ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

CIVIL ENGINEERING

For

B. TECH. FOUR YEARS DEGREE PROGRAMME

(Applicable for the batches admitted from 2013-14)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

Approved By AICTE, New Delhi
Recognized under 2(f),12(b) of UGC
Permanently Affiliated to JNTUK, Kakinada.
K. Kotturu, TEKKALI-532 201, Srikakulam, Andhra Pradesh

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resources, we input the best quality education in Technology and Management. In the process, we make education more objective so that efficiency for employability increases on a continued basis

VISION OF THE DEPARTMENT

To become a pioneer in the field of civil engineering by providing high quality education and research to serve the public consistently with competitive spirit and professional ethics.

MISSION OF THE DEPARTMENT

1. To provide qualityeducation and advance skills to the students in order to expertise theoretically and practically in the areas of civil engineering.
2. To improve the professional potentiality of the students and staff through educational programmes, consultancy, industry interaction and research in the field of civil engineering
3. To inculcate healthy competitive spirit towards the higher education and successful career in the field of civil engineering.
4. To provide students and faculty with opportunities to create, disseminate and apply knowledge by maintaining a state of the art research centre.
5. To make students ethical and responsible citizens to serve the nation.

THE PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1.**Be employed as a practicing engineer in fields such as design, development, testing and research or undertake higher studies.
2. **PEO2.**Engage in lifelong self-directed learning, a capacity that is vital for success in today's global and rapidly changing engineering environment.
3. **PEO3.**Create new methods / processes to meet the society needs with their knowledge.
4. **PEO4.**Conduct themselves as ethical and responsible professionals with good communication skills and demonstrate leadership skills.

PROGRAM OUTCOMES

a. An ability to apply knowledge of mathematics and science to solve engineering problems appropriate to CIVIL ENGINEERING.

b. An ability to analyze a problem, and identify and define the design requirements appropriate to its solution.

c. An ability to design, implements, and evaluate construction projects and industrial processes to meet desired needs of the society.

d. An ability to function effectively on teams to accomplish a common goal.

e. An ability to identify, formulates, analyze and solve problems and substantiate the conclusions.

f. An understanding of professional, ethical, legal, security and social issues and responsibilities.

g. An ability to communicate the engineering activities effectively with a range of audience.

h. An ability to analyze the local and global impact of CIVIL ENGINEERING on individuals, organizations, and society.

i. Recognition of the need for and an ability to engage in continuing professional development through Life Long Learning.

j. An ability to continuously update their knowledge on contemporary issues.

k. An ability to use current techniques, skills, and tools necessary for CIVIL ENGINEERING practice.

l. An ability to qualify in competitive examinations like GATE, IES etc,

Academic Regulations 2013 for B. Tech.
(Effective for the students admitted into I year from the Academic Year 2013-2014 and onwards)

1. Award of B. Tech. Degree:
   A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.
   (a) Pursued a course of study for not less than four academic years and not more than eight academic years.
   (b) Registered for **180** credits and he/she must secure total **180** credits.

2. Students, who fail to complete their Four years Course of study within **8** years or fail to acquire the 180 Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. Courses of study:
   The following courses of study are offered at present with specialization in the B. Tech. Course.

S. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology

   And any other course as approved by the authorities of the University from time to time.

4. Credits (Semester system from I year onwards):

Sl. No	Course	Credits
1	Theory Course	02/03
2	Laboratory Course	02
3	Advanced Laboratory Course	03
3	Self Study course/Internship	01
4	Employability skills	02
5	Project	06

5. Evaluation Methodology:
   The performance of a student in each semester shall be evaluated subject – wise with a maximum of **100** marks for theory course and **75** marks for laboratory and other courses. The project work shall be evaluated for **200** marks.

5.1 Theory course:
   For theory courses the distribution shall be **30** marks for Internal Evaluation and **70** marks for the End - Examinations.
   Out of 30 internal marks – **25** marks are assigned for descriptive exam and **5** marks for assignments.

(i) Pattern for Internal Midterm Examinations (25 marks):
   For theory courses of each semester there shall be **3