomy, EDM and GPS for field surveying.

CEB2216 STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- To impart adequate knowledge on properties and behaviour of steel specimens such as hardness, impact resistance, young's modulus, modulus of rigidity and stiffness by conducting tests as per standard procedure.
- To impart understanding about stiffness and modulus of rigidity of real time spring components and method to find young's modulus of wood.

MODULE I INDIAN STANDARDS & TEST PROCEDURES 6

Indian Standards for conducting tension test on metal - Test procedure for determining impact strength, young's modulus, stiffness and modulus of rigidity on metal specimen; and young's modulus of wood.

MODULE II MECHANICAL PROPERTIES OF METAL 15

Hardness of metal by Rockwell and Brinell hardness tests - Impact strength of metal by Izod and Charpy method - Properties of steel rebar by tension test

MODULE III BEHAVIOUR OF MATERIALS UNDER LOAD 15

Stress-strain behaviour of steel rebar and Young's modulus by conducting tension test - Verification of Maxwell reciprocal theorem by conducting bending test on simply supported beam and cantilever beam - Stiffness and Modulus of rigidity of steel specimen by torsion test - Load-deflection behaviour of wood under static bending test to find young's modulus

MODULE IV TESTS ON SPRING 9

Stiffness and modulus of rigidity of open coil spring by compression test - Stiffness and Rigidity modulus of closed coil spring by tension test.

Total Hours: 45

REFERENCES:

1 IS 1521-1972, Method for Tensile Testing of Steel Wire, Bureau of Indian Standards.

2 IS 1786-1985, Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement, Bureau of Indian Standards.

3 Haji Sheik Mohammed, M.S., "Strength of Materials Laboratory - Manual", B.S. Abdur Rahman University, Chennai, 2012.

OUTCOMES:

At the end of course, students will

- be able to determine properties of materials such as hardness, impact resistance, young's modulus, modulus of rigidity and stiffness by conducting tests as per standard procedure.
- have the ability to find stiffness and modulus of rigidity of spring components and young's modulus of wood.

CEB2217 HYDRAULIC ENGINEERING LABORATORY **L T P C**

0 0 3 1

OBJECTIVES:

- To enable the students to learn the fundamental principles of fluid mechanics through experimentation.
- To develop skills for analyzing experimental data, designing and conducting experiments.

MODULE I MEASUREMENT OF FLOW THROUGH TANKS, PIPES AND OPEN CHANNEL **15**

Determination of co-efficient of discharge for Orifice and Mouthpiece fitted in a tank by constant head method and variable head method - Determination of co-efficient of discharge for Venturimeter, Orifice meter - Determination of co-efficient of discharge for Notches.

MODULE II MEASUREMENT OF LOSSES IN PIPES **6**

Study on friction losses in pipes - minor losses in pipes.

MODULE III PERFORMANCE CHARACTERISTICS OF PUMPS **15**

Study on performance characteristics of Jet pump, Centrifugal pump, reciprocating pump and submersible pump.

MODULE IV PERFORMANCE CHARACTERISTICS OF TURBINES **9**

Study on performance characteristics of Pelton turbine and Francis turbine.

Total Hours : 45

REFERENCES:

1. Kumar, K.L., "Engineering Fluid Mechanics", 7th Edition, Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Jain, A.K., "Fluid Mechanics (including Hydraulic Machines)", 8th Edition, Khanna Publishers, New Delhi, 1995.
3. Ramamirtham, S., “Fluid Mechanics, Hydraulics and Fluid Machines”, Dhanpat Rai & Sons, New Delhi, 1998.

OUTCOMES:

At the of the course, students will be able to

- measure the fluid flow through tanks, pipes and open channel; and measure losses in pipes.
- to analyze the performance of different types of pumps and turbines.

SEMESTER V

CEB3101	STRUCTURAL ANALYSIS – I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on the various structural systems and general behavior of structures.
- To impart knowledge on analysis of determinate and indeterminate structures to determine structural reactions, member forces, deflections using various methods.
- To expose students to analyze the structure using influence lines.

MODULE I CONCEPTS OF STRUCTURAL ANALYSIS 5

Equations of Equilibrium, Displacements, Compatibility, Boundary Conditions, Principles of Superposition, Degrees of Freedom, Determinate and indeterminate Structures

MODULE II DEFLECTION OF DETERMINATE STRUCTURES 8

Deflections of pin-jointed plane frames and rigid plane frames- Principles of virtual work- Williot diagram - Mohr's correction

MODULE III SLOPE DEFLECTION METHOD 8

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry - Simplification for hinged end - Support displacements.

MODULE IV MOMENT DISTRIBUTION METHOD 8

Stiffness and carry-over factors - Distribution and carryover of moments - Analysis of continuous Beams - Plane rigid frames with and without sway - Naylor's simplification.

MODULE V MOVING LOADS AND INFLUENCE LINES 8

Influence lines for reactions in statically determinate structures – Influence lines for member forces in pin jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads.

MODULE VI INFLUENCE LINES FOR INDETERMINATE STRUCTURES 8

Muller Breslau's principle – Application of Muller Breslau's principle to determinate beams and continuous beams.

Total Hours: 45

TEXT BOOKS:

1. Bhavikatti, S. S., "Structural Analysis", Vol. I & II, Vikas Publishing House Pvt. Ltd., New Delhi, 2003.
2. Arya, A.S. and Jain, O.P., "Theory and Analysis of Structures", NemChand & Bros., Roorke, 1992.
3. Wang, C.K., "Statically Indeterminate Structures", Tata McGraw Hill, New York, 1953.
4. Punmia, B.C., Ashok Kumar Jain & Arun Kumar Jain, "Theory of structures", Laxmi Publications, New Delhi, 1999.

REFERENCES:

1. Ashok K. Jain., "Advanced Structural Analysis", Nem Chand & Sons, Roorkee 1996.
2. Pandit, G.S. and Gupta, S.P., "Structural Analysis – A Matrix Approach", Tata McGraw Hill Publishing Company Ltd., 2006
3. Vaidhiyanathan, R. and Perumal, P., "Structural Analysis - I", Lakshmi Publications, New Delhi, 2004.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Company, New Delhi, 2005.

OUTCOMES:

At the end of the course, student will

- be able to analyse statically determinate beams, trusses and frames by using various methods
- have the ability to analyze statically determinate and indeterminate structures

CEB3102 DESIGN OF STEEL STRUCTURES L T P C

3 1 0 4

OBJECTIVES:

To impart knowledge to students on

- Significance of steel structures, structural steel sections for industry applications and limit state design concept.
- Design of bolted and welded connections.
- Design of compression members, tension members, beams and roof trusses as per IS 800 – 2007 codal provisions.

MODULE I INTRODUCTION TO STEEL STRUCTURES 4

Importance of steel structures - chemical composition and properties - various forms - Indian standard structural steel sections. Review of IS 800 : 2007 : General design requirements - Loads and forces - Limit state design concept - Limit state of strength - Limit state of serviceability.

MODULE II BOLTED AND WELDED CONNECTION 9

Metal joining methods - types of connections. Bolted connection - classification of bolts - advantages and disadvantages - failure modes - IS 800 codal provisions - Shear, bearing and tension capacity of bolts - Design of lap joint, butt joint -types of eccentric connection - Design of bracket connection - bolts subjected to combined shear and tension. Welded connection : Importance - advantages and disadvantages - types of welded joints - IS 800 codal provisions - strength of weld - Design of welded lap joint - bracket connection.

MODULE III DESIGN OF TENSION MEMBERS 9

Types of sections - behaviour of tension members - Design strength due to yielding, rupture of critical section and block shear - IS 800 : 2007 codal provisions for design - importance of lug angle - concept of shear lag - Design tensile strength of plate, angle and roof truss member - Design of tension members - Design of tension splice

MODULE IV DESIGN OF COMPRESSION MEMBERS 8

Types of members and forms - short column, long column and buckling phenomenon - slenderness ratio - effective length - buckling class - IS 800 :

2007 codal provisions for design - Design of simple column - Design of laced and battened columns - Column bases - Design of slab base and gusseted base - connection details.

MODULE V DESIGN OF BEAMS 8

Importance and functions - behaviour of steel beams - IS 800 codal provisions - design of simply supported beams - web crippling and web buckling - design of laterally unsupported beams - built up beams - beams subjected to biaxial bending - Design of plate girder - bolted and welded type - intermediate and bearing stiffeners - web splices sand.

MODULE VI ROOF TRUSSES 7

Types of roof trusses - components - load combinations - IS 875 : 1987 codal provisions - Design wind speed, wind pressure and wind loads - Wind pressure calculation on buildings in hilly terrain - Design of purlin for load combinations - design load on roof truss.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Bhavikatti, S.S., "Design of Steel Structures", I.K. International Publishing House Pvt. Ltd., New Delhi, 2010.
2. Shah, V.L. and Veena Gore, "Limit State Design of Steel Structures", Structures Publications, Pune, 2010.
3. Duggal, S.K., “Design of Steel Structures", Tata McGraw-Hill Publishers, New Delhi, 2009.

REFERENCES:

1. Subramanian, N., "Steel Structures - Design and Practice", Oxford University Press, Chennai, 2011.
2. Haji Sheik Mohammed, M.S., "Lecture Notes on Design of Steel Structures", B.S. Abdur Rahman University, Chennai, 2011.

OUTCOMES:

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

- apply limit state design concept for structural steel sections used for industry applications.
- design bolted and welded connections for the given loading conditions, design compression members, tension members, beams and roof trusses for industry needs as per IS 800 - 2007 codal provisions.

CEB3103 GEOTECHNICAL ENGINEERING I L T P C

3 0 0 3

OBJECTIVES:

- To familiarize students with geotechnical terminology and concepts commonly encountered in engineering practice.
- To expose the students to fundamentals of soil mechanics with emphasis on soil, its origin and behavior under load.

MODULE I INTRODUCTION TO SOIL 7

Nature of Soil - Problems with soil - Phase relation - sieve analysis - sedimentation analysis- Atterberg limits - classification for engineering purposes - BIS Classification System

MODULE II SOIL WATER AND WATER FLOW 7

Soil water - Various forms- Influence of clay minerals - Capillary rise - Suction - Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability - Darcy's Law- Permeability measurement in the laboratory - quick sand condition.

MODULE III STRESS DISTRIBUTION IN SOIL 7

Stress distribution in soil media - Boussinesque formula- stress due to line load, circular and rectangular loaded area - approximate methods - Use of influence charts -Westergaard equation for point load.

MODULE IV COMPACTION AND CONSOLIDATION 8

Soil compaction - factors affecting compaction - field compaction methods and monitoring.Terzaghi's one dimensional consolidation theory- governing differential equation - laboratory consolidation test - Field consolidation curve. Components of settlement - Immediate and consolidation settlement.

MODULE V SHEAR STRENGTH 8

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - Saturated soil and unsaturated soil (basics only)-Strength parameters - Measurement of shear strength, direct shear, triaxial compression, UCC and Vane shear tests-types of shear tests based on drainage and their applicability - Drained and undrained behavior of clay and sand.

MODULE VI SLOPE STABILITY **8**

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

Total Hours: 45

TEXT BOOKS:

1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 1995.
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2000.
3. Venkatramaiah, C., "Geotechnical Engineering", New Age International Publishers, New Delhi, 1995.
4. Khan, I.H., "A text book of Geotechnical Engineering", Prentice Hall of India, New Delhi, 1999.

REFERENCES:

1. Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.
2. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations - Basic Geotechniques", 6th Edition, Prentice-Hall, New Jersey, 2002.
3. Das, B.M., "Principles of Geotechnical Engineering", 5th Edition, Thomas Brooks/ Cole Publishing Company, 2002
4. Muni Budhu., "Soil Mechanics and Foundations", John Willey & Sons, Inc., New York, 2000.

OUTCOMES:

At the end of this course, the student will

- be able to perform classification of soil for engineering purposes and determine engineering properties of soil.
- have the capability to do soil compaction in the field.
- be able to determine settlement and shear strength characteristics of soil and slope stability.

CEB3104 TRANSPORTATION ENGINEERING II

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart basic knowledge on railway engineering, geometric design of railways, railway signals and docks & harbour engineering.
- To provide understanding on urban transportation planning and modern urban transportation.

MODULE I INTRODUCTION TO RAILWAY ENGINEERING 7

Railways: Role of Railway Transportation, Advantages and Disadvantages of Railway Transportation, Elements of permanent track way: Rails, Rail Gauges, Sleepers, Ballast, Rail Joints, Fittings, Principal of Traction: Tractive Effort, Train resistances

MODULE II GEOMETRIC DESIGN OF RAILWAYS 7

Elements of Geometric Design: Gradients and Grade compensation on Curves, Cant, Transition Curve, Vertical curve, Sub grade and Embankments: Cutting, Level, Function, Formation of sub grade, Materials used, Slope and Stability of Embankment, Points and Crossings: Turnouts, Diamond crossings, Crossovers, Stations and Yards

MODULE III RAILWAY SIGNALS & MAINTENANCE 7

Signals: Signaling and interlocking, Necessity, Mechanical Devices, Detectors, Stretcher bar, Point lock, Slotting of signals, Connecting Devices, Temperature compensation, Track Drainage, Safety in Railways, Modernization of Track for High Speeds, Modern Methods for Track Maintenance, Railway Expenses, Rates and Fares.

MODULE IV HARBOUR ENGINEERING 8

Role of water transportation, Basic consideration- Ocean Winds, Waves, Tides, Wharf, Pier, Harbour, Port, Layout of Harbour, Port entrance, Construction and operation of Lock gates, Dock: Wet, dry and floating docks, Break water- different types, dredging.

MODULE V URBAN TRANSPORTATION PLANNING **8**

Urban Transportation Planning Process, Urban Travel and Transportation Systems Characteristics, Function and form of urban structures, services, classification of urban centres, growth patterns, Travel Demands Forecasting-trip generation, trip distribution, modal split and trip assignment, urban transport problems, Transport Behavior of Individuals and Households, Land use/ Transportation systems, land value and congestion, access and business migration

MODULE VI MODERN URBAN TRANSPORTATION **8**

Introduction to Urban Freight Transportation and Urban Mass Transportation Systems. Characteristics of buses, bicycle, para transit, rapid transit, Traffic Restraint Techniques and methods. Classification, mass and rapid transit system, Introduction to Intelligent Transportation System (ITS), Public Transport policy, intermediate. Introduction to BRT, Mono rail, sky bus, metro projects, grade separated interchanges such as flyovers, underpasses, overpasses, concept of Integrated Inter Model transit system

Total Hours: 45

REFERENCES:

1. Vassilios Profillidis, “Railway Management and Engineering”, Ashgate Publishing Ltd., Surrey U.K. & Burlingtion U.S, 2006.
2. Srinivasan, R., "Harbour, Dock and Tunnel Engineering”, Charotar Publishing House Pvt. Limited, Anand, Gujarat, 2009.
3. Sigurd Grava, “Urban Transportation Systems”, McGraw Hill Professional, 2003.
4. Vukan R. Vuchic, “Urban Transit Systems and Technology”, John Wiley & Sons, New Jersey, 2007.
5. Alan Black, “Urban Mass Transportation Planning”, McGraw-Hill, New Delhi, 1995.

OUTCOMES:

At the end of the course, student will

- be able to perform geometric design of railways, railway signals and design of railways and track maintenance.
- be able to design a harbour layout with all facilities.
- be able to perform travel demand forecasting and plan the transportation systems.

GEB3201 ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To explore the salient features and processes that characterise the rocks, soils, water and their interconnectivity with the atmosphere through bio element cycling
- To rationalise the biological environment at the level of cell, the population, the community ,ecosystem and the biome
- To get sensitized with the impacts of human activity on the natural environment and with the methods to conserve it
- To study the impacts of human activity on water and air and to identify the steps to conserve
- To find out an unique solution for the environmental crisis in the developing and developed countries
- To learn about the assessments of the impacts with the help of NGOs and public and to proceed to a sustainable living

MODULE I PHYSICAL ENVIRONMENT **8**

Earth's surface - the Interior of Earth – Plate Tectonics – Composition of the Crust: Rocks – formation and types, Soils – formation and components – soil profile.

Atmosphere – structure and composition – weather and climate – tropospheric airflow

Hydrosphere – water budget – hydrological cycle – Rainwater and precipitation, River Water and solids, Lake Water and stratification, Seawater and solids, soil moisture and groundwater.

Bioelement cycling – The Oxygen cycles – the carbon cycle – the nitrogen cycle – the phosphorous cycle – the sulfur cycle sodium, potassium and magnesium cycles.

MODULE II BIOLOGICAL ENVIRONMENT 7

Cellular basis of life – prokaryotes and eukaryotes – cell respiration – photosynthesis – DNA and RNA – genetically modified life

Population dynamics – population – population growth – survival and growth curves – population regulation – future of human population

Biological communities - Five major interactions: competition, predation, parasitism, mutualism and commensalism – Concepts of habitat and niche – natural selection – species richness and species diversity – ecological succession and climax.

Ecosystem and Biomes – Food Chains and food webs – biomagnifications – ecological pyramids - Trophic levels – Energy flow in ecosystem – ecosystem stability – Terrestrial and aquatic biomes.

MODULE III IMPACTS ON NATURAL RESOURCES AND CONSERVATION 9

Biological resources – nature and importance – direct damage – introduced species – Habitat degradation, loss and fragmentation – Values of biodiversity – hotspots of biodiversity, threats to biodiversity- endangered and endemic species of India- conservation of biodiversity, in-situ and ex-situ conservation

Land Utilization – past patterns of land use – Urban and Industrial development – deforestation, salinisation, soil erosion, and desertification – Modern Agriculture and Impacts

Waste management – types of solid wastes: domestic, municipal, industrial and e-wastes - disposal options – reduce, recovery, reuse – waste minimization, cleaner production technology.

MODULE IV IMPACTS ON WATER AND AIR AND CONSERVATION 8

Water pollution – organic oxygen demanding wastes – anthropogenic phosphate and eutrophication - Ground water contamination – Usage of fertilizer and pesticides– acid rain –acid mine discharges – toxic metals – organochlorines – endocrine disrupting substances- treatment process – Rain water harvesting and watershed management- manmade radionuclide's – thermal pollution

Atmospheric pollution – primary and secondary pollutants – anthropogenic, xenobiotic, synergism, sources and sink, residence time, levels and impacts of major pollutants – processes leading to smog, acid rain, global warming, stratospheric ozone depletion - Noise pollution and abatement.

MODULE V IMPACTS ON ENERGY AND CONSERVATION, ENVIRONMENTAL CRISIS 8

Energy – Renewable and non renewable energy resources – thermal power plants – nuclear fuels, fossil fuels, solar energy, wind energy, wave energy, tidal energy, ocean thermal energy, hydropower, geothermal energy, biomass energy

Environment crisis – state of environment in developed and developing countries- managing environmental challenges for future – disaster management, floods, earthquake, cyclone and landslides.

MODULE VI ENVIRONMENTAL IMPACT ASSESSMENT AND SUSTAINABILITY 5

Environmental Impact Assessment – Impacts: magnitude and significance – steps in EIA – methods – precautionary principle and polluter pays principle – role of NGOs and Public – value education –Environment protection act (air, water, wild life) and forest Conservation act

Concept of Sustainability – Sustainable Development – Gaia Hypothesis - Traditional Knowledge for sustainability.

Total Hours: 45

TEXT BOOKS:

1. Environmental Science (The Natural Environment and Human Impact), Andrew R. W. Jackson and Julie M. Jackson, Pearson Education Limited, Harlow, Essex, England, 2000.
2. Environmental Science (Working with the Earth), G Tyler Miller, Jr., Thomson Brooks/Cole, 2006.

REFERENCES:

1. Physical Geology, Earth Revealed, David McGeary and Charles C Plummer, WCB McGraw Hill, 1998.

2. Sustainability: A Philosophy of Adaptive Ecosystem Management, Bryan G. Norton, 2005.

3. Environmental Impact Assessment, Larry W. Canter, McGraw-Hill, 1996.

4. The Revenge of Gaia: Why the Earth is Fighting Back and How We Can Still Save Humanity, James Lovelock, Penguin UK, 2007.

OUTCOMES:

After the completion of the course the student should be able

- To differentiate the rock and the soil and to recognise the pivotal importance of bio element cycling
- To examine the biological environment both at the microscopic and biome levels
- To analyse the role played by the urban and industrial development that change the pattern of land use
- To judge the level of air and water pollution
- To discriminate renewable energy from non renewable energy and to discuss about the environmental crisis prevailing
- To assess the human impacts on environment and to appreciate the sustainable living

ENB3181 CAREER BUILDING & PEOPLE SKILL

L	T	P	C
0	0	2	1

OBJECTIVES:

- To prepare the students for building their competencies and career building skills.

TOPICS OUTLINE:

This course is practical oriented one and exercises will be given to the students group users /individually depending upon the aspect considered. The following aspect will form the broad outline content of the syllabi. The exercises will be designed by the faculty member and coordinated by the overall course coordinator.

LAB ACTIVITIES:

- Preparation for the placement
  - o Group discussions: Do's and Don'ts – handling of Group discussions – What evaluators look for.
  - o Interview – awareness of facing questions – Do's and Don'ts of personal interview.
  - o Selection of appropriate field vis-à-vis personality / interest.
  - o Preparation of Resume–Objectives, profiles vis-à-vis companies requirement.
  - o Enabling students to prepare for different procedures / levels to enter into any company – books / websites to help for further preparation.
  - o Technical interview – how to prepare and face it.
- Workplace skills
  - o Presentation skills o Oral presentations
  - o Technical presentations o Business presentations o Technical writing
  - o Interpersonal relationships – with colleagues - clients – understanding one's own behavior – perception by others.

ASSESSMENT:

As the course is practical one, it will be assessed using a portfolio based assessment. The students must in consultation with the Faculty member, plan

a portfolio of evidence for the above mentioned activities. The students must develop a résumé or résumés that promote own ability to meet specific job requirements and plan their portfolio in a format appropriate to industry they wish to target. The case studies will contain direct observation of the candidate developing career plans, résumés and skills portfolio, reflect written or oral questioning to assess knowledge and problem-solving activities to assess ability to align career aspirations with realistic career goals. The course coordinator in consultation with the course committee will decide the number of exercises and mark to be awarded for each beside the weightage for the end semester assessment.

OUTCOMES:

The course will help the students to

- develop team work skills
- take part effectively in various selection procedures followed by the recruiters.

CEB3105 CONCRETE AND HIGHWAY LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- To provide sufficient knowledge on concrete mix design, properties of fresh and hardened concrete, testing and quality assurance of materials used for Highway Engineering as per Indian Standards.

MODULE I STANDARDS **6**

Indian Standards for Mix design, fresh and hardened concrete properties. Indian Road Congress guidelines for Highway materials: Material selection - Material testing - Limiting values.

MODULE II CONCRETE MIX DESIGN **6**

Concrete mix design as per Indian Standards for the given parameters - Casting of concrete and strength assessment.

MODULE III FRESH CONCRETE PROPERTIES **9**

Workability of concrete : Slump test, compaction factor test, flow table test and Vee-Bee consistometer test.

MODULE IV HARDENED CONCRETE PROPERTIES **9**

Compressive strength test on cubes and cylinder specimen - flexural strength test on concrete prism - splitting tensile strength test on concrete cylinder.

MODULE V AGGREGATES FOR HIGHWAY APPLICATION **6**

Proportioning of combined aggregates (Sieve analysis) - Impact strength - crushing strength - abrasion resistance - water absorption.

MODULE VI PROPERTIES OF BITUMEN **9**

Grade of Bitumen - Penetration - Softening point - Ductility - Specific gravity. Binder content in bituminous mixture - Marshal stability test.

Total Hours : 45

REFERENCES:

1. Santha Kumar, A.R., “Concrete Technology”, Oxford University Press, Chennai 2007.
2. Shetty, M.S., “Concrete Technology – Theory and Practice”, S. Chand & Company Limited, New Delhi, 2008.
3. IS 516-1968, Methods of Test for Strength of Concrete, Bureau of Indian Standards, New Delhi.
4. IS 1199-1959, Methods of Sampling and Analysis of Concrete, Bureau of Indian Standards, New Delhi.
5. IS 5816-1999, Splitting Tensile Strength of Concrete - Method of Test, Bureau of Indian Standards. New Delhi.
6. IS 10262 - 1982, Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.
7. IS 383-1970, Specification for coarse and fine aggregate from natural sources for concrete, Bureau of Indian Standards, New Delhi.
8. IS 2386 - Part I - 1963, Methods of test for aggregates for concrete - Particle size and shape, Bureau of Indian Standards, New Delhi.
9. IS 1203 - 1978, Determination of penetration of bitumen, Bureau of Indian Standards, New Delhi.
10. IS 1205-1978, Determining softening point of bitumen, Bureau of Indian Standards, New Delhi.
11. IS 1208-1978, Determination of ductility of bitumen, Bureau of Indian Standards, New Delhi.

OUTCOMES:

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

- perform concrete mix design as per Indian standards
- assess the fresh and hardened concrete properties by conducting tests as per Indian standards
- determine the properties of materials used in highway engineering.

CEB3106 GEOTECHNICAL ENGINEERING LABORATORY **L T P C**

0 0 3 1

OBJECTIVE:

- To impart knowledge on soil mechanics concepts through hands on training in fundamental experiments as per Indian standards.

MODULE I TESTS ON PHYSICAL PROPERTIES OF SOILS **9**

Grain size distribution by Sieve analysis and Hydrometer analysis, Specific gravity of soil grains, Relative density of sands and Atterberg limits test.

MODULE II TESTS ON UNIT WEIGHT OF SOIL **9**

Field density test (Core cutter and sand replacement methods)

MODULE III PERMEABILITY TESTS **9**

Permeability determination (constant head and falling head methods)

MODULE IV COMPACTION AND CONSOLIDATION TESTS **9**

Determination of moisture - density relationship using Standard Proctor Compaction test. One dimensional consolidation test (Determination of co-efficient of consolidation only)

MODULE V SHEAR STRENGTH TESTS **9**

Determination of shear strength parameters -Direct shear test on cohesion less soil, Unconfined compression test on cohesive soil, Triaxial compression test.

Total Hours: 45

REFERENCES:

1. I S 2720 (Part I – XIV), “Methods of test for Soils”, Bureau of Indian Standards, New Delhi.
2. Saibaba Reddy, E. and Rama Sastri, K., “Measurement of Engineering Properties of Soils”, New Age International Publishers, New Delhi, 2002.
3. Head, K.H, “Manual of Soil Laboratory Testing, (Vol.1 to 3)”, John Wiley & Sons, Chichester, 1998.

4. Vasanthi, P., “Soil Laboratory Manual”, B.S. Abdur Rahman University, Chennai, 2012.

OUTCOMES:

At the end of the laboratory course, the students will able to

- prepare a soil report for the given site conditions indicating the types of soil and its engineering characteristics.

CEB3107 ENVIRONMENTAL ENGINEERING LABORATORY **L T P C**

0 0 3 1

OBJECTIVES:

- To impart the skill & knowledge to assess the physical, chemical and biological characteristics of water & wastewater.

MODULE I WATER QUALITY STANDARDS & SAMPLING TECHNIQUES 9

General - Drinking water standards - Quality requirement for industrial use - Quality standards for boiler water - Quality standards for cooling water - Quality of water requirement for specific industries - Quality requirement for irrigation water - Quality requirement for bathing waters - Quality requirement for fishery waters - Quality standards for water in concrete usage

MODULE II PHYSICAL ANALYSIS 9

Temperature, Color, Odor, Taste, Turbidity, pH, Conductivity, Total Solids, Total Suspended Solids, Total Dissolved Solids, Total Volatile Solids, Total fixed Solids, Jar Test for Coagulant

MODULE III INORGANIC OR CHEMICAL ANALYSIS 9

Hardness, Calcium, Magnesium, Chloride, Sulphate, Fluoride, Alkalinity, Nitrate,

Phosphate, Residual Chlorine & Available Chlorine

MODULE IV ORGANIC ANALYSIS 9

Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Phenols, Oil & grease, Pesticides, Nitrate

MODULE V TOXIC METALS 6

Copper, Chromium, Cadmium, Zinc, Lead, Mercury, Iron, Manganese (AAS)

MODULE VI BACTERIOLOGICAL ANALYSIS (DEMO) 3

Total Coliform, Feacal Coliform

Total Hours : 45

REFERENCES:

1. APHA., “Standard methods for the examination of Water and Waste Water”, American Public Health Association, United States, 2013.
2. CPCC, “Water and Waste analysis – Manual”, Central Pollution Control Board, New Delhi, 2011.

OUTCOMES:

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

- determine the suitability of water for various purposes
- determine the different characteristics of wastewater

SEMESTER VI

CEB3211	**STRUCTURAL ANALYSIS - II**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVES:

- To enable students to analyze the various types of arches and suspension bridges.
- To provide in-depth knowledge on structural mechanics with emphasis on matrix methods for analysis of beams and framed structures.
- To provide knowledge on the concepts of plastic theory to analyze beams and rigid frames.
- To give exposure to finite element method.

MODULE I FLEXIBLITY MATRIX METHOD **8**

Primary structure - Compatibility conditions - Analysis of indeterminate beams, pin-jointed frames, rigid jointed frames.

MODULE II MATRIX STIFFNESS METHOD **8**

Element and global stiffness matrices– Co-ordinate transformations – Rotation matrix- Compatibility matrix – transformations of stiffness matrices, load vectors and displacement vectors – Analysis of Continuous Beams – Analysis of pin-jointed frames and rigid jointed frames.

MODULE III ARCHES **8**

Arches structural forms – Examples of arch structures – Types of arches – Analysis of three-hinged and two-hinged arches – fixed, parabolic and circular arches – Settlement and temperature effects.

MODULE IV SUSPENSION BRIDGES **8**

Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders

MODULE V PLASTIC ANALYSIS OF STRUCTURES **8**

Introduction to plastic theory – assumptions in plastic analysis - Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Basic theorems – Methods of plastic analysis – Plastic analysis of indeterminate beams and frames.

MODULE VI FINITE ELEMENT METHOD **5**

Introduction - Discretisation of a structure - Displacement functions – Truss element - Beam element - Triangular elements

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Bhavikatti, S. S., “Structural Analysis”, Vol.1 and 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2003.
2. Jain, A.K. and Arya, A.S., “Structural Analysis”, Vol.II, Nemchand Publishers, Roorkee, 1996.
3. Wang, C.K., “Statically Indeterminate Structures”, Tata McGraw Hill, New York, 1953.
4. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, “Theory of structures”, Laxmi Publications, New Delhi, 1999.
5. Thadani, B.N. and Desai, J.P., “Structural Mechanics”, We in all Book Corporation, Bombay, 1998.

REFERENCES:

1. Ashok K. Jain, “Advanced Structural Analysis”, Nem Chand & Sons, New Delhi,1996.
2. Pandit, G.S. and Gupta, S.P., “Structural Analysis – A Matrix Approach”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
3. Vaidhiyanathan, R. and Perumal, P., “Structural Analysis II”, Lakshmi Publications, New Delhi, 2004.
4. Reddy, C.S., “Basic Structural Analysis”, Tata McGraw Hill Publishing Company, New Delhi, 2005.

OUTCOMES:

On successful completion of the course, students will

- have the ability to analyse arches and suspension bridges.
- be able to analyse beams, trusses and frames by using matrix methods.
- be able to perform plastic analysis of structures.
- gain knowledge on finite element method.

CEB3212	DESIGN OF RCC	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the fundamental concepts of reinforced concrete with emphasis on design of rectangular and flanged beams, slabs, columns and footings.
- To impart knowledge to analyze and design reinforced concrete structural members under bending, shear, and/or axial loads as per Indian Standards.
- To give exposure to the design of staircases.

MODULE I DESIGN CONCEPTS **5**

Concept of elastic method, ultimate load method and limit state method – Advantages of Limit State method over other methods – Limit State philosophy as per IS Code recommendations.

MODULE II DESIGN OF BEAMS **8**

Fundamental assumption –Linear elastic analysis of composite sections – Flexural and shear behaviour of reinforced concrete – Analysis and Design of singly and doubly reinforced rectangular and flanged sections – Behaviour and design of torsion – Mechanisms of bond resistance – Flexural bond – Anchorage bond.

MODULE III DESIGN OF SLABS **8**

Behaviour of slabs spanning in one and two directions - Design of one way simply supported and continuous slabs - Design of two-way slabs for various edge conditions.

MODULE IV DESIGN OF COMPRESSION MEMBERS **8**

Classification of columns – Behaviour of RC columns - Design of short columns under axial compression, combined axial compression with uniaxial and biaxial bending.

MODULE V DESIGN OF FOOTINGS **8**

Types of footings – Pressure distribution under footings – Code requirements for design of footings – Design of axially and eccentrically loaded square and rectangular footings – Design of combined rectangular footings.

MODULE VI DESIGN OF STAIRCASES **8**

Dimensioning and Types of staircases – Structural behaviour of staircases – loads on staircases - Design of dog- legged, open newel, circular staircases.

L – 45; T – 15; Total Hours- 60

TEXT BOOKS:

1. Unnikrishna Pillai and Devdas Menon., “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., New Delhi.2003.
2. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, New Delhi, 2004.
3. Punmia, B.C., “Limit State Design of Reinforced Concrete Structures”, Laxmi Publications (P) Limited, New Delhi, 2007.
4. Krishna Raju, N., “Design of RC Structures”, CBS Publishers and Distributors, New Delhi, 2008.
5. Sinha, S.N., “Reinforced Concrete Design”, Tata-McGraw-Hill, New Delhi, 2002.

REFERENCES:

1. Syal, I.C. and Goel, A.K., “Reinforced Concrete Structures”, A.H. Wheelers & Co. Pvt. Ltd., New Delhi, 2008.
2. Purushothaman, P., “Reinforced Concrete Structural Elements – Behavior, Analysis & Design”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1984.
3. Mallick, D.K. and Gupta, A.P., “Reinforced Concrete”, Oxford and IBH Publishing Company, New Delhi, 1987.

OUTCOMES:

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

- analyze the behaviour of reinforced concrete members subjected to flexure, shear and axial loading.
- design reinforced concrete elements such as beams, slabs, columns and staircases in accordance to IS codal provisions.

CEB3213	GEOTECHNICAL ENGINEERING II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on site investigation, design of shallow and deep foundations, retaining walls and slopes.
- To provide knowledge to determine bearing capacity of soil and settlement of foundation under load.

MODULE I SITE INVESTIGATION AND SELECTION OF FOUNDATION 7

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

MODULE II SHALLOW FOUNDATION 7

Introduction-Location and depth of foundation- Codal provisions - bearing capacity of shallow foundation on homogeneous deposits- Terzaghi's formula and BIS formula - factors affecting bearing capacity-problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) - Allowable bearing pressure.

MODULE III FOOTINGS AND RAFTS 7

Types of foundation - Contact pressure distribution below footings & raft - Isolated and combined footings- types- proportioning - mat foundation - types - use - proportioning - floating foundation.

MODULE IV SETTLEMENT OF FOUNDATIONS 8

Settlement - Components of settlement - Determination of settlement of foundations on granular and clay deposits - Allowable settlements - Codal provision - Methods of minimizing settlement, differential settlement.

MODULE V PILES 8

Types of piles and their function - Factors influencing the selection of pile-

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

MODULE VI RETAINING WALLS **8**

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

Total Hours : 45

TEXT BOOKS:

1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 1995.
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2000.
3. Venkatramaiah, C., "Geotechnical Engineering", New Age International Publishers, New Delhi, 1995.
4. Khan, I.H., "A text book of Geotechnical Engineering", Prentice Hall of India, New Delhi, 1999.

REFERENCES:

1. Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.
2. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations - Basic Geotechniques", 6th Edition, Prentice-Hall, New Jersey, 2002.
3. Das, B.M, "Principles of Geotechnical Engineering", 5th Edition, Thomas Brooks/ Cole Publishing House, 2002.
4. Muni Budhu, "Soil Mechanics and Foundations", John Willey & Sons, Inc., New York, 2000.

OUTCOMES:

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

- plan a site investigation programme.
- design shallow and deep foundations, retaining walls and slopes.
- determine bearing capacity of soil and settlement of foundation under load.

MSB3181 MANAGEMENT OF BUSINESS ORGANISATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give an exposure to principles of management and organizational structures.
- To introduce concepts of operation and material management.
- To provide an understanding of management of human resources.
- To impart some basic knowledge on marketing, pricing and selling.
- To give an overview of accounting and management of finance.

MODULE I PRINCIPLES OF MANAGEMENT **7**

Functions of management - Planning - Organizing - Staffing - Direction - Motivation - Communication - Coordination - Control, organizational structures - Line - Line and staff - Matrix type, functional relationships - Span of control, Management by Objectives (MBO) - Forms of Industrial ownership.

MODULE II OPERATIONS MANAGEMENT **8**

Introduction to operations management - Functions of production/operations management - Types of production, Overview of facility location - Lay out planning, introduction to production planning and control, work study, quality assurance, lean manufacturing and six sigma, plant maintenance and management.

MODULE III MATERIALS MANAGEMENT **8**

Materials Planning - Types of inventory, Purchasing function - Source selection - Negotiation - Ordering, Stores management - Functions - Types of stores - Overview of inventory control, Introduction to newer concepts: MRP-I – MRPII - ERP - JIT.

MODULE IV HUMAN RESOURCE MANAGEMENT **7**

Human Resource Management - Objectives - Role of Human Resource Manager -Manpower planning - Selection and placement - Training – Motivation - Performance assessment - Introduction to grievances handling and labour welfare.

MODULE V MARKETING MANAGEMENT 7

Marketing - Concept and definition - Elements of marketing mix - PLC – Steps in new product development - Pricing objectives and methods – Advertising types/media - Steps in personal selling - Sales promotion methods – Distribution channels: functions, types.

MODULE VI FINANCIAL MANAGEMENT 8

Financial management functions - Introduction to financial accounts, financial performance - Profit and loss account statement - Balance sheet, budgetary control - Meaning - Uses - limitations - Types of costs - Basics of depreciation methods -Break-even analysis - Meaning - Assumption - Uses and limitations, working capital - Meaning and relevance - Use of operating ratios.

Total Hours: 45

REFERENCES:

1. Bhushan Y.K., "Fundamentals of Business Organisation and Management", Sultan Chand & Co., 2003.
2. Banga & Sharma "Industrial Engineering & Management", 11th Edition, Khanna Publications, 2007.
3. Khanna, O.P., "Industrial Engineering & Management", Dhanpat Rai Publications, 2004.
4. S.N.Maheswari "Principles of Management Accounting", 16th Edition, S.Chand & Company Ltd, 2007.

OUTCOMES:

After doing the course,

- the students would have gained basic knowledge of the concepts of management and the functions of management.
- the students would have learnt fundamentals of the functional areas of management viz., operations management, materials management, marketing management, human resources management and financial management.

CEB3214 COMPUTER MODELLING AND STRUCTURAL DESIGN LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- The main objective of this practical course is to provide hands on experience in preparation of structural design and drawings for concrete and steel structures using latest software.

MODULE I BEAMS **9**

Analysis and Design of continuous beam subjected to various loading systems.

MODULE II PLANE FRAMES **9**

Analysis and Design of plane frames with two bay five-storey (G+4).

MODULE III SPACE FRAMES **9**

Analysis and Design of space frames with single bay two-storey (G+1).

MODULE IV FOUNDATION AND STAIRCASE **9**

Design of foundation for the space frames with single bay two storeys (G+1). Design of staircase with single bay two-storey (G+1).

MODULE V TRUSSES **9**

Analysis and Design of steel roof truss frame for industrial buildings.

Total Hours: 45

REFERENCES:

1. Krishna Raju, N., “Structural Design & Drawing (Concrete & Steel)”, CBS Publishers, New Delhi, 2005.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, “Design of steel structures”, Lakshmi publications Pvt. Ltd., Chennai, 2008.
3. Krishnamurthy, D., “Structural Design & Drawing – Vol. II”, CBS Publishers & Distributors, New Delhi,1992.
4. Krishnamurthy, D., “Structural Design & Drawing – Vol. III Steel Structures”, CBS Publishers & Distributors, New Delhi, 1992.
5. STADD.Pro, Manual, CAAD Centre, Chennai, 2007.

OUTCOMES:

At the end of the laboratory course, the students will

- be able to analyse and design steel /concrete structural components and prepare relevant structural drawings as per I.S Specifications using latest software.

CEB3215	SEMINAR	L	T	P	C
		0	0	2	1

GENERAL GUIDELINES:

- Seminar is an important component of learning where the student gets acquainted with preparing and presentation of a technical report.
- The students are advised to collect peer reviewed journal papers relevant to their proposed project work and prepare a report in consultation with a faculty having expertise in that field.
- Presentation schedules will be prepared by the course faculty in line with the academic calendar.
- The students shall be required to present a technical report in PPT and submit a relevant report.
- At the end of each presentation, the class students are encouraged to ask questions to clarify their queries and finally the course faculty gives his/her comments to improve the quality in subsequent presentations.
- The marks will be awarded based on technical content, report preparation and presentation skills and in depth knowledge of the student in the subject.
- The marks awarded shall be intimated to the students at the completion of one cycle of presentation by all the students and communicated to the Class Advisor in the specified format.
- Each student shall be given at least two opportunities to exhibit his/her presentation skills.

CEB3216	SURVEY & SOIL INVESTIGATION CAMP	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To impart the skill & knowledge to execute real-time survey and soil investigations.

MODULE I TOPOGRAPHY & CONTOURING **7**

Preparation of Elevation Contour Map & Digital Elevation Model

MODULE II PROFILE LEVELING **7**

Preparation of Longitudinal Profile & Cross-sectional Profiles for a new road alignment and computation of Volume of Cutting and filling required.

MODULE III CARTOGRAPHY **7**

Preparation of Map for a small area & reporting the statistics of the area

MODULE IV TACHOMETRIC TRAVERSING **7**

Determination of shortest distance between two points and its gradient by tachometric traversing

MODULE V SETTING OUT WORKS **7**

i. Setting out of a Curve for a new road or rail alignment

ii. Marking of foundation for a multi-storey building

MODULE VI SOIL INVESTIGATION **10**

Conduction of SPT, Plate Load Test, Preparation of Bore log & Soil Profile

Total Hours: 45

OUTCOME:

- At the end of the course, the student will be able to execute real-time survey works and prepare soil investigation reports for various civil engineering projects.

SEMESTER VII

CEB4101	PRESTRESSED CONCRETE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge on basic concepts of prestressed concrete, analysis of stresses, losses of prestress, transmission of prestress and deflection of prestressed concrete members.
- To impart knowledge to analyze and design prestressed concrete flexural members.
- To give exposure to prestressed concrete in composite construction and special structures.

MODULE I BASIC CONCEPTS & ANALYSIS OF STRESSES 8

Concept of Prestressing – Advantages of prestressed concrete – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept –Stresses in tendons.

MODULE II LOSSES OF PRESTRESS AND DEFLECTION IN MEMBERS 7

Losses of prestress –Deflections of prestressed concrete members - Factors influencing deflections –Effect on tendon profile on deflections - Short term and long term deflections as per codal provisions.

MODULE III DESIGN OF PSC MEMBERS 8

Flexural strength – Strain compatibility method - Simplified procedures as per codes – Shear and Principal Stresses – Ultimate shear resistance of PSC members - Design of shear reinforcement – Design of PSC sections for flexure.

MODULE IV TRANSMISSION OF PRESTRESS 6

Transmission of prestress in pre-tensioned members –bond and transmission length – end zone reinforcement – Anchorage zone stresses - stress distribution - Design of anchorage zone reinforcement.

MODULE V COMPOSITE CONSTRUCTION 8

Analysis for stresses – Differential Shrinkage - Estimation of deflections – Flexural and shear strength of composite members.

MODULE VI PSC SPECIAL STRUCTURES **8**

Concept of circular prestressing – Design of prestressed concrete pipes and cylindrical water tanks - Prestressed concrete poles, piles sleepers, pressure vessels.

Total Hours : 45

TEXT BOOKS:

1. Krishna Raju, N., "Prestressed Concrete", Tata McGraw Hill Company, New Delhi, 1998.
2. Rajagopal, N., "Prestressed Concrete", 2nd Edition, Narosa Publications, New Delhi, 2007.
3. Sinha, N.C. and Roy, S.K., "Fundamentals of Prestressed Concrete", S.Chand & Co., New Delhi, 1985.

REFERENCES:

1. Mallick, S.K. and Gupta, A.P., "Prestressed concrete", Oxford and IBH publishing Co.Pvt. Ltd., New Delhi, 1997.
2. Lin, T.Y., "Design of Prestressed Concrete Structures", Asia Publishing House, Bombay, 1995.
3. Ramaswamy, G.S., "Modern Prestressed Concrete Design", Arnold Heinimen, New Delhi, 1990.

OUTCOMES:

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

- appreciate the basic concepts of prestressed concrete, development of stresses, losses in prestress, transmission of prestress and deflection of prestressed concrete members.
- design prestressed concrete flexural members.
- recognize the significance of prestressed concrete in composite construction and special structures such as pipes, water tanks, sleepers, pressure vessels etc.

CEB4102	ESTIMATION AND COSTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on various methods of estimation of buildings, roads, and irrigation structures
- To introduce the concepts of rate analysis and tendering process.
- To provide understanding on valuation engineering and report preparation.

MODULE I METHODS OF ESTIMATION 7

Types of estimates – Units of measurements – Methods of estimates – Advantages.

MODULE II ESTIMATE OF BUILDINGS 8

Load bearing and framed structures - Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, Various types of arches - Calculation of brick work and RCC works in arches - Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails.

MODULE III ESTIMATE OF WATER SUPPLY AND SANITARY INSTALLATIONS 7

Sanitary and water supply installations- Estimating of septic tank, soak pit - Water supply pipe line - Sewer line - Tube well - Open well

MODULE IV ESTIMATE OF OTHER STRUCTURES 7

Estimate of bituminous and cement concrete roads - Estimate of retaining walls -Culverts

MODULE V RATE ANALYSIS, SPECIFICATION AND TENDERS 8

Data- Schedule of rates- Analysis of rates- Specifications- Sources- Detailed and general specifications- Tenders- Contracts-Types of contracts-Arbitration and legal requirements.

MODULE VI VALUATION & REPORT PREPARATION 8

Necessity - Basics of value engineering - Capitalized value - Depreciation -

Escalation - Value of building - Calculation of Standard rent - Mortgage - Lease - Principles for report preparation -Report preparation for residential buildings.

Total Hours: 45

TEXT BOOK:

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., New Delhi, 2003.

REFERENCE:

1. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & Company Ltd., New Delhi, 2004.

OUTCOMES:

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

- estimate different items of work for buildings, road works, irrigation structures etc.
- practice the concepts, tools and techniques of quantity surveying

CEB4103	CONSTRUCTION MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on planning of construction projects, scheduling of activities using network diagrams, estimating cost of project, controlling the cost of project by creating cash flows and budgeting.
- To give exposure to project information systems.

MODULE I CONSTRUCTION PLANNING 7

Basic concepts in the development of construction plans-Choice of technology and construction method-Defining work tasks - Defining precedence relationships among activities-Estimating activity durations-Estimating resource requirements for work activities-Coding systems. Introduction to software's used in construction management.

MODULE II SCHEDULING PROCEDURES AND TECHNIQUES 8

Introduction - plan development process- scheduling-definition -types of construction schedules-scheduling techniques-CPM - Terms and definitions - Earliest and Latest times - different types of floats - significance- calculation of critical path method-PERT - terms and definitions - network and solving problems using PERT - standard deviation and probability calculation in PERT.

MODULE III RESOURCE PLANNING 8

Materials: Quantity of materials - time of purchase- inventory control - terms and definitions - types of inventory -EOQ -reasons for maintain inventory - different tools for inventory.

Equipment: Classification of major construction equipment- planning and selecting of equipment- task consideration - cost consideration.

Labor : Classes of labor - cost of labor- labor schedule - optimum use of labor Resource oriented scheduling- Crashing and time/cost tradeoff

MODULE IV COST CONTROL MONITORING AND ACCOUNTING 7

Cost – Types of Cost -Cost control problem-Project budget-Forecasting for activity cost control - Financial accounting systems and cost accounts-Control

of project cash flows-Schedule and budget updates-Relating cost and schedule information.

MODULE V QUALITY CONTROL & SAFETY DURING CONSTRUCTION 8

Quality and safety concerns in construction-Organizing for quality and safety-Work and material specifications-Total quality control-Quality control by statistical methods -Statistical quality control with sampling by attributes-Statistical quality control by sampling and variables-Safety.

MODULE VI ORGANIZATION & USE OF PROJECT INFORMATION 7

Project information- Types and use-Organizing information in databases-Centralized database management systems-Databases and application programs-Information transfer and flow.

Total Hours: 45

TEXT BOOKS:

1. Chitkara, K.K., “Construction Project Management, Planning, Scheduling and Control”, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pitsburgh, 2000.
3. Joy, P.K., “Total Project Management - The Indian context”, Macmillan India Ltd., New Delhi, 1992.

REFERENCES:

1. Moder, J., Phillips, C. and Davis, “Project Management with CPM, PERT and Precedence Diagramming”, 3rd Edition, Van Nostrand Reinhold Co., 1983.
2. Willis, E.M., “Scheduling Construction Projects”, John Wiley and Sons, New York, 1986.
3. Halpin, D.W., “Financial and Cost Concepts for Construction Management”, John Wiley and Sons, New York, 1985.

OUTCOMES:

At the end of the course, students will

- be able to apply general principles of management in construction industry.
- gain knowledge on planning and control tools including their applications.

CEB4104	REMOTE SENSING AND GIS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To equip the students with fundamental principles and concepts underlying remote sensing and to make them aware of the technological developments in the geographical database management and its advantages.

MODULE I FUNDAMENTALS OF REMOTE SENSING 7

Remote sensing: definition – components of remote sensing- energy sensor, interacting body – Active and Passive remote sensing – platforms – aerial and space platforms – balloons ,helicopters, aircrafts and satellites – synoptivity and repeativity – electromagnetic radiation (EMR) – EMR spectrum – visible, infrared (IR) near IR, middle IR, thermal IR and microwave – black body radiation – Plancks Law – Stefan –Boltzman law.

MODULE II EMR INTERACTION WITH EARTH SURFACE FEATURES 8

Atmospheric characteristics – scattering of EMR – Rayleigh, Mie, Non-selective and Raman scattering – EMR interaction with water vapour and ozone – atmospheric windows – significance of atmospheric windows – EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface.

MODULE III DIGITAL IMAGE PROCESSING 7

Digital processing of satellite images: Geometric rectification, spatial and radiometric enhancement, edge detection, band ratio, false color composites, Principal component analysis, Spectral domain enhancement, Supervised and unsupervised classification for thematic map generation.

MODULE IV MICROWAVE REMOTE SENSING 8

Microwave Remote Sensing: Basic principles, spatial resolution of SAR system, geometric characteristics, and signature of earth features.

MODULE V MISCELLANEOUS REMOTE SENSING TECHNIQUES 8

Aerial photography, Stereo photo interpretation, Thermal radiation principles and thermal imaging, Radar transmission characteristics / Image interpretation, Passive microwave sensing / LIDAR.

MODULE VI GIS BASICS 7

Geographic Information System: Basic concepts, Hardware - Digitizer, Scanner, Workstations, Printers and Plotters – Data Structures - Raster and Vector, Point, Line, Polygon, Spatial and Non-Spatial – Geo-referencing - Map Projections - Analysis using Raster and Vector data.

Total Hours: 45

TEXT BOOKS:

1. Anji Reddy, “Remote sensing and Geographical Information systems”, BS Publications, 2008.
2. Srinivas, M.G., “Remote sensing applications”, Narosa Publishing House, New Delhi, 2001.
3. Lillesand, T.M. and Kuefer, R.W., “Remote sensing and image interpretation”, John Wiley and sons, 2001.

REFERENCE:

1. De Merse and Michael, N., “Fundamentals of Geographic Information System”, 2nd Edition, John Wiley and sons, New York, 2003.

OUTCOMES:

At the end of the course, the students will

- gain a broad insight about the fundamentals of remote sensing & GIS and EMR interactions.
- be able to interpret and identify the features from spectral and microwave images.

CEB4105 IRRIGATION ENGINEERING L T P C

3 0 0 3

OBJECTIVE:

- To provide the basic knowledge on irrigation, crop water requirements, types of irrigation, irrigation structures and irrigation water management.

MODULE I INTRODUCTION 8

Irrigation – Need and mode of irrigation –Merits and demerits of irrigation – Irrigation schemes- Crop and crop seasons - Irrigation efficiencies – Planning and Development of irrigation projects.

MODULE II WATER REQUIREMENTS OF CROPS 8

Soil-moisture-irrigation relationship – consumptive use of water - Field capacity- Determination of depth and frequency of irrigation- Duty – Factors affecting duty- Duty Delta relationship – Determination of required channel capacity

MODULE III IRRIGATION METHODS 7

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation.

MODULE IV DIVERSION AND IMPOUNDING STRUCTURES 9

Weirs – elementary profile of a weir – weirs on pervious foundations - Factors affecting location and type of dams - Gravity dams –-Earth dams – Arch dams – Forces on gravity dams –stability analysis- Spillways - Hydraulic design aspects.

MODULE V CANAL IRRIGATION 8

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design aspects of cross drainage works – Canal Head works – Canal regulators – River Training works.

MODULE VI IRRIGATION WATER MANAGEMENT 5

Need for optimisation of water use – Minimising irrigation water losses – On farm development works – Check dams- Percolation ponds – Participatory

irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

Total Hours: 45

TEXT BOOKS:

1. Asawa, G.L., “Irrigation Engineering”, John Wiley & Sons, Australia, 1994.
2. Sharma, R.K., and Sharma, T.K., “Irrigation Engineering”, S. Chand and company, New Delhi, 1984.
3. Gupta, B.L, & Amir Gupta, “Irrigation Engineering”, Satya Praheshan, New Delhi.

REFERENCES:

1. Dilip Kumar Majumdar, “Irrigation Water Management (Principles & Practices)”, Prentice Hall of India (P) Ltd., New Delhi.
2. Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 1999.
3. Garg, S.K., “Irrigation Engineering, Khanna Publishers, Delhi, 1978.

OUTCOMES:

At the end of the course the students will

- be able to calculate crop water requirements, frequency of irrigation and design irrigation channels.
- gain knowledge about irrigation project schemes, its component structures and irrigation water management.

CEB4106	DESIGN PROJECT	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To assess the ability pertaining to technical knowledge in a creative way to open ended problems.
- To provide opportunity to involve in analytical and/or design related to Civil Engineering in areas such as Structures, Geotechnical, Environmental, Transportation, Water Resources Engineering etc.

Total Hours: 45

GENERAL GUIDELINES

- The design project aims to provide a platform for students to exhibit their technical skills related to Civil Engineering in areas such as Structures, Geotechnical, Environmental, Transportation, Water Resources Engineering etc.
- The design project allows students to generalize, apply and synthesize the concepts learned over the duration of the course.
- This approach encourages students to work as a team and “learn by doing”, thereby develop the problem-solving skills which is fundamental to industry practice in the field of civil engineering.
- Students, working in groups of four, must identify the design project, narrow down the theme, identify the related activities, minute scheduling of activities with completion time, procurement of materials / equipments / collection of details; and orderly execution to achieve the desired objective.
- The faculty act as facilitator in helping students to acquire the technical knowledge and basic proficiency needed to perform different scheduled activities which comprise the project work.

OUTCOMES:

At the end of project work, students will

- have the ability to apply problem solving skills related to Civil Engineering practice.

- be equipped to solve real-world problems through challenging design projects with confidence
- have the ability to prepare technical reports, drawings and make technical presentations.

CEB4107	IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING	L	T	P	C
		0	0	3	1

OBJECTIVE:

- To impart knowledge regarding design and drawing of different types of irrigation and environmental structures showing plan, elevation and sectional details.

MODULE I TANK IRRIGATION STRUCTURES **9**

Design and Drawing of Tank surplus weirs and Tank sluices

MODULE II CROSS DRAINAGE STRUCTURES **9**

Design and Drawing of Syphon aqueducts, Super passage, Canal regulator

MODULE III CANAL DROPS **9**

Design and Drawing of Canal Drop- Notch type, Syphon Well Drop

MODULE IV SEDIMENTATION TANKS **9**

Design and Drawing of rectangular and circular sedimentation tank, clari flocculator and model making

MODULE V FILTERS **6**

Design and Drawing of Slow and Rapid sand filters and Trickling filters

MODULE VI WASTE WATER TREATMENT SYSTEM **3**

Layout of Waste water Treatment unit - Unit operations and processes-flowchart-Model making

Total Hours: 45

TEXT BOOKS:

1. Satyanarayana Murthy, "Irrigation Design and Drawing", L. Banumathi Publishers, Tuni, East Godavari District, A.P., 1986.
2. CPHEEO, “Manual on Water Supply and Treatment”, Central Public Health and Environmental Engineering Organisation, New Delhi, 1987.

REFERENCES:

1. Sharma, R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 1984.
2. CPHEEO, “Manual on Sewerage and Sewage Treatment” , Central Public Health and Environmental Engineering Organisation, New Delhi, 1987.
3. SP 35, Hand book on Water Supply and Drainage, Bureau of Indian Standards, New Delhi, 1987.
4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., "Environmental Engineering", McGraw-Hill Book Co., New Delhi, 1985.

OUTCOME:

- At the end of the course, the student will be able to design and draw different irrigation and environmental structures.

CEB4108	GEOGRAPHIC INFORMATION SYSTEMS LABORATORY	L T P C 0 0 3 1

OBJECTIVES:

- To familiarize the students about Geo-spatial technology as well as the basic concepts that derives the Geospatial technology.
- To impart hands on practice related to civil engineering using various GIS software's.

MODULE I GEOGRAPHIC COORDINATE SYSTEM **3**

Georeferencing and rectifying maps.

MODULE II DIGITIZATION OF MAP **6**

Creation of GIS Data/Feature based digitization.

MODULE III CONVERSION **6**

Convert data from one format to other format. 1. Raster to Vector and 2. Vector to Raster

MODULE IV DATABASE MANAGEMENT **6**

Adding attributes, using joins and relates - Data Cleanup Tools.

MODULE V SHORTEST PATH ANALYSIS **6**

Road network - Shortest path analysis

MODULE VI CREATING THEMATIC MAPS **6**

Creating thematic maps such as landuse, soil and sewer networks.

MODULE VII SPATIAL ANALYSIS **6**

Overlay and proximity analysis

MODULE VIII GOOGLE EARTH INTEGRATION **6**

Converting data into KML file and overlaying in google Earth

Total Hours: 45

REFERENCE:

1. Chor Pang Lo and Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Pearson Educations Inc., 2009.

OUTCOME:

- At the end of the laboratory course, students will be able to use GIS tools in wide range of civil engineering applications.

SEMESTER VIII

CEB 4211	**PROJECT**	**L**	**T**	**P**	**C**
		0	**0**	**18**	**9**

OBJECTIVE:

- The Project aims to provide opportunity for the students to exhibit their capacity in executing a project work as a team which deals with analysis / design / experimental works related to civil engineering.

GENERAL GUIDELINES:

- The students will be given opportunity to select a project topic of his/her interest and advised to approach the faculty member with expertise in that field to appraise the project and get his/her willingness to guide the project.
- The information related to proposed topic and the faculty member willing to act as guide shall be informed to the course co-ordinator within the stipulated time. The project co-ordinator in consultation with Professor in-charge and Head of the Department shall give initial approval.
- In the project students are expected to identify a suitable topic, draw the need for present study and scope of the investigation, review at least 10 journal papers in the related field, formulate the experimental / analytical methodology and conduct preliminary studies.
- Detailed experimental investigation / in-depth analytical study / fabrication of equipment have to be performed in line with the scope of investigation.
- The students are expected to analyse the obtained results and discuss the same in an elaborate manner by preparing necessary charts / tables / curves to get an inference.
- The important conclusions need to be drawn and scope for further research also to be highlighted.
- The project co-ordinator shall arrange to conduct three reviews to ascertain the progress of the work and award the marks based on the performance.
- At the end, students should submit a report covering the various aspects of Project work. The typical components of the project report are Introduction, Need for present study, Scope of the Investigation, Literature review, Methodology / Experimental investigation / development of software packages,

Results & discussion of experimental and analytical work, Conclusions, References etc.

- The project co-ordinator shall arrange for final viva-voce examination to ascertain the overall performance in Project work.

Total Hours: 90

OUTCOME:

- At the end of the course, the students will be able to apply their knowledge base in civil engineering and utilize the creative ability and inference capability to solve real world problems.

ELECTIVES

GROUP-I

STRUCTURAL ENGINEERING & GEOTECHNICAL ENGINEERING

CEBX01 BRIDGE ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To impart knowledge on different types of bridges and culverts, investigation and planning procedures, design principles of various bridges using IRC Specifications, bearings, substructures and foundations.

MODULE I COMPONENTS, INVESTIGATIONS & SPECIFICATIONS 6

Components of a bridge structure - Inspection and site investigations for a bridge -Determination of linear waterway, design discharge and scour depth - Economical span - Types and choice of bridges - IRC loading for road bridges - General design considerations

MODULE II SLAB BRIDGES & CULVERTS 7

Slab Bridge - Distribution of concentrated loads by IRC - Load distribution by Courbon's Method – Skew slab Bridge, RC box culvert (single vent only)

MODULE III REINFORCED CONCRETE BRIDGES 10

Design of tee beam bridge – design of main girder and cross girders, Single span rigid frame bridge (barrel or slab type only), Continuous girder bridges and Balanced cantilever RC bridges – Design of articulations.

MODULE IV STEEL BRIDGES 7

Design principles of Plate Girder bridges, IRC specifications.

MODULE V PRESTRESSED CONCRETE BRIDGES 7

Types of Prestressed Concrete Bridges - Types of prestressing – Pretensioning and Post-tensioning - Design principles of Post-tensioned concrete bridges.

MODULE VI BEARING, SUBSTRUCTURE & FOUNDATIONS 8

Bearings – types, functions – simple problems – Substructures – Pier and

Abutment – Materials, Design - Stability requirements – Foundations – types, pile foundation, well foundation, Caissons – pneumatic and box types.

Total Hours: 45

TEXT BOOKS:

1. Ponnuswamy, S., “Bridge Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 2001.
2. Jhonson Victor, D., “Bridge Engineering”, Oxford & IBH Publishing Co., New Delhi, 2003.
3. Raina, V.K., “Concrete Bridge Practice - Analysis, Design and Economics", 3rd Edition, Shroff Publishers, New Delhi, 2010.

REFERENCES:

1. Vazirani, V.N., Ratwani, M.M., and Vaswani, “Bridge Engineering”, Khanna Publishers, New Delhi, 2000.
2. Krishnaraju, N., "Design of bridges”, New Age International Publishing Ltd., New Delhi, 2005.
3. Chen, W.F. and Lian Duan, "Bridge Engineering Handbook", CRC Press, 2010.
4. Bindra, S.P., “Principles and Practice of Bridge Engineering”, 9th Edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2012.
5. IRC 22-1986, Standard Specification and Code of Practice for Road Bridges, Section VI, Composite Construction, The Indian Road Congress, New Delhi.
6. IRC 83-1982, Standard Specification and Code of Practice for Road Bridges, Section IX, Bearings, part-I, Metallic Bearings, The Indian Road Congress, New Delhi.
7. IRC 83-1987, Standard Specification and Code of Practice for Road Bridges, Section IX, Bearings, Part-II, Elastomeric Bearings, The Indian Road Congress, New Delhi.
8. IRC 78-1983, Standard Specification and Code of Practice for Road Bridges, Section VII, Foundation and Substructures, The Indian Road Congress, New Delhi.
9. IRC 40-1970, Standard Specification and Code of Practice for Road Bridges,

Section IV, Brick, Stone, Block Masonry, The Indian Road Congress, New Delhi.

10. IRC 18-2000, Design Criteria for Prestressed Concrete Road Bridges (Post-Tensioned Concrete), The Indian Road Congress, New Delhi.
11. IRC 5-1998, Standard Specifications and Code of Practice for Road Bridges, Section I – General Features of Design (Seventh Revision), The Indian Road Congress, New Delhi.
12. IRC 6-2010, Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Stresses (Fifth Revision), The Indian Road Congress, New Delhi.
13. IRC 21-2000, Standard Specifications and Code of Practice for Road Bridges, Section III – Cement Concrete (Plain and Reinforced) (Third Revision), The Indian Road Congress, New Delhi.
14. IRC: 24-2010, Standard Specifications and Code of Practice for Road Bridges, Steel Road Bridges (Limit State Method) Third Revision,The Indian Road Congress, New Delhi.
15. IRC: 22-2008, Standard Specifications and Code of Practice for Road Bridges, Section VI – Composite Construction (Limit States Design) (Second Revision), The Indian Road Congress, New Delhi.

OUTCOMES:

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

- apply design principles of plate girder bridges and prestressed concrete bridges.
- design different bridge components using relevant IRC specifications.

CEBX02	EARTHQUAKE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide basic understanding on the theory of vibrations, earthquake phenomena and its measurements.
- To impart knowledge pertaining to design of structures in seismic areas using IS codal provisions.
- To provide insight knowledge on the seismic retrofitting techniques of structures.

MODULE I THEORY OF VIBRATIONS **9**

Concepts of vibrations – Response of the system – Simple Harmonic Motion – Damped and Undamped -Free and Forced vibration- natural frequencies and modes shapes.

MODULE II ENGINEERING SEISMOLOGY **9**

Earthquake characterizations – causes of Earthquake - types of Earthquake –Seismic waves – Magnitude and Intensity – Measurement of Earthquake – Seismic zones – Architectural Features – Indian Seismic Codes– Liquefaction of soil - Indian and world seismicity.

MODULE III SEISMIC BEHAVIOUR OF RC STRUCTURES **9**

Seismic design philosophy – Earthquake resistant design of RC members – beams – columns – beam column joints – slabs – staircases – shear wall – seismic coefficient – load combinations - response spectrum method.

MODULE IV SEISMIC BEHAVIOUR OF STEEL STRUCTURES **7**

Behaviour of flexural members for earthquake resistance – steel frames – steel panel zones – bracing members–connection design and joint behavior.

MODULE V DUCTILE DETAILING **6**

IS 13920 codal provisions for detailing – beams – columns – beam column joints – footing – staircases – shear wall – special confining reinforcements.

MODULE VI SEISMIC RETROFITTING OF STRUCTURES **5**

Base isolation – Seismic dampers – Retrofitting and strengthening of structural members – Response of Buildings – Case study.

Total Hours: 45

TEXT BOOKS:

1. Duggal, S.K., “Earthquake Resistant Design of Structures”. Oxford University Press, New Delhi, 2007.
2. Paulay,T. and Priestly, M.N.J., “Aseismic Design of Reinforced Concrete and Masonry Building”, John Wiley and Sons, 1991.
3. Arya, A.S., “Earthquake Engineering”, Jai Krishna 60th Birthday Anniversary Commemoration Volume, ISET, Sarita Prakashan, Meerut, 1974.

REFERENCES:

1. Anil K.Chopra, “Dynamics of Structures - Theory and Applications to Earthquake Engineering” Prentice Hall of India (P) Ltd., New Delhi, 1996.
2. Allen, R.T., Edwards, S.C., “Repair of Concrete Structures”, Blackie and Sons, U.K. 1987.
3. BMTC, “Improving Earthquake Resistance of Housing” Building Materials and Technology Promotion Council, New Delhi, 2000.
4. Damodarasamy, S.R. and Kavitha, S., "Basics of Structural Dynamics and Aseismic Design”, PHI learning Pvt. Ltd., New Delhi, 2009.

OUTCOMES:

At the end of this course, students will

- gain knowledge on the basic principles of structural dynamics.
- be able to perform design and detailing of structures for ductility.
- have knowledge on important aspects of seismic damage evaluation and their retrofitting techniques.

CEBX03	SPATIAL STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the fundamental concepts of spatial structures and behaviour of roof structures, folded plates, shell structures and space frames.
- To expose the students to optimization techniques.

MODULE I ASPECTS OF SPACE STRUCTURES **7**

Introduction to space structures - Types - Materials used - Advantages and disadvantages- Some important aspects of space structures - Single and multi layer grids.

MODULE II ROOF STRUCTURES **7**

Cable suspended roof structures – Tensile membrane structures- Characteristics of pneumatic structures.

MODULE III FOLDED PLATES **7**

Folded Plate structures, structural behaviour, types, design principles.

MODULE IV SHELL STRUCTURES **8**

Classification of shells - Structural action - Membrane theory - Shells of revolution and shells of translation - Examples - Limitations of membrane theory.

MODULE V SPACE FRAMES **8**

Space frames - Configuration - Types of nodes - General principles of design Philosophy - Behaviour- Analysis of space frames - Formex Algebra – Detailed design of space frames

MODULE VI OPTIMIZATION TECHNIQUES **8**

Optimization by structural theorems - Maxwell, Mirchell and Heyman's Theorems for trusses and frames - Fully stressed design with deflection constraints - Genetic Algorithm.

Total Hours: 45

TEXT BOOKS:

1. Billington, D.P., “Thin Shell Concrete Structures”, McGraw Hill Book Co., New York, 1982.
2. Subramanian, N., "Principles of Space Structures”, Wheeler Publishing Co., New Delhi, 1999.

REFERENCES:

1. Ramasamy, G.S., “Design and Construction of Concrete Shells Roofs”, CBS Publishers, New Delhi, 1986.
2. Timoshenko, S., “Theory of Plates and Shells”, McGraw Hill Book Co., New Delhi, 1990.
3. Santhakumar, A.R. and Senthil, R., “Proceedings of International Conference on Space Structures”, Anna University, Chennai, 1997.

OUTCOMES:

At the end of the course, the students will

- be able to analyse and apply design principles of roof structures, folded plates, shell structures and space frames including optimization techniques.

CEBX04 INDUSTRIAL STRUCTURES L T P C

3 0 0 3

OBJECTIVES:

- To enable planning and understanding of general requirements of various industrial structures.
- To impart knowledge on design of various special structures in steel and RCC.
- To expose students, the principles involved in the design of prefabricated structures.

MODULE I PLANNING OF INDUSTRIAL STRUCTURES 5

Classification of industries and industrial structures – General requirements of various industries – Planning and layout of buildings and components.

MODULE II FUNCTIONAL REQUIREMENTS 6

Lighting – Ventilation Lighting – Illumination levels – Characteristics of Good lighting – Principles of day lighting design – Artificial lighting – Ventilation – Natural and Mechanical Ventilation – Evaporate cooling design – Measurement – Contaminant control – Installation and Operation - Acoustics – Fire safety – Guidelines from factories act.

MODULE III DESIGN OF STEEL STRUCTURES 10

Analysis and Design of Industrial buildings and bents – Industrial Roofs - Crane girders - Design of bunkers and silos.

MODULE IV POWER TRANSMISSION STRUCTURES 10

Tower configuration and bracings – Loads acting on towers – Analysis and Design of Lattice Towers – Transmission Line Towers – Tower foundations.

MODULE V DESIGN OF R.C. STRUCTURES 9

Analysis and Design of bunkers and silos – Design of Chimneys – Design of Grid floor

MODULE VI PREFABRICATED STRUCTURES 5

Principles of Prefabrication - Prestressed precast roof trusses – Functional requirements of precast concrete units

Total Hours: 45

REFERENCES:

1. Manohar, S.N., “Tall Chimneys; Design and Construction”, Tata McGraw Hill, New Delhi, 1985.
2. SP 32: 1986, Handbook on Functional Requirements of Industrial buildings, Bureau of Indian Standards, New Delhi.
3. Santhakumar, A.R. and Murthy, S.S., “Transmission Line Structures”, McGraw-Hill, New Delhi, 1990.
4. Krishna Raju, N., "Advanced Concrete Structures", McGraw Hill, New Delhi, 2000.
5. Ramchandra, "Design of Steel Structures", Vol . I & II, Standard Book House, New Delhi, 1996.
6. Dayaratnam, P., "Design of Steel Structures", Wheeler and Co., New Delhi, 1999.

OUTCOMES:

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

- plan and design steel and RCC structures widely used in industrial projects.
- design transmission towers and prefabricated structures.

CEBX05 REPAIR AND REHABILITATION OF STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart knowledge on quality assurance in construction, durability of concrete and deteriorating mechanisms and damage assessment of distressed structures.
- To expose students to various materials and techniques for repairing and rehabilitation of distressed structures with real time case studies and engineered demolition techniques.

MODULE I QUALITY ASSURANCE AND DURABILITY 8

Introduction to Repair, Rehabilitation and maintenance. Importance of quality assurance - influencing parameters. Durability of concrete - strength and permeability. Deteriorating mechanisms : Corrosion of steel rebar -effects due to climate, chemical action, wear and erosion

MODULE II DAMAGE ASSESSMENT OF DISTRESSED STRUCTURES 8

Distress in structures, Damage assessment of distressed structures - Importance - Assessment procedure : preliminary inspection, planning, visual inspection, field and laboratory tests, report preparation. Non destructive testing techniques for damage assessment : Rebound hammer, Ultrasonic pulse velocity, half cell potential measurements.

MODULE III MATERIALS FOR DURABILITY AND REPAIR 8

Construction chemicals, Plasticizers, corrosion inhibitors, protective coatings for steel and concrete, rust convertors, fibre reinforced concrete, polymer concrete composites.

MODULE IV REPAIR TECHNIQUES 9

Significance of repair material and repair techniques. Repair techniques : Mortar and dry pack, vacuum concrete, Ferro cement, guniting and shotcrete, epoxy injection, grouting, plate bonding, prestressing, FRP jacketing and laminates.

MODULE V REHABILITATION OF DISTRESSED STRUCTURAL ELEMENTS 9

Procedure for repairing structural and non-structural cracks. Rehabilitation procedure for : leaky sunken slabs, water tank and terrace slab, dampness in buildings. Case study on : Rehabilitation of distressed over head water tank due to corrosion and rehabilitation of fire damaged structure.

MODULE VI BUILDING DEMOLITION TECHNIQUES 3

Engineered demolition techniques - Water jetting, flame cutting, soundless chemical demolition etc

Total Hours: 45

TEXT BOOKS:

1. Santha Kumar, A.R., “Concrete Technology”, Oxford University Press, New Delhi, 2007.
2. Shetty, M.S., “Concrete Technology – Theory and Practice”, S. Chand & Company Limited, New Delhi, 2008.
3 Yoshihiko Ohama, “Hand Book of Polymer – Modified Concrete and Mortars”, Noyes Publications, U.K.,1995.
4 Philip Perkins, H., "Repair, Protection and Waterproofing of Concrete Structures", Elsevier Applied Science Publishers, 1986.
5. Ransom, W.H., "Building Failures - Diagnosis and Avoidnce", E.& F.N. Spon Publishers, 1987.
6 Michael T. Kubal, "Waterproofing the Building Envelope", Mc-Graw Hill Inc., New Delhi, 1993.

OUTCOMES:

At the end of the course the students will

- be able to assess the damage in distressed structures and suggest materials & techniques for repair and rehabilitation.

CEBX06	TALL STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To expose students the problems associated with tall structures with respect to different loads.
- To impart knowledge on the behaviour, analysis, design of various structural systems and stability of tall buildings including dynamic analysis.

MODULE I DESIGN CRITERIA & LOADING **7**

General - Factors affecting growth, height and structural form - Design philosophy - Loading - Gravity loading - Wind loading - Earthquake loading - Combinations of loading - Strength and Stability - Stiffness and Drift limitations - Human comfort criteria- Creep effects - Shrinkage effects - Temperature effects - Fire - Foundation settlement - Soil-structure interaction.

MODULE II STRUCTURAL FORMS **6**

Structural forms – braced frame, rigid frame, in filled frame, shear wall structures, wall- frame structures, framed tube structures, outrigger braced structures, space structures, hybrid structures, R.C.floor systems - One-way slab on beams and girders - Two-way flat slab - Two-way flat plate - Waffle flat slabs - Two-way slab and beam - Steel framing floor systems - One-way beam system - Two-way beam system - Three-way beam system - Composite steel - Concrete floor systems.

MODULE III MODELING FOR ANALYSIS **8**

Modeling for analysis - Assumptions - Modeling for approximate analyses - Modeling for accurate analysis - Reduction techniques.

MODULE IV BEHAVIOUR & ANALYSIS OF STRUCTURAL SYSTEMS **8**

Types, Behaviour and analysis methods of braced frames - Behaviour and analysis of Rigid frame structures - Behaviour, analysis & design of In filled frame structures - Behaviour and analysis of Shear wall, Coupled shear wall and Wall-frame structures - Behaviour of Tubular structures, Core structures and Outrigger-braced structures.

MODULE V STABILITY OF TALL BUILDINGS **8**

Overall buckling analysis of frames (approximate methods) - Overall buckling analysis of wall frames - Second order effects of gravity loading - Translational - Torsional instability - Out-of-plumb effects - Effects of foundation rotation - Creep and Shrinkage effects - Temperature effects.

MODULE VI DYNAMIC ANALYSIS **8**

Response to wind loading - Along-wind response - Across-wind response - Estimation of natural frequencies & damping - Types of excitation - Design to minimise dynamic response - Response to earthquake motions - Response to ground accelerations - Response spectrum analysis - Estimation of natural frequencies and damping - Human response to building motions.

Total Hours: 45

TEXT BOOKS:

1. Bryan Stafford Smith and Alex Coull, " Tall building Structures Analysis Design", John Wiley and Sons, Inc., New York, 1991.
2. Taranath, B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill Book Co., New York, 1988.

REFERENCES:

1. Lin, Y. and Burry, D., Stotes, "Structural Concepts and Systems for Architects and Engineers", John Wiley, New York, 1994.
2. Lynn S. Beedle., “Advances in Tall Buildings”, CBS Publishers and Distributors, New Delhi, 1996.
3. Angus J. MacDonald., “Wind Loading on Buildings”, Wiley, New York, 1975.
4. Lawson, T. V., “Wind Effects on Buildings”, Applied Science Publishers, London, 1980.
5. Alan Garnett Davenport., “Wind Loads on Structures”, National Research Council Canada, 1960.

OUTCOMES:

At the end of the course, the students will

- be able to apply the principles and procedures to design tall structures.
- gain knowledge on the stability of tall structures and their response to wind and earthquake motions.

CEBX07	ADVANCED CONCRETE DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquaint with the limit state of serviceability and design of various types of retaining walls.
- To enable students to design water tanks and flat slabs.
- To give an exposure on analysis of multistory frames and yield line theory.

MODULE I SERVICEABILITY LIMIT STATES : DEFLECTION AND CRACKING **8**

Limit state of Deflection - factors affecting deflection - Short and long term deflections- control of deflection - computation of deflection as per IS code – Limit state of Cracking – reasons and effects of cracking - limiting criteria on cracking -Estimation of crack width.

MODULE II RETAINING WALLS **8**

Types of Retaining walls - Design of cantilever and counterfort retaining walls

MODULE III WATER TANKS **8**

Underground rectangular tanks - Overhead circular and rectangular tanks – Domes for water tanks - Design of staging and foundations.

MODULE IV BUILDING FRAMES **7**

Analysis of multistory frames-method of substitute frames –Analysis for vertical loads- Analysis of frames subjected to horizontal forces-portal method & cantilever method.

MODULE V FLAT SLABS **7**

Types of flat slabs – Direct design method - Equivalent frame method – Shear in flat slab – Design of flat slab.

MODULE VI YIELD LINE THEORY **7**

Introduction to yield line theory – Yield line patterns – Characteristic features

of yield lines – Load on slabs – Yield line analysis by virtual work method to square, rectangular, circular and triangular slabs.

Total Hours: 45

TEXT BOOKS:

1. Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, New Delhi, 2008.
2. Unikrishnana Pillai, S. and Devdas menon, “Reinforced Concrete Design” Tata McGraw-Hill Book Company, New Delhi, 2003.
3. Varghese, P.C., “Advanced Reinforced Concrete Design”, PHI Learning Ltd., New Delhi, 2005.
4. Krishna Raju, N., “Advanced Reinforced Concrete Design”, CBS Publishers and Distributors, New Delhi, 2008.

REFERENCES:

1. Dunham, C.W., “Advanced Reinforced Concrete Design”, McGraw-Hill Book Company, New Delhi, 1964.
2. Punmia, B.C., “Limit State Design of Reinforced Concrete Structures”, Laxmi Publications (P) Limited, New Delhi, 2007.
3. Ram Chandra, "Limit State Design of Concrete Structure", Standard Book House, New Delhi, 2007.

OUTCOMES:

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

- analyze and design retaining walls, water tanks and flat slabs.
- apply the design principles, procedures and current codal provisions for analysis and design of reinforced concrete structures.

CEBX08 OFFSHORE STRUCTURES L T P C

3 0 0 3

OBJECTIVES:

- To impart knowledge about the different types of offshore structures and their significance, wave theories, forces on offshore structures and design concepts.

MODULE I BASICS OF OFFSHORE STRUCTURES 8

Offshore Structures – Definition, Significance, Functions, Configurations, Types – Fixed Structures, Floating Structures, Compliant Structures.

MODULE II OCEAN ENVIRONMENT 7

Ocean water properties, Wave theories – Linear Wave Theory, Non-Linear Wave Theory (Stream Function Theory), 2nd and 5th order Stokes Wave Theories, Breaking Waves, Internal Waves and Sea Spectrum Model.

MODULE III LOADS ON OFFSHORE STRUCTURES 8

Static Loads – Gravity Loads, Hydrostatic Loads, Resistance Loads and Current Loads - Dynamic Loads – Wind Loads and Wave Loads (Morison Equation, Forces on Oscillating Structures, Wave Plus Current Loads, Froude-Krylov Force, Wave Diffraction Force) - Steady Wave Drift Force - Viscous Drift Force - Varying Wind Load - Impulse Loads.

MODULE IV RESPONSE OF OFFSHORE STRUCTURES 7

Structure Motion in one degree – Transient Response of Structure – Forced Linearly Damped System - Non-linearly Damped Structure – Motions of Floating Structures – Interaction of two Floating Structures – Slowly-Varying Response – Simplified Computation of Slow-Drift Oscillation – High-Frequency Response – Hydrodynamic Damping for Floating Systems.

MODULE V STATISTICS & DESIGN APPROACHES 8

Wave Statistics – The Gaussian Distribution and The Rayleigh Distribution - Response Statistics – Design Approaches – Design Wave, Short-term Design and Long-term Design – Combination of Multiple Stochastic Load effects.

MODULE VI PROBABILISTIC DESIGN & UNCERTAINTY 7

Probabilistic Design – Limit States and Failure Criteria, Uncertainty – Measures, Representation, Probabilistic Description of Response in Complex Structures.

Total Hours: 45

TEXT BOOKS:

1. James F. Wilson, “Dynamics of Offshore Structures”, John Wiley & Sons, New York, 2003.
2. Chakrabarti, S.K., “Handbook of Offshore Engineering”, Elsevier, London, 2005.
3. API RP2A-WSD, “Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms”, 20th Supplement, API Publishing Services, N.W., Washington D.C., 2007.

REFERENCES:

1. Mather, A., “Offshore Engineering: An Introduction", 2nd Edition, Witherby, Livingston, U.K, 2000.
2. Sadehi, K., “Coasts, Ports and Offshore Structures Engineering : Power and Water”, University of Technology, Tehran, Iran, 2001
3. Gou, B., Song, S., Chacko, J. and Ghalambor, A., “Offshore Pipelines”, GPP Publishers, U.K, 2006.
4. Mohamed A. El-Reedy, “Offshore Structures: Design, Construction and Maintenance”, Gulf Professional Publishing, U.S.A., 2012.

OUTCOMES:

At the end of the course, students will

- be able to predict the environmental forces and resulting motions of typical offshore structures.

CEBX09 GROUND IMPROVEMENT TECHNIQUES L T P C

3 0 0 3

OBJECTIVES:

- To impart knowledge about selection, design, and construction aspects of ground improvement techniques in problematic soils and rock subsurface strata.

MODULE I INTRODUCTION 7

Role of ground improvement in foundation engineering - methods of ground improvement - Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

MODULE II DRAINAGE AND DEWATERING 8

Drainage techniques - Well points - Vaccum and electro osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

MODULE III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 7

Insitu densification of cohesion less and consolidation of cohesive soils - Dynamic compaction and consolidation - Vibrofloatation - Sand pile compaction - Preloading with sand drains and fabric drains- Stone columns - Lime piles - Installation techniques only - relative merits of various methods and their limitations.

MODULE IV EARTH REINFORCEMENT 8

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - use of Geotextiles for filtration, drainage and separation in road and other works.

MODULE V GROUTING TECHNIQUES 8

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring.

MODULE VI STABILISATION METHODS **7**

Stabilization with cement, lime and chemicals - Stabilization of expansive soils

Total Hours: 45

TEXT BOOKS:

1. Koerner, R.M., “Construction and Geotechnical Methods in Foundation Engineering”, McGraw-Hill, New York, 1994.
2. Purushothama Raj, P., “Ground Improvement Techniques”, Tata McGraw-Hill Publishing Company, New Delhi, 1995.

REFERENCES:

1. Moseley, M.P., "Ground Improvement", Blackie Academic and Professional, Chapman and Hall, Glassgow, USA and Canada, 1993.
2. Koerner, R.M., “Design with Geosynthetics”, 3rd Edition, Prentice Hall, New Jersey, 2002.
3. Jewell, R.A., “Soil Reinforcement with Geotextiles”, CIRIA Special Publication, London, 1996.
4. Das, B.M., “Principles of Foundation Engineering”, Thomson Brooks / Cole, USA, 2003.
5. Jones, E.P., "Earth Reinforcement and Soil Structure", Butterworth's, London, 1995.

OUTCOMES:

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

- identify basic deficiencies of various soil deposits.
- decide upon the various ways and means of improving the soil.

CEBX10 DESIGN OF MACHINE FOUNDATION L T P C

3 0 0 3

OBJECTIVES:

- To provide sound understanding of the concepts, principles, and techniques of designing foundations for different types of machines.

MODULE I INTRODUCTION TO VIBRATION OF SYSTEMS 7

Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping.

MODULE II WAVES AND WAVE PROPAGATION 8

Wave propagation in an elastic homogeneous isotropic medium- Raleigh, shear and compression waves-waves in elastic half space.

MODULE III DYNAMIC PROPERTIES OF SOILS 7

Elastic properties of soils-coefficient of elastic, uniform and non-uniform compression - shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil- codal provisions.

MODULE IV DESIGN OF RECIPROCATING MACHINES 8

Dynamic loads - simple design procedures for foundations under reciprocating machines.

MODULE V DESIGN OF IMPACT AND ROTARY MACHINES 8

Design procedures for machines producing impact loads - rotary type machines.

MODULE VI VIBRATION ISOLATION 7

Vibration isolation techniques-mechanical isolation- foundation isolation-isolation by location-isolation by barriers- active and passive isolation tests.

Total Hours: 45

TEXT BOOKS:

1. Swamisaran, “Soil Dynamics and Machine Foundations”, Galgotia Publications Pvt. Ltd., New Delhi, 1999.

2. Prakesh, S. and Puri, V.K., “Foundation for Machines”, McGraw-Hill, New York, 1993.

3. Srinivasulu, P. and Vaidyanathan, “Hand book of Machine Foundations”, McGraw-Hill, New York, 1996.

4. Kramar, S.L., “Geotechnical Earthquake Engineering”, Prentice Hall International Series, Pearson Education (Singapore) Pvt. Ltd., U.S.A., 1986.

5. Kameswara Rao, “Dynamics Soil Tests and Applications”, Wheeler Publishing, New Delhi, 2003.

REFERENCES:

1. Kameswara Rao, “Vibration Analysis and Foundation Dynamics”, Wheeler Publishing, New Delhi, 1998.

2. IS 2974 (Part V) - 1987, Code of Practice for Design and Construction of Machine Foundations, Bureau of Indian Standards, New Delhi.

3. Moore, P.J., “Analysis and Design of Foundation for Vibration”, Oxford and IBH, New Delhi, 1995.

OUTCOMES:

- At the end of the course, the students will be able to design different types of machine foundations subjected to dynamic loads.

ELECTIVES
GROUP II

WATER RESOURCES & ENVIRONMENTAL ENGINEERING

CEBX11	**HYDROLOGY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To impart a good understanding of all the components of the hydrological cycle, the mechanics of rainfall, its spatial and temporal measurement including their applications.
- To offer exposure to simple statistical analysis, application of probability distribution of rainfall and run off process.

MODULE I PRECIPITATION **8**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

MODULE II ABSTRACTION FROM PRECIPITATION **8**

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

MODULE III HYDROGRAPHS **7**

Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph.

MODULE IV RUNOFF ESTIMATION **9**

Runoff calculation using empirical formulae- SCS curve number method- Rational formulae – Hydrograph methods – Introduction to rainfall runoff modelling- Application of GIS in rainfall runoff analysis- case studies.

MODULE V FLOODS AND FLOOD ROUTING **8**

Flood frequency studies – Recurrence interval – Gumbel's method – Flood

routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control.

MODULE VI GROUND WATER HYDROLOGY **5**

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – aquifer yield- Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

Total Hours: 45

TEXT BOOKS:

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2000.
2. Raghunath, H.M., "Hydrology – Principles, Analysis and Design", New Age International (P) Ltd., New Delhi, 2006.
3. Jayarami Reddy, P., "Hydrology", Laxmi Publications (P) Ltd., New Delhi, 2005.

REFERENCES:

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc. Ltd., New York, 2000.
2. Singh, V.P., "Hydrology", McGraw-Hill Inc. Ltd., New York, 2000.

OUTCOMES:

- At the end of the course, students will be able to perform rainfall runoff analysis, flood analysis, prediction and assessment of ground water potential.

CEBX12	HYDRAULIC STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide appropriate knowledge for the planning and designing of various components of an irrigation project scheme.

MODULE I TANK IRRIGATION STRUCTURES 8

Detailed design of Tank bunds – Tank surplus weirs – Tank sluices weirs on pervious foundations - Percolation ponds.

MODULE II IMPOUNDING STRUCTURES 8

Design of Gravity Dams – Design concepts of Earth dams – Arch dams – Spill ways – Energy dissipation devices.

MODULE III CROSS DRAINAGE WORKS 8

Design of Aqueducts – Syphon aqueducts – Super passage – Canal syphon

MODULE IV CANAL TRANSMISSION STRUCTURES 7

Design of Canal drops – Notch type – Rapid type fall – Syphon well drops

MODULE V CANAL REGULATION STRUCTURES 7

Design aspects of Canal head works – Canal regulator – Canal escape – Silt exclusion structures.

MODULE VI IRRIGATION WATER MANAGEMENT STRUCTURES 7

On farm development works – Structures for proportional field distribution – Duck bill weirs.Rain water harvesting structures – Design aspects.

Total Hours: 45

TEXT BOOKS:

1. Garg, S.K., “Irrigation Engineering and Design of Structures”, Khanna Publishers, New Delhi, 2009.
2. Satyanarayana Murthy, “Irrigation Design and Drawing”, L. Banumathi Publishers, Tuni, East Godavari District, A.P., 1998.

REFERENCE:

1. Sharma, R.K., “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., New Delhi, 2002

OUTCOME:

- At the end of the course, the student will be able to conceive and plan an irrigation project scheme and design its components.

CEBX13	COASTAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart sufficient knowledge on the coastal processes, coastal dynamics and management perspectives.

MODULE I COASTAL ZONE **7**

Introduction to basic concepts -Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources and their conservation – Non living resources and their exploration and exploitation.

MODULE II WAVE DYNAMICS **7**

Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.

MODULE III WAVE FORECASTING AND TIDES **8**

Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides –Renewable tidal energy- Effects on structures – seiches, Surges and Tsunamis.

MODULE IV COASTAL PROCESSES **8**

Erosion and depositional shore features – Change levels of shoreline-sediment movement -Methods of protection – Littoral currents – Shifting river mouths and delta formation - Coastal aquifers – Sea water intrusion –Desalination - Impact of sewage disposal in seas

MODULE V COASTAL STRUCTURES **8**

Types and selection of break waters – Design and Application of break water- Need and mode of dredging – Selection of dredgers- Types and design of Coastal Protection Works- Design of shore defense structures- Wave-tidal engineering structures and other infrastructure in coastal zone – Dykes and Levees

MODULE VI COASTAL MANAGEMENTS **7**

Land use in coastal zone – Coastal zone management – Concepts and development – Data base for coastal zone management – Design and operation of closure works – Sand closure --Generation, propagation and effect of tsunami –Environment impact of ports-Introduction and basic concepts of GIS – Aquaculture remote sensing – Basic concepts – Application of remote sensing in coastal zone management.

Total Hours: 45

TEXT BOOKS:

1. Richard Sylvester, “Coastal Engineering, Vol. I and II”, Elsevier Scientific Publishing Co., New York, 1999.
2. Quinn, A.D., “Design & Construction of Ports and Marine Structures”, McGraw-Hill Book Co., 1999.

REFERENCES:

1. Ed. A.T. Ippen, “Coastline Hydrodynamics”, McGraw-Hill Inc., New York, 1993.
2. Dwivedi, S.N., Natarajan, R. and Ramachandran, S., “Coastal Zone Management in Tamilnadu State, India", Ocean Data Centre, 1991.
3. ACER, "Coastal Engineering Manual, Vol. I-VI", U.S. Army Coastal Engineering Research, USA.

OUTCOMES:

- At the end of the course, students will gain knowledge on different types of coastal structures, coastal management and coastal protection works.

CEBX14	DAM ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge on various types of dams and their design & construction.
- To provide insight into to the causes of failures of embankments, methods of analysis and remedial techniques.

MODULE I INTRODUCTION **7**

Classification of Dams- Factors governing the selection of type of Dam- materials available for embankment construction - character of foundation - climate - shape and size of valley - river diversion - probable wave action-time available for construction - function of reservoir -earthquake activity.

MODULE II GRAVITY DAM DESIGN AND CONSTRUCTION **7**

Forces acting on gravity dam – Methods of design of gravity dam – high & low dams - Joints, keys and openings in Dams – Galleries – Temperature control in gravity dam.

MODULE III EARTH DAM DESIGN AND CONSTRUCTION **8**

Design of foundation - embankment design - design of provisions to control pore pressure - methods of foundation treatment - prevention of under seepage - special design problems - design considerations on earthquake regions - upstream slope wave protection - downstream slope protection- Phases of construction - site preparation -foundation preparation - borrow pit excavation - soil compaction - construction control - slope treatment and riprap - post construction embankment movement - pore water pressures during construction.

MODULE IV BUTTRESS DAM AND ARCH DAM **7**

Introduction to Buttress Dams – Types and Forces on Buttress Dams –Design of Flat slab type Buttress dam – Advantages and disadvantages –Types of Arch Dams – Forces acting on Arch dams – Design principle of Arch Dams

MODULE V ADVANCED THEORY OF SEEPAGE & SHEAR STRENGTH OF EARTHEN DAM **8**

Seepage pressure - quick conditions -Laplace equation - flow net phreatic

line on earth dam - a Casagrande's solution – Shaffernak and Van Iterson solution - Leo Casagrande solution - piping and exit gradient - Khosla's theory -composite profile - Schwarz Christoffel transformation-determination of permeability in soil-rock - longitudinal test - radial test - shear tests on rock - single jack test - direct shear test on rock cubes -punch shear test - shear box tests - tensile strength tests on rock - brazilian test - flexural strength for bending test - young's modulus by bending test and brazilian tests

MODULE VI STABILITY ANALYSIS OF EARTHEN DAM 8

Standard methods of analysis - Taylor's modified swedish method including side forces between slices - wedge method (sliding block) - stability conditions during construction - full reservoir and draw down conditions - pore pressure due to gravity seepage after instantaneous draw downs.

Total Hours: 45

TEXT BOOKS:

1. Sowers, G.F., "Earth and Rockfill Dam Engineering", Asia Publishing House, 1962.
2. Sherard, J.L., "Earth & Earth Rock Dams - Engineering Problems of Design & Construction", John Wiley & Sons Inc, 1963.
3. Modi, P.N., "Irrigation Water Resources & Water Power Engineering", Standard Book House, New Delhi, 2008.

REFERENCES:

1. Thomas, H.H., "Engineering of Large Dams - Part -1", Wiley Publishers, University of Michigan, 1976.
2. Verma, B.P., "Rock Mechanics for Engineers", Khanna Publishers, New Delhi, 2013.
3. Varsheny, R.S., "Concrete Dams", Oxford & IBH Publishing Company, New Delhi, 1982.
4. Sherard, J.L., "Earth & Earth Rock Dams", John Wiley & Sons Inc., 1963.

OUTCOMES:

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

- plan & design various types of dams.
- suggest proper remedial techniques for distressed dams.

CEBX15 AIR POLLUTION AND CONTROL L T P C

3 0 0 3

OBJECTIVES:

- To impart knowledge on the sources, characteristics, effects and control of air pollution and noise pollution.

MODULE I SOURCES AND EFFECTS OF AIR POLLUTANTS 8

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion.

MODULE II SAMPLING & ANALYSIS 7

Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

MODULE III DISPERSION OF POLLUTANTS 8

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

MODULE IV AIR POLLUTION CONTROL 8

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

MODULE V AIR QUALITY MANAGEMENT 7

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality.

MODULE VI NOISE POLLUTION **7**

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention.

Total Hours: 45

TEXT BOOKS:

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.
2. Rao, C.S., “Environmental Pollution Control Engineering”, Wiley Eastern Ltd., New Delhi, 2003.
3. Rao, M.N., and Rao, H.V.N., “Air Pollution Control”, Tata-McGraw-Hill, New Delhi, 1996.

REFERENCES:

1. Mahajan, S.P., “Pollution Control in Process Industries”, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
2. Peavy, S.W., Rowe, D.R. and Tchobanoglous, G., “Environmental Engineering”, McGraw Hill, New Delhi, 1985.

OUTCOME:

- At the end of the course, the students will be able to assess the level of air & noise pollution and plan appropriate controlling measures.

CEBX16	SOLID WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on the sources, characterization, processing and disposal of municipal solid waste.

MODULE I SOURCES AND TYPES OF MUNICIPAL SOLID WASTES 7

Sources and types of solid wastes – Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization;

MODULE II EFFECTS OF SOLID WASTE DISPOSAL 7

Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

MODULE III ON-SITE STORAGE & HANDLING 7

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

MODULE IV COLLECTION AND TRANSFER 8

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

MODULE V OFF-SITE PROCESSING 8

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

MODULE VI LANDFILLS 8

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment.

Total Hours: 45

TEXT BOOKS:

1. George Tchobanoglous, “Integrated Solid Waste Management”, McGraw-Hill Publishers, New Delhi, 1993.
2. Bilitewski, B., HardHe, G., Marek, K., Weissbach, A., and Boeddicker, H., “Waste Management”, Springer, 1994.

REFERENCES:

1. CPHEED, "Manual on Municipal Solid Waste Management", Central Public Health and Environmental Engineering Organisation, New Delhi, 2000.
2. Landreth, R.E. and Rebers, P.A., “Municipal Solid Wastes – Problems and Solutions”, Lewis Publishers, New York, 1997.

OUTCOMES:

- At the end of the course, the students will be able to formulate a municipal solid waste management scheme.

CEBX17 INDUSTRIAL WASTE TREATMENT L T P C

3 0 0 3

OBJECTIVE:

- To impart appropriate knowledge on waste audit, waste water treatment techniques, waste water reuse and methods of industrial waste water treatment.

MODULE I INTRODUCTION 7

Sources and types of industrial wastewater - Environmental impacts - Regulatory requirements - generation rates - characterization - Toxicity and Bioassay tests.

MODULE II WASTE AUDIT 8

Prevention Vs Control of Industrial Pollution- Source reduction techniques - Waste Audit- Evaluation of pollution prevention options.

MODULE III WASTEWATER TREATMENT TECHNIQUES 7

Waste minimization - Equalization - Neutralization - Oil separation – Flotation - Precipitation - Heavy metal Removal - adsorption - Aerobic and anaerobic biological treatment - Sequencing batch reactors - High Rate reactors - Chemical oxidation - Ozonation - Photo catalysis - Wet Air Oxidation - Evaporation - Ion Exchange - Membrane Technologies - Nutrient removal.

MODULE IV WASTEWATER REUSE 8

Individual and Common Effluent Treatment Plants - Zero effluent discharge systems - Wastewater reuse.

MODULE V SLUDGE DISPOSAL 7

Disposal of effluent on land - Quantification, characteristics and disposal of Sludge, Sludge digestion, drying beds, Conditioning and Dewatering.

MODULE VI TREATMENT FOR WASTEWATER FOR SPECIFIC INDUSTRIES 8

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for textiles - Tanneries - Pulp and paper - metal finishing - Petroleum Refining - Pharmaceuticals -

Sugar and Distilleries - Food Processing - fertilizers - Thermal Power Plants and Industrial Estates.

Total Hours: 45

TEXT BOOKS:

1. Eckenfelder, W.W., “Industrial Water Pollution Control”, McGraw-Hill, New Delhi, 1999.
2. Arceivala, S.J., “Wastewater Treatment for Pollution Control”, McGraw-Hill, New Delhi, 1998.

REFERENCE:

1. Frank Woodard, "Industrial Waste Treatment Handbook", Butterworth Heinemann, New Delhi, 2001.

OUTCOMES:

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

- perform waste audit, use waste water treatment techniques and reuse waste water.
- suggest methods for industrial waste water treatment.

CEBX18 HAZARDOUS WASTE MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To offer sufficient knowledge on various sources and characterization of municipal solid wastes.
- To give an exposure to the on-site and off-site processing of municipal solid waste including disposal methods.

MODULE I INTRODUCTION 7

Hazardous substances and Hazardous wastes, sources of generation, Composition, physical form; quantity and quality of hazardous wastes – Legal and Administrative requirements and aspects for management, regulations for pollution control administrative liability.

MODULE II WASTE COLLECTION 8

Waste Collection, segregation at source, on and off site collection, pre transport Requirements, safety in handling, transportation, storage, treatment, disposal technologies - Waste minimization physical and chemical and biological disposal treatment technologies.

MODULE III LAND DISPOSAL OF WASTE 7

Creation of treatment, storage and disposal facilities (TSDF) - Site selection for creating TSDF landfill, standards and guidelines for accepting a waste for land disposal, leachate management, monitoring and inspection, closure requirements and post - closure monitoring.

MODULE IV THERMAL TREATMENT OF WASTE 8

Thermal treatment incinerability tests, different types of incinerators and their applicability for hazardous waste management - Biological treatment of facilities.

MODULE V RECLAMATION 8

Reclamation of hazardous wastes - Management of gaseous emissions/air pollutants generated during treatment and disposal operations of hazardous wastes.

MODULE VI REMEDIATION **7**

Remediation of hazardous wastes – Types – Stabilisation, Solidification, Myco remediation- Case studies

Total Hours: 45

TEXT BOOK:

1. Charles Wentz, A., “Hazardous Waste Management", 2nd Edition, McGraw Hill International, London, 1995.

REFERENCE:

1. Stanley E. Manahan, “Hazardous Waste Chemistry, Toxicology and Treatment”, Lewis Publishers, Chelsea, 1990.

OUTCOMES:

At the end of the course, the students will

- Differentiate various sources and characterization of municipal solid wastes, on-site and off-site processing of municipal solid waste including disposal methods.
- be able to suggest remedial measures for hazardous waste.

CEBX19 ENVIRONMENTAL IMPACT ASSESSMENT L T P C

3 0 0 3

OBJECTIVES:

- To familiarize the students about impact of infrastructure projects on the components of environment, impact assessment methods and mitigation measures.

MODULE I INTRODUCTION 7

Evolution of EIA - Concepts - Methodologies - Screening - Scoping – Mitigation - Matrices - Checklist.

MODULE II EIA PROCESS 8

Rapid and Comprehensive EIA - Legislative and Environmental Clearance procedure in India - Prediction tools for EIA.

MODULE III EIA FOR SPECIFIC PROJECTS 7

Assessment of Impact - Air - Water - Soil - Noise - Biological.

MODULE IV PUBLIC PARTICIPATION IN EIA 8

Socio-cultural environment - Public participation - Resettlement and Rehabilitation.

MODULE V MONITORING IN EIA 8

Documentation of EIA - Environmental management plan - Post project monitoring

MODULE VI ENVIRONMENTAL AUDIT 7

Environmental Audit- Life cycle assessment - EMS - case studies in EIA.

Total Hours: 45

TEXT BOOK:

1. Canter, R. L., “Environmental Impact Assessment”, McGraw Hill, New Delhi, 1996.

REFERENCE:

1. John G. Rau and David C. Wooten (Ed.), “Environmental Impact Analysis Hand Book”, McGraw Hill Book Company, 1990.

OUTCOMES:

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

- assess impact of infrastructure projects on the components of environment.
- assess the impact of urbanization on environment and suggest remedial measures.

CEBX20	ENVIRONMENTAL GEOTECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on geotechnical engineering problems associated with soil contamination, safe disposal of wastes and remediation of contaminated soils.

MODULE I INTRODUCTION **7**

Introduction to Environmental Geo techniques-Environmental cycles and their interaction-Soil water environment interaction relating to geotechnical problems-Effect of pollution on soil water behavior - Sources, production and classification of wastes.

MODULE II ENVIRONMENTAL REGULATIONS **4**

Environmental regulations in India - Case studies of foundation failures by ground contamination.

MODULE III SITE SELECTION AND METHOD OF DISPOSAL **9**

Criteria for selection of sites for waste disposal facilities-parameters controlling the selection of wastes disposal sites-current practices for waste disposal, subsurface disposal techniques-Passive contaminant systems- Leachate contamination-applications of geo membrane and other techniques in solid and liquid waste disposal-rigid or flexible membrane liners.

MODULE IV HYDROLOGY OF CONTAMINANTS **9**

Transport phenomena in saturated and partially saturated porous media contaminant migration and contaminant hydrology-Hydrological design for ground water pollution control-Ground water pollution downstream for landfills - pollution of aquifers by mining and liquid wastes-protection of aquifers.

MODULE V HAZARDOUS WASTE MANAGEMENT **8**

Hazardous waste control and storage system-Stabilization / Solidification of wastes-Processes and Functions- Monitoring and performance of contaminant facilities-Environmentally safe disposal of solid and liquid wastes

MODULE VI REMEDIAL MEASURES FOR WASTE MANAGEMENT 8

Ground modification techniques in waste fill, Remedial measures for contaminated grounds -Remediation technology - Bio-remediation

Total Hours: 45

TEXT BOOKS:

1. Wentz, C.A., " Hazardous Waste Management ", McGraw Hill, Singapore, 1989.
2. Daniel, B.E., " Geotechnical Practice for Waste disposal ", Chapman and Hall, London, 1997.
3. Ott, W.R., "Environmental Indices -Theory and Practice", Ann Arbor Science, 1978.

REFERENCES:

1. Fried, J.J., “Ground Water Pollution ", Elsevier, 1975.
2. ASTM 874 – 1985, “Hydraulic Barrier in Soil and Rock", American Society for Testing and Materials, U.S.A.
3. Westlake, K., “Landfill Waste Pollution and Control ", Albion Publishing Ltd., England, 1995.
4. Lagrega, M.D., Buckingham, P.L. and Evans, J.C., " Hazardous Waste Management ", McGraw Hill Inc., Singapore, 1994.

OUTCOMES:

- At the end of the course, the students will be able to recommend on waste disposal methods and remedial measures for contaminated land.

GROUP – III

CEBX21	**TRANSPORTATION ENGINEERING & GIS**	**L**	**T**	**P**	**C**
	TRAFFIC ENGINEERING	**3**	**0**	**0**	**3**

OBJECTIVE:

- To impart knowledge on the basic concepts, design principles and management techniques of highway traffic.

MODULE I INTRODUCTION **7**

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics.

MODULE II TRAFFIC SURVEYS AND ANALYSIS **7**

Surveys and Analysis – Volume survey and its characteristics – Capacity-Speed and Delays- Origin and Destination studies.

MODULE III TRAFFIC CONTROL **8**

Traffic Signs, Road Markings, Design of Traffic Signals and Signal Co-ordination (Problems), Traffic control Aids and Street Furniture, Computer Applications in Signal Design

MODULE IV DESIGN OF GEOMETRIC INTERSECTIONS **8**

Conflicts at Intersections, Classification of Intersections at Grade, Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Channelization and Rotary Design (Problem)

MODULE V TRAFFIC MANAGEMENT **8**

Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Restrictions on Turning Movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal Flow Operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)

MODULE VI TRAFFIC STUDIES **7**

General outline of traffic studies - Parking studies – Accidental studies – Congestion studies –Fuel conception and emission studies.

Total Hours: 45

TEXT BOOKS:

1. Khanna, K. and Justo, C.E.G., “Highway Engineering”, Khanna Publishers, Roorkee, 2001.

2. Kadiyali, L.R., “Traffic Engineering and Transport Planning”, Khanna Technical Publications, New Delhi, 2000.

REFERENCE:

1. Subhasg C. Saxena, “A Course in Traffic Planning and Design”, Dhanpat Rai Publications, New Delhi, 1989.

OUTCOME:

- At the end of the course, the students will be able to traffic surveys, design geometric intersections and traffic signal.

CEBX22	PAVEMENT DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To impart sufficient knowledge on various components of highway engineering such as highway planning, design of geometric elements of highways & urban roads, and rigid & flexible pavements design.
- To give an exposure to desirable properties of highway materials and construction practices.

MODULE I PRINCIPLE OF PAVEMENT DESIGN **7**

Components of a road and their function – Factors affecting pavement stability – Equivalent Single wheel load – Vehicle and traffic factors, moisture, Climate and soil factors – Stress distribution in different conditions –Modulus of elasticity of various layers.

MODULE II FLEXIBLE PAVEMENT DESIGN **8**

Empirical method using soil classification tests- Estimation of CBR values-method of designing pavement-plate bearing test method-asphalt institute method –AASHTO Method-bur mister design method –principles of bituminous mix design-IRC Methods.

MODULE III RIGID PAVEMENT DESIGN **8**

General design consideration – Stresses in concrete pavement- Design procedure as per IRC method – Design of different joints in concrete pavement and their maintenance.

MODULE IV PAVEMENT EVALUATION **8**

Method of pavement evaluation – Distress in flexible pavements – Distress in rigid pavements – Structural evaluation of flexible and rigid pavements – Evaluation by deflection measurements.

MODULE V PAVEMENTSTRENGTHENING **7**

Strengthening of pavement-Methods –Flexible overlays and types- Rigid overlays-Case studies

MODULE VI HIGHWAY MAINTENANCE **7**

Maintenance of Bituminous surface, concrete roads and low cost roads – Maintenance of shoulders and drainage system.

Total Hours: 45

TEXT BOOKS:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering", 8th Edition, New Chand and Brothers, Roorkee, 2001.
2. Wright, P.H., "Highway Engineers", John Wiley and Sons Inc., New York, 1996.

REFERENCES:

1. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna Tech. Publications, New Delhi, 2000.
2. Yoder, R.J. and Witchak M.W., "Principles of Pavement Design", John Wiley, 2000.
3. IRC 37–2001, Guidelines for the Design of Flexible Pavements, The Indian roads Congress, New Delhi.
4. IRC 58-1998, Guideline for the Design of Rigid Pavements for Highways, The Indian Roads Congress, New Delhi.

OUTCOMES:

At the end of the course, the students will

- be able to design rigid and flexible pavements as per IRC guidelines, assess quality and serviceability condition of roads, evaluate pavements and suggest appropriate maintenance procedure.

CEBX23	MODERN SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge on latest techniques & methods in surveying and related instrumentation.
- To give an exposure to fundamental and advanced concepts in surveying and applications of Global Positioning System (GPS).

MODULE I HYDROGRAPHIC SURVEYING 6

Tides – MSL – Sounding and methods – Location of Soundings and methods –Three-point problem – Strength of fix – Sextants and station pointer – River Surveys – Measurement of current and discharge.

MODULE II MODERN SYSTEMS IN SURVEYING AND MAPPING 9

General – Electronic Distance Measurement (EDM) – Digital Theodolite and its accuracy – Total Station and it's inbuilt programs like Co-go, Missing Line Measurement, Remote Elevation Measurement, 3D Coordinate Measurement, Automatic Azimuth Angle Setting, Resection, Setting out measurements and Area Calculation. Automatic total station – Laser Theodolite. Laser alignment instrument and electronic level – Digital level – Instrument for measuring tunnel profiles – Inertial positioning systems – Global Positioning System (GPS) – Digital Terrain Model (DTM) – LIDAR Measurements - Introduction to mapping software – Modern Trends.

MODULE III GLOBAL POSITIONING SYSTEM 8

History of GPS, GPS design objectives and details of segments space, control and user, blocks of GPS- Block I, II/IIA, IIR Satellites, and IIF. GPS Signal Structure - Carriers, GPS codes: C/A, P, navigational message, GPS receiver: Types and Structure of receivers, Principles of GPS position fixing: Pseudo ranging. Determination of GPS satellite coordinates, Types of ephemerides, GPS errors.

MODULE IV GPS SURVEY METHODS AND APPLICATIONS 8

Single Point or Point Vs Relative, Static Vs Kinematic, Real time Vs Post mission. Practical GPS survey field procedures: Code and Carrier-based

positioning, Accuracy and recording time.GPS Applications - Geodetic control surveys, Cadastral surveys, Remote sensing, Engineering and monitoring. Military applications, Geographical Information System, Vehicle tracking and car navigation, LBS and special applications.

MODULE V PHOTOGRAMMETRY **7**

Photogrammetric terms; Applications; Type of photographs; Perspective geometry of near vertical and tilted photographs, heights and tilt distortions; Flight planning; Stereoscopy, base lining, floating marks, parallax equation and stereo measurements for height determination; Developments in photogrammetry: analogue, analytical and digital methods; photogrammetric instruments.

MODULE VI TOTAL STATION **7**

Electro-optical system: Measuring principle, Working principle, Sources of Error,Infrared and Laser Total Station instruments. Microwave system: Measuring principle, Working principle, Sources of Error, Microwave Total Station instruments.

Comparison between Electro-optical and Microwave system applications. Care and maintenance of Total Station instruments.

Total Hours: 45

TEXT BOOKS:

1. Punmia, B.C., “Surveying”, Vol. II, III, Laxmi Publications, New Delhi, 2007.
2. Wolf, P. R., and Ghilani, C. D., “Adjustment Computations: Statistics and Least Squares in Surveying and GIS”, John Wiley & Sons, New York, 1997.
3. Kanetkar, T.P., “Surveying and Leveling”, Vol. I and II, United Book Corporation, Pune, 1994.
4. Roy, S.K., “Fundamentals of Surveying”, 2nd Edition, Prentice - Hall of India Private Ltd., New Delhi, 2004.

REFERENCES:

1. Hofmann-Wellenhof, B., Lichtenegger, H. and Collins, J., “Global Positioning System: Theory and Practice”, Springer, Berlin, 1994.

2. Xu Guochang, “GPS: Theory, Algorithms and Applications”, Springer, Berlin, 2007.

3. Schofield, W., “Engineering Surveying”, 5th Edition, Butterworth - Heinemann, London, 2001.

OUTCOMES:

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

- apply latest techniques & methods in surveying including instrumentation; and fundamental & advanced concepts in surveying.
- use GPS in different application areas.

CEBX24	GIS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide fundamental concepts of GIS and to introduce the multidisciplinary fields in geospatial technology such as remote sensing, cartography, surveying and photogrammetry.
- To give an exposure to the potential use of GIS in various civil engineering applications.

MODULE I FUNDAMENTALS OF GIS **7**

Introduction – definitions of GIS – components of GIS – Geographic data Presentation: maps – mapping process – coordinate systems – transformations – map projection – geo referencing - data acquisition.

MODULE II GIS DATA MODELS & STRUCTURES **8**

Geographic data representation, storage, quality and standards: storage: digital representation of data –data-base structures and database management systems.

MODULE III SPATIAL DATA STRUCTURES **7**

Raster data representation – vector data representation – concepts and definitions of data quality – components of data quality – assessment of data quality – managing data errors – geographic data standards.

MODULE IV GIS DATA PROCESSING AND ANALYSIS **8**

GIS data processing, analysis and modeling : Raster based GIS data processing – vector based GIS data processing – queries – spatial analysis – descriptive statistics – spatial autocorrelation – quadrant counts and nearest neighbour analysis – network analysis – surface modeling – DTM.

MODULE V APPLICATIONS OF GIS FOR NATURAL RESOURCES **8**

Applications of GIS: Natural Resources Management, Natural hazard management, Land information, Water Resources Management, Environmental Engineering & Monitoring.

MODULE VI APPLICATIONS OF GIS IN CIVIL ENGINEERING 7

Applications of GIS: Urban planning, Transportation Engineering, Utility management, Business development, Cartography, Web GIS and Mobile GIS.

Total Hours: 45

TEXT BOOKS:

1. Anji Reddy, “Remote sensing and Geographical systems”, B.S Publications, Hyderabad, 2008.
2. Clarke, K., “Getting Started with Geographic Information Systems”, Prentice Hall, New Jersey, 2001.

REFERENCES:

1. Burrough, P.A., “Principles of Geographical Information Systems”, Oxford Publication, 2001.
2. De Mers and Michael, N., “Fundamentals of geographic information system”, 2nd Edition, John Wiley and sons, 2003.

OUTCOMES:

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

- to use remote sensing & GIS techniques in various civil engineering disciplines.

CEBX25	GEODESY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide students comprehensive understanding of the various concepts of geodetic surveying and to solve geodetic problems.

MODULE I FUNDAMENTALS **6**

Definitions, Classifications, and Problem of Geodesy. Historical development and Organization of Geodesy. Reference Surfaces and their relationship. Applications. Engineering, Lunar and Planetary Geodesy.

MODULE II GEOMETRIC GEODESY **9**

Geodetic, Geocentric and Reduced latitudes and their relationship. Coordinates in terms of Reduced, Geodetic and geocentric latitude. Radius of curvature in the meridian & prime vertical and their relationship. Radius of curvature in any azimuth, Length of the meridian arcs and arcs of parallel and Area of trapezium on the ellipsoid. Curves on the ellipsoid, properties of Geodesic and Everest ellipsoid.

MODULE III GEODETIC COORDINATE SYSTEMS **7**

Natural or Astronomical Co-ordinate System, Geodetic or Geographical co-ordinate System, Rectangular or Cartesian Co-ordinate System and relationship between them. Curvilinear Co-ordinate System.

MODULE IV PHYSICAL GEODESY **8**

Gravity field of earth, Concept of equipotential, Geopotential and Spheropotential Surface - Normal gravity, The Significance of gravity measurements, Measurements of Absolute and Relative gravity, Reduction of gravity measurements, Isostasy. Gravity networks. Gravity anomaly and Gravity disturbance - Fundamental equation of Physical Geodesy. Determination of Geoid and Deflection of Vertical, Orthometric height, Normal height, Dynamic height and their corrections, Ellipsoidal height and geoidal height.

MODULE V GEODETIC ASTRONOMY **9**

Horizon, Hour Angle, Right Ascension and Ecliptic co-ordinate System,

relationship with Cartesian System, Transformation between them. Special star positions, Major constellations, Rising and setting of Stars with respect to Declination, hour angle and Azimuth, Culmination, Prime Vertical Crossing and Elongation - Variation in celestial co – ordinates, Sidereal time, Universal time, Zone time and Atomic time. Determination of Astronomical Azimuth, latitude and longitude. Star catalogues, Ephemerides and Almanacs.

MODULE VI GEODETIC COMPUTATION 6

Rectangular and Polar Co – ordinates - First and Second geodetic problem - Similarity and Helmert's transformation, Point determination by Intersection - Resection and Arc Section.

Total Hours: 45

TEXT BOOK:

1. James R. Smith, "Introduction to Geodesy", John wiley & Sons Inc., New York,1997.

REFERENCES:

1. Wolfgang Torge, "Geodesy", Walter De Gruyter Inc., Berlin, 2001.
2. Bomford, G., "Geodesy", Clarendon press, Oxford, 1980.
3. Petr Vanicek and Edward J. Krakiwsky, "Geodesy : The Concepts", North-Holland Publications Co., Amsterdam, 1991.
4. Heribert kahmen and Wolfgang Faig, "Surveying", Walter De Gruyter, Berlin, 1988.
5. Schwarze, V.S., "Geodesy: The challenge of the 3rd Millennium", Springer verlag, 2002.
6. Howard gore, J., "Elements of Geodesy", Kessinger Publishing, 2007.
7. George I. Hosmer, "Geodesy", Kessinger Publishing, 2007.

OUTCOME:

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

- apply various concepts of geodetic surveying to solve geodetic problems.

GROUP - IV

OTHER ELECTIVES

CEBX31 HOUSING, PLANNING AND MANAGEMENT **L T P C**

3 0 0 3

OBJECTIVE:

- To impart comprehensive knowledge on planning, design, evaluation, construction and financing of housing projects.

MODULE I INTRODUCTION TO HOUSING **7**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of sustainable housing

MODULE II HOUSING LAWS **8**

Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels.

MODULE III HOUSING PROGRAMMES **8**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations

MODULE IV PLANNING AND DESIGN OF HOUSING **7**

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design-Problems)

MODULE V COST-EFFECTIVE MATERIALS AND TECHNIQUES **8**

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation.

MODULE VI HOUSING FINANCE AND PROJECT APPRISAL **7**

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash

Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

Total Hours: 45

TEXT BOOKS:

1. Meera Mehta and Dinesh Mehta, “Metropolitan Housing Markets”, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D. Heggade, “Housing in India”, Himalaya Publishing House, Bombay, 1997.

REFERENCES:

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.
3. National Housing Policy, Government of India, 1994.

OUTCOMES:

At the end of the course, the students will

- acquire sufficient knowledge about housing laws, housing programmes, planning and design of housing projects, cost effective materials & techniques and appraisal of housing projects.
- be able to apply the housing laws and regulations during planning and designing a house
- be able to implement the cost effective material when planning for new buildings.

CEBX32	BUILDING SERVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on various elements of building services like water supply, sanitation, electrical installations, lighting, air conditioning, and fire safety including smart buildings.

MODULE I WATER TREATMENT AND SUPPLY SYSTEMS 7

Water quality, Purification and treatment- water supply systems-distribution systems in small towns -types of pipes used- laying jointing, testing-testing for water tightness plumbing system for building-internal supply in buildings-municipal bye laws and regulations.

MODULE II SANITATION AND DRAINAGE 8

Rain Water Harvesting - Sanitation in buildings-arrangement of sewerage systems in housing -pipe systems- storm water drainage from buildings - septic and sewage treatment plant - collection, conveyance and disposal of town refuse systems.

MODULE III ELECTRICITY AND LIGHTING 8

Types of wires , wiring systems and their choice -planning electrical wiring for building -main and distribution boards -transformers and switch gears -modern theory of light and colour -synthesis of light -luminous flux -candela- lans of illumination-lighting design-design for modern lighting.

MODULE IV VENTILATION AND COOLING 7

Ventilation and its importance-natural and artificial systems-Window type and packaged air-conditioners-chilled water plant -fan coil systems-water piping - cooling load -air conditioning systems for different types of buildings -protection against fire to be caused by A.C. Systems.

MODULE V FIRE SAFETY AND NBC PROVISONS IN BUILDINGS 8

Causes of fire in buildings-safety regulations-NBC-planning considerations in buildings like Non-combustible materials, construction, staircases and A.C. systems, special features required for physically handicapped and elderly in building types.

MODULE VI SMART AND INTELLIGENT BUILDINGS 7

Heat and smoke detectors-dry and wet risers - Automatic sprinklers - Capacity determination of OHT and UGT for firefighting needs.. Intelligent buildings- Building automation-Smart buildings- Building services in high rise buildings.

Total Hours: 45

REFERENCES:

1. Ernst and Neufert, “Architect’s Data”, 3rd Edition, Oxford Brookes University, England, 2001.
2. Fair, G.M., Geyer, J.C. and Okun, D., “Water and Waste Engineering”, Vol.II, John Wiley & sons Inc., New York,1968.
3. Hopkinson, R.G. and Kay, J.D., “The Lighting of buildings”, Faber and Faber, London, 1969.
4. NBC, “Hand Book for Building Engineers in Metric systems”, National Building Code of India, New Delhi, 1968.
5. Philips, “Lighting in Architecture Designs”, McGraw Hill, New York, 1964.
6. Callendar, J.H., “Time saver Standards for Architecture Design Data”, McGraw Hill, New York, 1974.
7. William H. Severns and Julian R. Fellows, “Air Conditioning and Refrigeration”, John Wily and sons, London, 1988.

OUTCOMES:

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

- evaluate the functioning of various elements of building services such as water supply, sanitation, electrical installations, lighting, air conditioning, and fire safety including smart buildings.
- provide solutions regarding suitable water supply and electrical systems in a building.

CEBX33 URBAN ENGINEERING & ARCHITECTURE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart knowledge on urbanization and its influence on region, city and built environment.
- To develop skills on computer applications in urban planning and advanced applications like MIS.
- To enrich with the basic architectural design principles in urban design.

MODULE I INTRODUCTION **7**

Definition of Terms – Human Settlement, Town/City, Region, City, Urbanization, Suburbanization, Urban Sprawl, Urban Fringe, Central Business District (CBD), Trend of Urbanisation at International, National, State and District levels. Urbanisation, Housing and Transportation -Sustainable Urban Development-Definition and Principles.

MODULE II PLANNING PROCESS **8**

Types of Urban and Regional Plans, Stages in the Planning Process – Delineation of Planning Areas, Goals and Objectives of Plans, Surveys and Analysis.

MODULE III PLAN IMPLEMENTATION **7**

Formulation of Plans, Evaluation of Alternative Plans, Plan Implementation, Legal, Financial and Institutional Constraints in the Planning .Social Orientation in the Urban Planning.

MODULE IV DEVELOPMENT MANAGEMENT SYSTEMS **8**

Development Control Rules – Zoning regulations, sub Divisional Regulations-Building Bye-laws - co-ordination between Urban Local Bodies and Other Functional Agencies such as Water supply & Sewerage boards, Housing Boards including Slum boards and Planning Authorities

MODULE V MIS AND DECISION SUPPORT SYSTEM **7**

Database, Management information system, Decision Support system for Land Suitability, Urban Renewal and Network Analysis.

MODULE VI ARCHITECTURAL DESIGN **8**

Architectural design – Principle of architecture – factors that determine climate – various design for climate – principle of landscape design.

Total Hours: 45

TEXT BOOKS:

1. Gallian B. Arthur and Simon Eisner, “The Urban Pattern, City Planning and Design”, Affiliated Press Pvt. Ltd., New Delhi, 1995.
2. Margaret Roberts, “An Introduction to Town Planning and Planning Techniques”, Hutchinson Educational, London, 1990.

REFERENCES:

1. CMDA, “Master Plans for Cities and Towns”, Chennai, Metropolitan Development Authority, Chennai, 1995.
2. CMDA, “Development Control Rules for Chennai Metropolitan Area”, Chennai Metropolitan Development Authority, 2002.
3. Rangwala, S.C., “Town Planning”, Anand Charotar Publishing House, 1994.

OUTCOMES:

At the end of the course, the students will

- be able to plan civil engineering structure in urban planning sector as per rules and regulations of the local authorities.

CEBX34	PRINCIPLES OF ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on the design principles and their application in architecture with the conception of forms, compositions and their spatial aspects.
- To impart knowledge of analytical understanding of spaces and built forms.

MODULE I ARCHITECTURAL SPACE AND MASS 7

Definition of Architecture – Elements of architecture – Space defining elements, openings in Space defining Elements, Spatial relationships, Spatial Organization-Primary forms, Properties of form, transformation of form, dimensional transformation, subtractive, additive forms, organization of additive forms – Articulation of forms.

MODULE II AESTHETIC COMPONENTS OF DESIGN 8

Exploration of the basic principles of Design such as proportion, scale, balance, rhythm, symmetry, hierarchy, axis with building examples.

MODULE III CIRCULATION 7

Components of building circulation – The building approach, the building entrance, configuration of path, path space relationship, form of circulation of space- circulation diagram for residence and restaurant.

MODULE IV PRINCIPLES OF COMPOSITION 8

Study of the basic principles that govern architectural composition such as Unity, Harmony, Dominance, Fluidity, Emphasis, Contrast.

MODULE V DESIGN PROCESS OF BUILDING 8

Design process – Integration of aesthetics and function- understanding of formative ideas, organization concepts, spatial characteristics, massing and circulation in design.

MODULE VI ANALYSIS OF BUILDING 7

Analysis of the following buildings-Falling water House & Guggenheim Museum

by F. L Wright-Villa Savoye& Chapel of Notre Dame by Le Corbusier.

Total Hours: 45

TEXT BOOKS:

1. Paul Alan Johnson, “The Theory of Architecture - Concepts and themes”, Van Nostrand Reinhold Co., New York, 1994.
2. Francis D.K. Ching, “Architecture: Form, Space and Order”, Van Nastrand Reinhold, , New York, 1999.
3. Pramar, V.S., “Design Fundamentals in Architecture”, Somaiya Publications Private Ltd., New Delhi, 1973.
4. Yogeswari, K., “Elements of Architecture”, Raamalinga Publication, Melmaruvathur, 2003.

REFERENCES:

1. Helm Marie Evans and Caria David Dunneshil, “An Initiation to Design”, Macmillan Publishing Co. Inc., NewYork, 1982.
2. Edward D. Mills, “Planning and Architects Handbook”, Butterworth, London, 1995.

OUTCOMES:

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

- to design various architectural models in accordance to the principles of architecture.
- to appreciate various design process and concepts of architectural design.

CEBX35	ENGINEERING ETHICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to identify the core values that shapes the ethical behavior of an engineer.
- To enable the students to utilize opportunities to explore one's own values in ethical issues.
- To make the students of ethical concerns and conflicts.
- To enhance familiarity with codes of conduct and increase the ability to recognize and resolve ethical dilemmas.

MODULE I ENGINEERING ETHICS **8**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

MODULE II ENGINEERING AS SOCIAL EXPERIMENTATION **8**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

MODULE III ENGINEER'S RESPONSIBILITY FOR SAFETY **8**

Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Case Studies Chernobyl and Bhopal disasters

MODULE IV ETHICAL RESPONSIBILITIES **7**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime

MODULE V ETHICAL RIGHTS **6**

Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

MODULE VI GLOBAL ISSUES **8**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics – Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

Total Hours: 45

REFERENCES:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York, 2005.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics Concepts and Cases”, Thompson Learning, Belmont, CA, 2000.
3. Charles D. Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
4. John R. Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003.
5. Edmund G. Seebauer and Robert L. Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, New York, 2001.
6. Bajaj, P.S., and Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, 2004.
7. David Ermann and Michele S. Shauf, “Computers, Ethics and Society”, Oxford University Press, New York, 2003.

OUTCOMES:

At the end of the course, the students will

- be able to identify the core values that shape the ethical behavior of an engineer.
- be aware of the ethical concerns and conflicts.
- be able to handle ethical dilemmas in a better way.

CEBX36	ENTREPRENEURSHIP FOR INFRASTRUCTURE ENGINEERS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To educate the students about entrepreneurship, marketing skills, role of entrepreneur and various business models and plans.

MODULE I INTRODUCTION TO ENTREPRENEURSHIP 7

Entrepreneurship General Concepts - Entrepreneurship – Regional Scenario & Characteristics & Qualities of an Entrepreneur – Advantages & Disadvantages of being an Entrepreneur

MODULE II SELF ANALYSIS & IDEA TO OPPORTUNITY MAPPING 7

Creativity and Innovation in Business & Self Analysis - Idea Generation and Opportunity Mapping

MODULE III SELECTION CRITERIA & PROCEDURE FOR A START-UP 8

Mechanism of product selection and technology-assistance from R&D labs and others on choice of technology - How to start an Enterprise unit (General concepts, Rules & Regulations, Govt. Norms)

MODULE IV TECHNICAL & FINANCIAL ASPECTS OF AN ENTERPRISE 8

Technical, Commercial & Financial aspects of Enterprise unit - Financial Support (Govt. agencies, banks, financial institutions, SFCs and others-securities demanded by FIs/banks)

MODULE V MARKETING & MARKET SURVEY 7

Marketing & market survey, Human Resources management & Quality control concepts

MODULE VI BUSINESS MODELS & BUSINESS PLAN 8

Introduction to Business Models and Business Plan. Writing a Project Report & business plan - Preliminary and final project report preparation, financial technical commercial and economic viability project implementation process project profiles.

Total Hours: 45

REFERENCES:

1. Vasant Desai, “Entrepreneurship Development Vol. I, II & III”, Himalaya Publishing House, Mumbai, 2007.
2. Gordon B. Baty, “Entrepreneurship for the Nineties”, Prentice Hall Inc., Granth Vitaran, Ahmedabad,1990.
3. Jay Narayan Vyas, “Small Scale Industry Handbook”, N.K. Vyas Publishers, Ahmedabad, 1986.
4. Jay Narayan Vyas and Dilip Patel, “Financing an industrial Unit”, Granth Vitaran, Ahmedabad, 1993.

OUTCOME:

- At the end of the course, students will acquire skills needed to establish own business or to be an entrepreneur.

GENERAL ELECTIVES

		L	T	P	C
GEBX01	**DISASTER MANAGEMENT**	**3**	**0**	**0**	**3**

OBJECTIVES:

- To give an exposure to various environmental hazards and disasters: and various concepts and principles to manage disaster.
- To give exposure to various environmental policies & programs in India for disaster management.

MODULE I ENVIRONMENTAL HAZARDS **7**

Environmental hazards, Environmental Disasters and Environmental stress-Meaning and concepts. Vulnerability and disaster preparedness.

MODULE II NATURAL DISASTERS **7**

Natural hazards and Disasters - Volcanic Eruption, Earthquakes, Tsunamis, Landslides, Cyclones, Lightning, Hailstorms, Floods, Droughts, Cold waves, Heat waves and Fire.

MODULE III MAN-MADE DISASTERS **7**

Man induced hazards & Disasters - Soil Erosion, Chemical hazards, Population Explosion.

MODULE IV DISASTER MANAGEMENT **8**

Emerging approaches in Disaster Management- Preparing hazard zonation maps, Predictability / forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Communication. Disaster resistant house construction, Population reduction in vulnerable areas, Awareness - Rescue training for search & operation at national & regional level - Immediate relief, Assessment surveys, Political, Administrative, Social, Economic, Environmental Aspects.

MODULE V NATURAL DISASTER REDUCTION & MANAGEMENT **8**

Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards.

MODULE VI ENVIRONMENTAL POLICIES & PROGRAMMES IN INDIA 8

Regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India. Ecological planning for sustainability & sustainable development in India, Sustainable rural development: A Remedy to Disasters, Role of Panchayats in Disaster mitigations, Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training.

Total Hours: 45

REFERENCES:

1. Satender, "Disaster Management in Hills", Concept Publishing Co., New Delhi, 2003.
2. Singh, R.B. (Ed.), "Environmental Geography", Heritage Publishers, New Delhi,1990.
3. Savinder Singh, "Environmental Geography", Prayag Pustak Bhawan,1997.
4. Kates, B.I. and White, G.F., "The Environment as Hazards", Oxford University Press, New York, 1978.
5. Gupta, H.K., (Ed), "Disaster Management", University Press, India, 2003.
6. Singh, R.B.,"Space Technology for Disaster Mitigation in India (INCED)", University of Tokyo, 1994.
7. Bhandani, R.K., "An overview on Natural & Manmade Disaster & their Reduction", IIPA Publication, CSIR, New Delhi, 1994.
8. Gupta, M.C., "Manuals on Natural Disaster management in India", National Centre for Disaster Management, IIPA Publication, New Delhi, 2001.

OUTCOMES:

At the end of the course, the students will

- achieve sufficient knowledge on the disaster prevention strategy, early warning system, disaster preparedness, response and human resource development.
- be familiar with the National Policy on Disaster Management.

GEBX02	NANO TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the basic concepts of Nanoscience relevant to the field of engineering.
- To provide an exposure about the importance of various synthesis method.
- To enrich the knowledge of students in various characterisation techniques.

MODULE I INTRODUCTION & CLASSIFICATION OF NANOMATERIALS 9

Definition - Origin of nanotechnology - Difference between bulk and nanomaterials- Top-down and bottom-up processes - Size dependent properties (magnetic, electronic,transport and optical), Classification based on dimensional property - 0D, 1D, 2D and 3D nanostructures – Kubo gap.

MODULE II TYPES OF NANOMATERIALS 9

Metal oxides and metal nano particles - Ceramic nano particles - Semi conducting quantum dots - Core-shell quantum dots - Nanocomposites - Micellar nanoparticles.

MODULE III PRODUCTION OF NANOPARTICLES 7

Sol-gel, hydrothermal, solvothermal, Plasma Arcing, Electro deposition, RF sputtering, Pulsed laser deposition, Chemical vapour, deposition.

MODULE IV CARBON BASED NANOMATERIALS 6

Carbon nanotubes: Single wall nanotubes (SWNT), Multiwall nanotubes (MWNT) - structures-carbon nanofibre, Fullerenes-Application of carbon nanotubes and Fullerenes.

MODULE V NANOPHOTONICS 7

Light and nanotechnology, Interaction of light and nanotechnology, Nanoholes and photons, nanoparticles and nanostructures; Nanostructured polymers, Photonic Crystals, Solar cells.

MODULE VI CHARACTERISATION TECHNIQUES 7

Basic principles of scanning Electron Microscopy (SEM), Atomic force

microscopy (AFM), Scanning tunneling microscopy (STM), Scanning probe microscopy (SPM) and Transmission electron microscopy (TEM), Particle size analyzer, Luminescence techniques.

Total Hours: 45

TEXTBOOKS:

1. Hari Singh Nalwa, “Handbook of Nanostructured Materials and Nanotechnology”, Academic Press, 2000.
2. Guozhong Cao, “Nanostructures and Nano materials-Synthesis, Properties and Applications”, Imperial College Press (2011).
3. Zhong Lin Wang, “Handbook of Nanophase and Nanomaterials (Vol 1 and II)”, Springer, 2002.
4. Mick Wilson, Kamali Kannangara, Geoff smith, “Nanotechnology: Basic Science and Emerging Technologies”, Overseas press, 2005.

REFERENCES:

1. A. Nabok, “Organic and Inorganic Nanostructures”, Artech House, 2005.
2. C.Dupas, P.Houdy, M.Lahmani, Nanoscience: “Nanotechnologies and Nanophysics”, Springer-Verlag Berlin Heidelberg, 2007.
3. Mick Wilson, Kamali Kannangara, Michells Simmons and Burkhard Raguse, “Nano Technology – Basic Science and Emerging Technologies”, 1st Edition, Overseas Press, New Delhi,2005.
4. M.S. Ramachandra Rao, Shubra Singh H, “Nanoscience and Nanotechnology: Fundamentals to Frontiers”, Wiley, 2013.

OUTCOMES:

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

- Apply the knowledge of different types of nanomaterials for various engineering applications.
- Acquire the knowledge of various methods of production of nanomaterials.
- Familiarize with various characterization techniques.

GEBX03	CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the system modeling and to derive their transfer function.
- To provide adequate knowledge of time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of Control systems.

MODULE I BASIC CONCEPTS AND SYSTEM REPRESENTATION 8

Control System - Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Block diagram reduction techniques – Signal flow graphs.

MODULE II TIME RESPONSE ANALYSIS AND DESIGN 8

Time response – Time domain specifications – Types of test input – First and Second order system - Type I and Type II System – Response - Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

MODULE III FREQUENCY RESPONSE ANALYSIS AND DESIGN 7

Performance specifications - correlation to time domain specifications - bode plots and polar plots – gain and phase margin – constant M and N circles and Nichols chart – all pass and non-minimum phase systems.

MODULE IV STABILITY 8

Characteristics equation – Location of roots in s plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

MODULE V COMPENSATOR DESIGN 8

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots and root locus technique.

MODULE VI CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS 6

Synchros – AC servomotors - DC Servo motors - Stepper motors - AC Tacho generator - DC Tacho generator - Typical applications of control system in industry.

Total Hours : 45

REFERENCES:

1. K. Ogata, "Modern Control Engineering", 4th Edition, Pearson Education, New Delhi, 2003.
2. I.J. Nagrath & M. Gopal, "Control Systems Engineering", New Age International Publishers, 2003.
3. C.J.Chesmond, "Basic Control System Technology", Viva student edition, 1998.
4. I.J.Nagarath and M.Gopal, "Control System Engineering", Wiley Eastern Ltd., Reprint, 1995.
5. R.C.Dorf and R.H.Bishop, "Modern Control Systems", Addison-Wesley (MATLAB Reference), 1995.

OUTCOMES:

At the end of the course, the student is expected to possess knowledge and achieve skills on the following:

- Proper understanding of basics of Control Systems.
- Ability and skill to carry-out time domain and frequency domain analysis.
- Capable of determining stability of the system using Routh Hurwitz criterion, Root locus and Nyquist criterion.
- Ability to design lag, lead and lag lead compensator networks.

GEBX04	GREEN DESIGN AND SUSTAINABILITY	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To impart knowledge to face challenges, the technology poses for water, energy, and climate change by implementing sustainable design.

MODULE I CONCEPTS OF SUSTAINABLE DEVELOPMENT **7**

Objectives of Sustainable Development - Need for sustainable development- Environment and development linkages - Globalization and environment- Population, poverty and pollution- global, regional and local environment issues-Green house gases and climate change.

MODULE II SUSTAINABLE DEVELOPMENT OF SOCIO ECONOMIC SYSTEMS **8**

Demographic dynamics of sustainability- Policies for socio economic development- Sustainable Development through trade- Economic growth- Action Plan for implementing sustainable development- Sustainable Energy and Agriculture.

MODULE III FRAME WORK FOR ACHIEVING SUSTAINBAILITY **7**

Sustainability indicators- Hurdles to sustainability- Business and Industry – Science and Technology for Sustainable Development- Performance indicators of sustainability and assessment mechanism- Constraints and barriers of Sustainable Development.

MODULE IV GREEN BUILDINGS **8**

Introduction to Green Building- Energy- Water- Materials and Resources - Sustainable Sites and Land Use - Indoor Environmental Quality- Life Cycle Assessment- Energy, water and materials efficiency.

MODULE V ENERGY CONSERVATION AND EFFICIENCY **7**

Energy savings- Energy Audit- Requirements- Benefits of Energy conservation- Energy conservation measures for buildings- Energy wastage- impact to the environment.

MODULE VI GREEN BUILDINGS DESIGN **8**

Elements of Green Buildings Design- Foundation, Electrical, Plumbing, flooring, Decking, roofing, insulation, wall coverings, windows, siding, doors and finishing, LEED certification for Green Buildings, Green Buildings for sustainability.

Total Hours: 45

TEXT BOOK:

1. Kirby, J., Okeefe, P., and Timber lake, “Sustainable Development”, Earthscan Publication, London, 1995.

REFERENCE:

1. Charles Kibert, J., “Sustainable Construction: Green Building Design and Delivery”, 2nd Edition, John Wiley and sons, 2007.

OUTCOMES:

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

- explain the relationship between sustainability and emergence of green building practices.
- address the economic, environmental, and social concerns.

GEBX05	KNOWLEDGE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The course

- Focuses on positioning knowledge as a valuable commodity, embedded in products and in the tacit knowledge of highly mobile individual employees.
- Presents KM as a deliberate and systematic approach to cultivating and sharing an organization's knowledge base.
- Brings out the paradigm in terms of information technology and intellectual capital.

MODULE I KNOWLEDGE MANAGEMENT 6

KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence – Experience – Common Sense – Cognition and KM – Types of Knowledge – History of Knowledge Management - From Physical assets to Knowledge Assets – Expert knowledge – Human Thinking and Learning.

MODULE II KNOWLEDGE MANAGEMENT SYSTEMS AND MODELS 9

Challenges in Building KM Systems – Conventional Vs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – KM cycle - Different variants of KM cycle - KM models - Implications and practical implementations.

MODULE III CAPTURING KNOWLEDGE AND SHARING 9

Tacit knowledge capture - Explicit knowledge codification - Knowledge taxonomies - Knowledge sharing - Communities - Obstacles to knowledge capture and sharing.

MODULE IV KNOWLEDGE MANAGEMENT TOOLS 9

KM System tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Knowledge capture and creation tools - Content creation tools - Data mining and knowledge discovery - Content management tools - Knowledge sharing and dissemination tools - Group ware and Collaboration tools - Intelligent filtering tools.

MODULE V KNOWLEDGE APPLICATION 6

KM at individual level - Knowledge workers - Task analysis and modeling - Knowledge application at group and organizational levels - Knowledge repositories - Knowledge reuse -Case study: e-learning.

MODULE VI VALUE OF KNOWLEDGE MANAGEMENT 6

KM return on investment and metrics - Benchmarking method - Balanced scorecard method - House of quality method - Results based assessment method - Measuring success - Future challenges for KM.

Total Hours : 45

TEXT BOOKS:

1. Elias M. Awad, Hassan M. Ghaziri, “Knowledge Management”, Prentice Hall, 2nd Edition, 2010.
2. Jay Liebowitz, “Handbooks on Knowledge Management”, 2nd Edition, 2012.
3. Irma Becerra-Fernandez, Rajiv Sabherwal, ”Knowledge Management: Systems and Processes”, 2010.

OUTCOMES:

Students who complete this course will be able to

- describe the fundamental concepts in the study of knowledge and its creation, acquisition, representation, dissemination, use and re-use, and management.
- explains the core concepts, methods, techniques, and tools for computer support of knowledge management.
- critically evaluate current trends in knowledge management and apply it for e-learning

GEBX06	APPROPRIATE TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To impart students knowledge about the basics and applications of various appropriate technologies in the field of civil engineering.

MODULE I BASICS CONCEPTS **7**

Back ground, Tools, Choices and Implications, Appropriate Technology Movement (an overview) - Basic design process, basic financial analysis-discounted cash flow, and energy fundamentals.

MODULE II APPROPRIATE TECHNOLOGY WITH REFERENCE TO BUILDING DESIGN **8**

Appropriate Building Materials, Appropriate Energy Saving Techniques, Water

Conservation (Indoor), Rain Water Harvesting.

MODULE III WATER, HEALTH AND SANITATION MANAGEMENT **8**

Water Storage: Designing Dams and Pipelines, Appropriate Selection for Sanitation Technique, Sewerage, Communal Health and Waste Water Recycling.

MODULE IV WASTE MANAGEMENT **7**

Types of Waste - Sources - Collections and On-Site Processing -Transferring Stations - Disposal Systems - Recycling.

MODULE V ENERGY EFFICIENT TECHNIQUES **8**

Green building concepts-renewable energy sources- Solar – Steam and wind-Biofuels - Biogas – Electricity.

MODULE VI TECHNOLOGY POLICY **7**

Government Policies- Energy Policy-Appropriate technology Development Centre-its function and responsibilities-Building policies-Case Studies.

Total Hours: 45

TEXT BOOKS:

1. Barrett Hazeltine and Christopher Bull, “Appropriate Technology: Tools Choices and Implications”, Academic Press, Orlando, USA, 1998.

2. Ken Darrow and Mike Saxenian, “Appropriate Technology Source Book : A Guide to Practical Books for Village and Small Community Technology”, Stanford, 1986.

REFERENCES:

1. Richard Heeks, “Technology and Developing Countries: Practical Applications Theoretical Issues”, 1995.

2. John Pickford, “The Worth of Water : Technical Briefs on Health, Water and Sanitation”, Intermediate Technology Publications, 1998.

OUTCOME:

- At the end of the course, the students will be able to use suitable technologies for various conditions for sustainable development.

GEBX07	SYSTEM ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic principles of systems engineering
- To understand the systems engineering methodology
- To provide a systems viewpoint

MODULE I INTRODUCTION TO SYSTEMS ENGINEERING 8

Concept of Systems Engineering – Origin – Systems Approach – Advantages of systems approach – Examples.

The building blocks of modern systems – Systems and environment – Interfaces – Complexity of Modern Systems.

MODULE II SYSTEM DEVELOPMENT PROCESS AND MANAGEMENT 8

System life cycle – the systems engineering method – Role of Testing – Management of system development – Risk Management – Organisation.

MODULE III CONCEPT DEVELOPMENT 8

Need Analysis – Concept Exploration – Performance requirement and validation - Concept selection and validation – systems architecture – Decision making.

MODULE IV ESTABLISHING ENGINEERING SYSTEMS 8

Risk Analysis – Risk Mitigation –System performance Analysis – Simulation Techniques in System Analysis – Validation Methods..

MODULE V DECISION SUPPORT TOOLS IN SYSTEMS ENGINEERING 7

Analytical decision support – Statistical influences on system design – System performance analysis – System Reliability, Availability and Maintainability (RAM) – Analysis of Alternatives.

MODULE VI CASE STUDIES **6**

Case studies in Software Systems Engineering – Systems for Product Design - Manufacturing Systems.

Total Hours: 45

REFERENCES:

1. Charles S. Wasson, “System Analysis, Design, and Development: Concepts, Principles, and Practices”, Wiley Series in Systems Engineering and Management, 2006.
2. Kossiakoff Alexander and William N. Sweet A, “Systems Engineering: Principles And Practice”, Wiley Student Edition, 2009.

OUTCOMES:

At the end of the course the student will have the

- ability to have systems of view of problems and issues at hand.
- ability to comprehend systems in their totality and specific.
- ability to design, build and evaluate simple systems for industrial requirement.
- ability to analyze systems and strengthen them for performance enhancement.

GEBX08 VALUE ANALYSIS AND ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To get acquainted with value analysis and engineering tool for productivity improvement.
- To understand and analyze the theory and methodology of Value Engineering.

MODULE I VALUE ENGINEERING BASICS **8**

Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity In Value Engineering.

MODULE II VALUE ENGINEERING JOB PLAN AND PROCESS **6**

Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioral and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.

MODULE III ORIENTATION AND INFORMATION PHASES **8**

Launching Value Engineering project work - Objectives and Targets - VE Project work: a time-bound programme - Projects and Teams - Time Schedule - Co-ordination - Consultant. Technical data - Marketing related information - Competition profile - Cost data - Materials Management related information - Quality related information - Manufacturing data.

MODULE IV FUNCTION ANALYSIS AND CREATIVE PHASES **9**

Objectives - Function definition - Classification of functions - Higher level functions – Function – Cost – Function – Worth - Value Gap - Value index - How to carry out Function Analysis? – Fast Diagraming - Cost Modelling.

Creativity - How to improve creativity of an individual? – How to promote creativity in the organization? - Obstacles to Creativity - Mental road blocks - Creativity killer phrases. Positive thinking - Ideas stimulators - Creativity techniques - Brainstorming.

MODULE V EVALUATION, INVESTIGATION AND RECOMMENDATION 6

Paired comparison and Evaluation Matrix techniques - Criteria for selection of VE solutions. Design – Materials – Quality – Marketing – Manufacturing - Preview session. The report - presentation.

MODULE VI IMPLEMENTATION PHASE AND CASE STUDIES 8

Design department - Materials department - Production Planning & Control - Quality Control – Manufacturing – Marketing - Need for co-ordinated teams - The Action Plan. Value Engineering case studies.

Total Hours: 45

TEXTBOOKS:

1. Mudge, Arthur E. “Value Engineering- A systematic approach”, McGraw Hill, New York, 2000.
2. Kumar S, Singh R K and Jha J K (Ed), “Value Engineering”, Narosa Publishing House, 2005.

REFERENCES:

1. Park RJ, “Value Engineering: A Plan for Invention”, St.Lucie Press, New York, 1999.
2. Lawrence, D.M., “Techniques of Value Analysis and Engineering”, McGraw Hill 1988.
3. George, E.D., “Engineering Design: a Material and Processing Approach”, McGraw Hill, 1991.
4. Heller, D.E., “Value Management, Value Engineering and Cost Reduction”, Addison Wesley, 1988.

OUTCOME:

- The student will be able to realize the value of products, processes and implement value analysis to achieve productivity improvement.

GEBX09	OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Introduce methods of optimization to engineering students, including linear programming, network flow algorithms, integer programming, interior point methods, quadratic programming, nonlinear programming, and heuristic methods.
- The goal is to maintain a balance between theory, numerical computation, problem setup for solution by optimization techniques, and applications to engineering systems.

MODULE I INTRODUCTION **7**

Overview of Optimization techniques for Civil Engineering Problems - Introduction to methods of optimization - Classification of Optimization problems - optimality and convexity - General optimization algorithm - necessary and sufficient conditions for optimality.

MODULE II LINEAR PROGRAMMING **8**

Introduction to linear programming - a geometric perspective - Standard form in linear programming; basic solutions; fundamental theorem of linear programming - Simplex Algorithm for Solving Linear Programs - Duality; complementary slackness; economic interpretation of the dual;

MODULE III DYNAMIC PROGRAMMING **8**

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of optimality; Recursive equations – Forward and backward recursions; Computational procedure in dynamic programming (DP); Discrete versus continuous dynamic programming; Multiple state variables; curse of dimensionality in DP.

MODULE IV APPLICATIONS **8**

Regression modeling in engineering; industrial blending problems; dynamic optimal control of engineering systems; optimal estimation in environmental engineering - Water resources; production planning in industrial engineering;

transportation problem - Heuristic optimization methods: genetic algorithms; ecological engineering application; Minimum cost network flow algorithms; out-of-kilter method; primal-dual methods; Dynamic Programming Applications - Water allocation as a sequential process - Capacity expansion and Reservoir operation.

MODULE V INTEGER PROGRAMMING 8

Integer programming - applications in optimal irrigation scheduling in agricultural engineering - Interior point optimization methods - affine scaling method.

MODULE VI NON-LINEAR PROGRAMMING 6

Non-linear programming - Kuhn-Tucker conditions for constrained nonlinear programming problems; necessary and sufficient conditions; quadratic programming; applications.

Total Hours: 45

REFERENCES:

1. Taha, H.A., “Operations Research - An Introduction", 9th Edition, Pearson Prentice Hall, 2011.
2. Winston.W.L. “Operations Research”, 4th Edition, Thomson – Brooks/Cole, 2003.
3. Kreyszig .E., “Advanced Engineering Mathematics“,10th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.

OUTCOMES:

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

- basic theoretical principles in optimization.
- formulation of optimization models.
- solution methods in optimization.
- methods of sensitivity analysis and post processing of results.
- applications to a wide range of engineering problems.

GEBX10	ENGINEERING SYSTEM MODELLING AND SIMULATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the concepts, techniques, tools for modeling and simulation systems and environments through the use of computers.
- To study the various aspects of discrete dynamic, stochastic systems modeling and conducting experiments with those models on a computer.

MODULE I INTRODUCTION **6**

Systems – Modelling – types – systems components – Steps in model building- Simulation Algorithms and Heuristics; Simulation Languages.

MODULE II RANDOM NUMBERS / VARIATES **7**

Random numbers – methods of generation – random variates for standard distributions like uniform, exponential, Poisson, binomial, normal etc. – Testing of Random variates – Monte Carlo Simulation.

MODULE III MODELLING PROCESS **7**

Primitive Models : Establishing relationships via physical laws; Establishing relationships via curve fitting; Parameters estimation problems; Elementary state transition models.

MODULE IV DESIGN OF SIMULATION EXPERIMENTS **9**

Steps on Design of Simulation Experiments – Development of models using of Highlevel language for systems like Queuing, Inventory, Replacement, Production etc., – Model validation and verification, Output analysis.

MODULE V SIMULATION LANGUAGES **10**

Need for simulation Languages – Comparisons & Selection of Languages – GPSSARENA- EXTEND – Study of any one of the languages.

MODULE VI CASE STUDIES USING SIMULATION LANGUAGES **6**

Total Hours: 45

REFERENCES:

1. Law, A.M., & W.D. Kelton, “Simulation Modelling and Analysis”, McGraw Hill, Singapore, 2000.
2. Harrel, C.R., et. al., “System Improvement Using Simulation”, 3rd Edition, JMI Consulting Group and ProModel Corporation, 1995.
3. Harrel, C.R. & T. Kerim, “Simulation Made Easy, A Manager’s Guide”, IIE Press, 1995.
4. Geoffrey Gordon, “Systems Simulation”, Prentice Hall, 2002.
5. David Kelton, Rondall P Sadowski, David T Sturrock, “Simulation with Arena”, Mc Graw Hill, 2004.

OUTCOMES:

The student should be able to

- Model and simulate systems and environments through the use of computers.
- Conduct experiments with discrete dynamic, stochastic system models on a computer.

GEBX11	SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various decision phases in a supply chain
- To be aware of the Supply Chain and its drivers
- To design Supply Chain Network
- To build a aggregate plan in supply chain
- To understand Sourcing Decisions in Supply Chain
- To comprehend the influence of Information technology in Supply Chain

MODULE I INTRODUCTION TO SUPPLY CHAIN 9

Understanding Supply Chain - Decision phases - Supply chain performance - Competitive and supply chain strategies - Achieving strategic fit - Expanding strategic scope

MODULE II SUPPLY CHAIN DRIVERS AND DESIGN 9

Drivers of supply chain performance – Designing distribution network - Network Design in the Supply Chain - Network design in Uncertain Environment

MODULE III AGGREGATE PLANNING AND MANAGING SUPPLY, DEMAND AND INVENTORY 9

Aggregate Planning in a Supply chain: role - Managing Supply - Managing Demand in Supply Chain – Cycle and Safety inventory in supply chain – Level of product availability.

MODULE IV SOURCING AND TRANSPORTATION 9

Sourcing decision in supply chain - Third and Fourth – Party Logistics providers - Supplier scoring and assessment - Transportation in a Supply Chain – Risk and Trade-offs in transportation design.

MODULE V INFORMATION TECHNOLOGY IN A SUPPLY CHAIN 9

Information technology in a supply chain – CRM, ISCM, SRM in supply chain - Over view of recent trends in Supply Chain: e-SRM, e-LRM, e-SCM.

Total Hours: 45

REFERENCES:

1. Sunil Chopra and Peter Meindl, “Supply Chain Management-Strategy Planning and Operation”, Pearson Education, 4th Indian Reprint, 2010.
2. Jananth Shah “Supply Chain Management – Text and Cases“ Pearson Education, 2008.
3. Altekar Rahul V, “Supply Chain Management-Concept and Cases”, Prentice Hall India, 2005.
4. Monczka et al., “Purchasing and Supply Chain Management”, Thomson Learning, 2nd Edition, 2nd Reprint, 2002.

OUTCOMES:

- After taking up the course the student will be able to brighten his prospects of taking up a career on supply chain management.
- The student decision making capability specific to supply chain issues in an industry is improved.
- The student can plan a well defined execution of supply chain strategy in companies.
- The student will be able to design an optimal distribution network as per the demands of the industry.
- The student can also determine the most favorable transportation plan for a company.
- The student will also be able to bring in company from paper environment to paperless environment.

GEBX12	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various principles, practices of TQM to achieve quality.
- To get acquainted with the various statistical tools and approaches for quality control and continuous improvement.
- To get aware of the importance of ISO and Quality Systems.

MODULE I INTRODUCTION **8**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

MODULE II TQM PRINCIPLES **7**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits.

MODULE III TQM IMPROVEMENT PROCESS **8**

Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

MODULE IV STATISTICAL PROCESS CONTROL (SPC) **8**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

MODULE V TQM TOOLS **7**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality

Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

MODULE VI QUALITY SYSTEMS **7**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

Total Hours: 45

TEXT BOOK:

1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education, Inc. 2003.

REFERENCES:

1. James R.Evans & William M.Lidsay, "The Management and Control of Quality", 5th Edition, South-Western (Thomson Learning), 2002.
2. Feigenbaum.A.V., "Total Quality Management", McGraw-Hill, 1991.
3. Oakland.J.S., "Total Quality Management", Butterworth Hcinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan. N.S., "Quality Management – Concepts and Tasks", New Age International, 1996.
5. Zeiri, "Total Quality Management for Engineers", Wood Head Publishers, 1991.

OUTCOMES:

The student should be able to

- apply the various statistical tools and approaches for quality control.
- achieve continuous process improvement through TQM.

GEBX13	ENERGY STUDIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the growing demand, supply of energy on global and national levels and the need for renewable energy promotion.
- To understand the basic need for energy conservation and waste heat recovery.
- To learn the important aspects of energy audit and management.
- To get acquainted with the global environmental issues and carbon credits.

MODULE I GLOBAL AND NATIONAL ENERGY SCENARIO 7

Role of energy in economic development, various energy resources - overall energy demand and availability- Energy consumption in various sectors and its changing pattern - Exponential increase in energy consumption and projected future demands. Need for renewable energy.

MODULE II SOLAR ENERGY 8

Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

MODULE III OTHER RENEWABLE ENERGY SOURCES 8

Power from wind – wind turbine working and types, solar thermal power plants – low medium and high power generation, power from wave , tidal, geothermal sources, OTEC system. MHD power plants – working, types, merits and demerits. Energy from biomass.

MODULE IV COGENERATION, WASTE HEAT RECOVERY AND COMBINED CYCLE PLANTS 8

Cogeneration principles- topping and bottoming cycles, role in process industries. Energy from wastes- waste heat recovery- heat recovery from industrial processes. Heat exchange systems – recuperative and regenerative heat exchangers – commercially available waste heat recovery devices. Combined cycle plants – concept, need and advantages, different combinations and practical scope.

MODULE V ENERGY CONSERVATION AND MANAGEMENT 7

Need for energy conservation – use of energy efficient equipments. Energy conservation opportunities - in educational institutions, residential, transport, municipal, industrial and commercial sectors – concept of green building. Energy audit in industries – need, principle and advantages. Case studies.

MODULE VI GLOBAL ENRGY ISSUES AND CARBON CREDITS 7

Energy crisis, fossil consumption and its impact on environmental climate change. Energy treaties – Montreal and Kyoto protocols - Transition from carbon rich and nuclear to carbon free technologies, carbon foot print – credits – clean development mechanism.

Total Hours: 45

TEXT BOOKS:

1. S.S. Rao and B.B. Parulekar, “Energy Technology”, 3rd Edition, Khanna Publishers, New Delhi, 2011.
2. O. Callaghn. P.W., “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.

REFERENCES:

1. G.D. Rai, “Non Conventional Energy Sources”, Khanna Publishers, New Delhi, 2011.
2. Archie, W Culp. “Principles of Energy Conservation”, McGraw Hill, 1991.
3. D Patrick and S W Fardo, “Energy Management and Conservation”, PHI,1990
4. P. O’Callaghan: “Energy Management”, McGraw - Hill Book Company, 1993.
5. Kenney, W. F., “Energy Conservation in Process Industries”, Academic Press, 1983.

OUTCOMES:

The student should be able to

- Realize the global and national energy status and need to switch over to renewable energy technology.
- Energy audit and suggest methodologies for energy savings.
- Utilize the available resources in an optimal way.
- Concern about the global environmental issues & promote carbon credits.

GEBX14	ROBOTICS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To learn about the robots, various components, of Robots, programming and their applications.

MODULE I INTRODUCTION **8**

Definition- Need - Application, Types of robots – Classifications – Configuration, work volume, control loops, controls and intelligence- basic parts - functions – specifications. of robot, degrees of freedoms, end effectors – types, selection

MODULE II ROBOT DRIVES AND CONTROL **8**

Controlling the Robot motion – Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Designing of end effectors – Vacuum, magnetic and air operated grippers.

MODULE III ROBOT SENSORS **8**

Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image Representation - Image Grabbing –Image processing and analysis – Edge Enhancement – Contrast Stretching – Band Rationing - Image segmentation – Pattern recognition – Training of vision system.

MODULE IV ROBOT PROGRAMMING & AI TECHNIQUES **7**

Types of Programming – Teach pendant programming – Basic concepts in AI techniques – Concept of knowledge representations – Expert system and its components.

MODULE V ROBOTIC WORK CELLS AND APPLICATIONS OF ROBOTS **7**

Robotic cell layouts – Inter locks – Humanoid robots – Micro robots – Application of robots in surgery, Manufacturing industries, space and underwater.

MODULE VI ROBOT KINEMATICS AND DYNAMICS **7**

Forward and inverse Kinematic equations, Denvit – Hartenbers representations

Fundamental problems with D-H representation, differential motion and velocity of frames - Dynamic equations for sing, double and multiple DOF robots – static force analysis of robots.

Total Hours: 45

REFERENCES:

1. Yoram Koren," Robotics for Engineers", Mc Graw-Hill, 1987.
2. Kozyrey, Yu, "Industrial Robots", MIR Publishers Moscow, 1985.
3. Richard. D, Klafter, Thomas, A, Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Prentice-Hall of India Pvt. Ltd., 1984.
4. Deb, S.R. "Robotics Technology and Flexible Automation", Tata Mc Graw-Hill, 1994.
5. Mikell, P. Groover, Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey, "Industrial Robotics Technology, Programming and Applications", Mc Graw- Hill, Int. 1986.
6. Timothy Jordanides et al,"Expert Systems and Robotics", Springer –Verlag, New York, May 1991.

OUTCOMES:

Students would be able to

- Understand about the robots, its various components.
- Design Robots for industrial applications.
- Do programming for robots and apply them in real time applications.

GEBX15	CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of Cyber Security Standards and Laws.
- To know the legal, ethical and professional issues in Cyber security.
- To understand Cyber Frauds and Abuse and its Security Measures.
- To know the technological aspects of Cyber Security.

MODULE I FUNDAMENTALS OF CYBER SECURITY 8

Security problem in computing – Cryptography Basics – History of Encryption – Modern Methods – Legitimate versus Fraudulent Encryption methods – Encryption used in Internet.

MODULE II TYPES OF THREATS AND SECURITY MEASURES 8

Security Programs – Non-malicious program Errors – Virus and other Malicious Code – Targeted Malicious Code – Control against program threats – Web Attacks – DOS – Online Security Resources.

MODULE III APPLICATION SECURITY 8

Introduction to Databases - Database Security Requirements – Reliability & Integrity – Multilevel Databases - E-Mail and Internet Security – SQL Injection – Cross Site Scripting – Local File Inclusion – Intrusion Detection Software”s.

MODULE IV PHYSICAL SECURITY AND FORENSICS 7

Firewalls – Benefits and Limitations – Firewall Types - Components – Server Room Design and Temperature Maintenance – Cyber Terrorism and Military Operation Attacks- Introduction to Forensics – Finding evidence on PC and Evidence on System Logs – Windows and Linux logs.

MODULE V CYBER STALKING & FRAUD 7

Introduction – Internet Frauds – Auction Frauds – Identity theft – Phishing – Pharming- Cyber Stalking – Laws about Internet Fraud – Protecting against Cyber Crime – Secure Browser settings – Industry Espionage.

MODULE VI CYBER SECURITY STANDARDS AND POLICIES 7

Introduction– ISO 27001– ISO 27002 - PCI DSS – Compliance - IT ACT – Copyright ACT, Patents. Definition of Policy – Types- User Policies- Administrative Policies – Access control – Developmental Policies.

Total Hours : 45

TEXT BOOK:

1. Chuck Easttom, “Computer Security Fundamentals”, 2nd Edition, Pearson Education, 2012.

REFERENCES:

1. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, 3rd Edition, Pearson Education, 2003.
2. William Stallings, “Cryptography and Network Security – Principles and Practices”, 3rd Edition, Pearson Education, 2003.
3. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill, 2000.

OUTCOMES:

Upon completion of this course, attendees should be able to satisfy the critical need for ensuring Cyber Security in Organizations.

- The students attending this course will be able to analyse the attacks and threats.
- They can also provide solutions with Intrusion Detection systems and Softwares.
- They will have knowledge about Cyber Frauds and Cyber Laws.

GEBX16	USABILITY ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of this course is

- To understand the emerging concept of usability, requirements gathering and analysis.
- To learn about human computer interaction with the help of interfaces that has high usability.

MODULE I INTRODUCTION **6**

Cost Savings – Usability Now – Usability Slogans – Discount Usability Engineering – Usability – Definition – Example – Trade-offs – Categories – Interaction Design – Understanding & Conceptualizing Interaction – Cognitive Aspects.

MODULE II USER INTERFACES **8**

Generation of User Interfaces – Batch Systems, Line Oriented Interfaces, Full Screen Interfaces, Graphical User Interfaces, Next Generation Interfaces, Long Term Trends – Usability Engineering Life Cycle – Interfaces – Data Gathering – Data Analysis Interpretation and Presentation.

MODULE III INTERACTION DESIGN **8**

Process of Interaction Design - Establishing Requirements – Design, Prototyping and Construction - Evaluation and Framework.

MODULE IV USABILITY TESTING **8**

Usability Heuristics – Simple and Natural Dialogue, Users' Language, Memory Load, Consistency, Feedback, Clearly Marked Exits, Shortcuts, Error Messages, Prevent Errors, Documentation, Heuristic Evaluation – Usability Testing - Test Goals and Test Plans, Getting Test Users, Choosing Experimenters, Ethical Aspects, Test Tasks, Stages of a Test, Performance Measurement, Thinking Aloud, Usability Laboratories.

MODULE V USABILITY ASSESSMENT METHODS **8**

Observation, Questionnaires and Interviews, Focus Groups, Logging Actual

Use, User Feedback, Usability Methods – Interface Standards - National, International and Vendor Standards, Producing Usable In-House Standards

MODULE VI USER INTERFACES 7

International Graphical Interfaces, International Usability Engineering, Guidelines for Internationalization, Resource Separation, Multilocale Interfaces – Future Developments – Case Study.

Total Hours : 45

TEXT BOOKS:

1. Yvonne Rogers, Helen Sharp, Jenny Preece, "Interaction Design: Beyond Human - Computer Interaction", John Wiley & Sons, 3rd Edition, 2011 (Module I, II, III).
2. Jakob Nielsen, "Usability Engineering", Morgan Kaufmann Academic Press, 1994. (Module I – VI).

REFERENCES:

1. Ben Shneiderman, Plaisant, Cohen, Jacobs, "Designing the User Interface: Strategies for Effective Human Interaction", Pearson Education, 5th Edition, 2010.
2. Laura M. Leventhal, Julie A. Barnes, "Usability Engineering: Process, Products, and Examples", Pearson/Prentice Hall, 2008

OUTCOMES:

Students who complete this course will be able to

- build effective, flexible and robust user interfaces.
- translate system requirements into appropriate human/computer interaction sequences.
- choose mode, media and device for the application requirements.

GEBX17	INDUSTRIAL SAFETY	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To understand the various safety measures to be taken in different industrial environments.

MODULE I SAFETY MANAGEMENT **7**

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety. safety education and training.

MODULE II SAFETY IN MANUFACTURING **7**

Safety in metal working-Machine guarding -Safety in welding and gas cutting - Safety in cold forming and hot working of metals -Safety in finishing, inspection and testing -Regulation.

MODULE III SAFETY IN CONSTRUCTION **8**

General safety consideration in Excavation, foundation and utilities – Cordoning – Demolition – Dismantling –Clearing debris – Types of foundations – Open footings.

Safety in Erection and closing operation - Safety in typical civil structures – Dams-bridges-water Tanks-Retaining walls-Critical factors for failure-Regular Inspection and monitoring.

MODULE IV ELECTRICAL SAFETY **8**

Electrical Hazards – Energy leakage – Clearance and insulation – Excess energy – Current surges – Electrical causes of fire and explosion – National electrical Safety code.

Selection of Environment, Protection and Interlock – Discharge rods and earthing device – Safety in the use of portable tools - Preventive maintenance.

MODULE V SAFETY IN MATERIAL HANDLING **8**

General safety consideration in material handling devices - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears – Prime movers.

Ergonomic consideration in material handling, design, installation, operation and maintenance of Conveying equipments, hoisting, traveling and slewing mechanisms.

Storage and Retrieval of common goods of shapes and sizes in a general store of a big industry.

MODULE VI SAFETY EDUCATION AND TRAINING 7

Importance of training-identification of training needs-training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

Total Hours: 45

REFERENCES:

1. Krishnan N.V, “Safety Management in Industry”, Jaico Publishing House, Bombay, 1997.
2. Blake R.B., “Industrial Safety”, Prentice Hall, Inc., New Jersey, 1973.
3. Fulman J.B., “Construction Safety, Security, and Loss Prevention”, John Wiley and Sons, 1979.
4. Fordham Cooper W., “Electrical Safety Engineering”, Butterworths, London, 1986.
5. Alexandrov M.P., “Material Handling Equipment”, Mir Publishers, Moscow, 1981.

OUTCOMES:

Students would be able to

- Acquire knowledge on various safety Hazards.
- Carry out safety measures for different industrial environments.

GEB X18	TRANSPORT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the transport fleet and their related activities for minimizing operational cost.
- To understand the need of maintenance and its importance.
- To understand the functions and applications of various types of transport system.

MODULE I INTRODUCTION **7**

Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.

MODULE II ORGANISATION AND MANAGEMENT **7**

Forms of Ownership – principle of Transport Management – Staff administration – Recruitment and Training – welfare – health and safety. Basic principles of supervising. Organizing time and people. Driver and mechanic hiring - Driver checklist - Lists for driver and mechanic - Trip leasing - Vehicle operation and types of operations.

MODULE III TRANSPORT SYSTEMS **9**

Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. chain of responsibility, forms of ownership by state, municipality, public body and private undertakings.

MODULE IV SCHEDULING AND FARE STRUCTURE **8**

Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling.

MODULE V MOTOR VEHICLE ACT **7**

Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.

MODULE VI MAINTENANCE **7**

Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

Total Hours: 45

TEXT BOOKS:

1. John Duke, "Fleet Management", McGraw-Hill Co, USA, 1984.
2. Kitchin.L.D., "Bus Operation", III edition, Illiffee and Sons Co., London, 1992

REFERENCE:

1. Government Motor Vehicle Act, Publication on latest act to be used as on date.

OUTCOMES:

Upon completion of the course, students will

- Know about different aspects related to transport system and management.
- Know features of scheduling, fixing the fares
- Know about the motor vehicle act and maintenance aspects of transport.

GEBX19 ADVANCED OPTIMIZATION TECHNIQUES **L T P C**

3 0 0 3

OBJECTIVES:

- To introduce the various advanced optimization tools.
- To provide an understanding to deal with ill identified and fuzzy problems.

MODULE I INTRODUCTION **7**

Review of conventional optimization techniques - limitations - limitation of exhaustive search - need for artificial intelligence - bio mimicking methods

MODULE II HEURISTICS METHODS **8**

Introduction – Advanced methods of algorithm design: Greedy method, Backtracking method, Divide and Conquer method – Dynamic programming – Heuristics exploration algorithms – Greedy search - Local search – Hill climbing – Tabu search – Gradient search – Beam search – Simulated Annealing

MODULE III GENETIC ALGORITHM **7**

Introduction - Basics of GA – Population – Reproduction – Cross over – Mutation -genetic algorithms in search, optimization and machine learning-practical genetic algorithms

MODULE IV ANT COLONY OPTIMIZATION **8**

Introduction: Ant Colony Optimization – Meta-heuristic Optimization – History – The ACO Meta-heuristic – ACO Algorithms: Main ACO – Ant system – Ant colony system – Max-Min Ant system – Applications: Routing in telecommunication networks – Travelling salesmen – Graph Coloring – Advantages & Disadvantages

MODULE V FUZZY LOGIC AND ANN **8**

Fuzzy logic, knowledge representation and inference mechanism – Fuzzy and expert control – standard Takagi-Sugeno mathematical characterizations – Design example – Biological foundations to intelligent systems: Artificial neural networks, Back-propagation networks, Radial basis function networks, and recurrent networks.

MODULE VI IMPLEMENTATIONS & APPLICATIONS 7

Reduction of size of an optimization problem – multilevel optimization – parallel processing – multi objective optimization – Job shop scheduling – Vehicle scheduling – Line balancing – Sensor integration.

Total Hours: 45

REFERENCES:

1. SingiresuS.Rao, “Engineering optimization – Theory and practices”, John Wiley and Sons, 1996.
2. Ravindran – Phillips –Solberg, “Operations Research – Principles and Practice”, John Wiley and Sons, 1987.
3. Fredrick S.Hillier and G.J.Liberman, “Introduction to Operations Research”, McGraw Hill Inc. 1995.
4. Kalymanoy Deb, “Optimization for Engineering Design”, PHI, 2003
5. Christos H. Papadimitriou, Kenneth Steiglitz, Combinatorial Optimization, PHI 2006

OUTCOMES:

At the end of the course student will be able to

1. Formulate a real life situation as an optimization the problem.
2. Identify the appropriate solution methodology and provide a solution

GEB X20	PLANT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide in depth knowledge on Plant Engineering
- To introduce detail engineering and P&ID
- To learn about the support to Instrumentation from other disciplines
- To study about the Installation and commissioning

MODULE I INTRODUCTION OF PLANTS **7**

General Project Cycle – Feed – Sales - Plant Description, Component / Areas of Plant, Plant Layout, Plant Interfaces, Plant Location

MODULE II ELEMENTS OF PLANT **8**

Main Elements of a Plant, Process Flow Scheme (PFD – Process Flow Diagram) P&ID's, Plant Legend Finalization.

MODULE III DETAIL ENGINEERING **10**

P & ID Development with PFD's, Major Discipline Involvement & Inter discipline Interaction, Major Instrumentation & Control Systems - Development Phase – Instrument List, I/O Count, Specification Sheets, Instrument Installation (Hook ups), Control Philosophy – Detail Engineering.

MODULE IV SUPPORT FROM OTHER DISCIPLINE **8**

Other Discipline Supports to Instrumentation – Plot Plan, Piping / Equipment Plan, Electrical Area Classification, Fire Hazardous Classification Telecommunication Systems - Control Network architecture

MODULE V INSTALLATION AND COMMISSIONING **7**

Plant Construction - Key Drawings for Construction Support Construction Activities, System Testing, Startup / Commissioning, Production.

MODULE VI CASE STUDIES **5**

Case studies of Water Treatment Plant - Paper Industry – Power Plant etc.

Total Hours: 45

REFERENCES :

1. Duncan C. Richardson, Plant Equipment and Maintenance Engineering Handbook, McGraw-Hill Education: New York, Chicago, San Francisco, Athens, London, Madrid, Mexico City, Milan, New Delhi, Singapore, Sydney, Toronto, 2014 McGraw-Hill Education
2. Gabriel Salvendy, Handbook of Industrial Engineering - Technology and operations management, John Wiley & Sons, 2001
3. Robert C Rosaler, Standard Handbook of Plant Engineering, McGraw-Hill third edition, 2004.
4. R. Keith Mobley, Plant Engineer's Handbook, Technology and Engineering, 2001

OUTCOMES:

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

- Review and correct P&IDs
- Do installation and commissioning of new plants
- Apply plant engineering in design and maintenance of water treatment plant / power plant etc

GEBX21	PROJECT MANAGEMENT SYSTEM	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students would gain knowledge on

- Technicalities attached to Project Management and Significance of Quality Consideration
- Project management methodologies – tools and techniques, supplemented with examples from case studies
- The importance of Efficient HR team and role of Communication in executing Projects.
- Managing Risks in Project Management

MODULE I INTRODUCTION TO PROJECT MANAGEMENT 9

Introduction to Project and Project Management-Project Management as a Career-Project Management Skill Sets-Project Scope Management: Project Charter, Scope Creep, Scope Validation, Scope Change Control-Type of Organization: Organization Structure-Influence of Organization Structure on Project, Project Stakeholders and Organizational Productivity.

MODULE II PROJECT MANAGEMENT PROCESS, TOOLS AND TECHNIQUES 8

Project life cycle-Initiation, Planning, Execution, Monitoring and Closing Phase; - Link between project management process, process groups and knowledge areas; Project management tools and techniques- Project Stakeholders description and mapping - Stakeholder Management Process

MODULE III PROJECT QUALITY, COST AND SCHEDULE MANAGEMENT 10

Triple constraints of project-quality, cost and schedule-Quality Planning, Quality Assurance and Quality Control, Process Control, Cost of Quality, Seven Tools of Quality Control- Cost Management: Cost Estimating Methods, Estimating Completion Cost, Earned Value Management, Budgeting, Life-Cycle Cost analysis- Project Time Management: Duration Estimation Method, FS/FF/SS/SF Relations, Lead/Lag, Arrow Diagram Method and Precedence Diagram Method for Scheduling-Resource Allocation

MODULE IV PROJECT HR & COMMUNICATION MANAGEMENT 10

Organizational Goals- (MBO/MBE/MBP)-Responsibility Assignment Matrix (RAM)-Types of Powers- Manage or Lead-Conflict management Techniques-Performance Evaluation Process-Motivation Theories and its Application for execution of Projects-Leadership Styles-Project Team Building-Project Staffing Constraints/Policies- Communication Management: Understanding Body languages of Project Personnel-Effective Communications- Interpersonal Skills for project Managers-PMIS-Communicating with the Customer-Communicating with Management- Formal vs. Informal Communications-Written, Verbal and Non-Verbal Communications.

MODULE V PROJECT PROCUREMENT & RISK MANAGEMENT 8

Introduction to Project Procure Management: Soliciting RFQ/RFP-Contract Proposals-Contract Negotiation-Contract Closure-Risk Management: Defining risks-Risk management process-Risk identification-Qualitative and Quantitative Risk-Probability and Decision trees-Risk Response strategies / methods-Expected monetary value-Risk vs. life cycle phases

Total Hours: 45

REFERENCES:

1. Jack. R. Meredith, Samuel. J. Mantel & Scott. M. Shafer, Project Management in Practice, Fifth Edition, Bangalore: Wiley, 2015
2. Bob Hughes, Mike Cotterrel “Software Project Management”, Tata McGraw-Hill, 2009.

OUTCOMES:

- Learners will be able to identify the Key Knowledge Areas and apply PM process in hypothetical project assignments given as continuous assessment.
- They would be able to suitably recognize tools and techniques required for various phases included in the project.
- They would also be able to manage scope, time, cost and other major components that would help them to execute the project efficiently.

GEBX22	NATIONAL SERVICE SCHEME	L	T	P	C
	(Paper: 01 - As per Ministry of Youth Affairs and Sports)	0	0	3	1

OBJECTIVES:

- understand the community in which they work
- understand themselves in relation to their community
- identify the needs and problems of the community and involve them in problem-solving
- develop among themselves a sense of social and civic responsibility
- utilise their knowledge in finding practical solutions to individual and community problems
- develop competence required for group-living and sharing of responsibilities
- gain skills in mobilising community participation
- acquire leadership qualities and democratic attitudes
- develop capacity to meet emergencies and natural disasters and
- practise national integration and social harmony

MODULE I INTRODUCTION AND BASIC CONCEPTS OF NSS 4

History, philosophy, aims & objectives of NSS – Emblem, flag, motto, song, badge, etc. – Organizational structure, roles and responsibilities of various NSS functionaries.

MODULE II NSS PROGRAMMES AND ACTIVITIES 10

Concept of regular activities, special camping, Day Camps – Basis of adoption of village/slums, Methodology of conducting Survey – Financial pattern of the scheme – Other youth programme/schemes of GOI – Coordination with different agencies – Maintenance of the Diary.

MODULE III UNDERSTANDING YOUTH 5

Definition, profile of youth, categories of youth – Issues, challenges and opportunities for youth – Youth as an agent of social change.

MODULE IV COMMUNITY MOBILISATION **9**

Mapping of community stakeholders – Designing the message in the context of the problem and the culture of the community – Identifying methods of mobilisation – Youth-adult partnership.

MODULE V VOLUNTEERISM AND SHRAMDAN **7**

Indian Tradition of volunteerism – Needs and importance of volunteerism – Motivation and Constraints of Volunteerism – Shramdan as a part of volunteerism.

Total Hours: 35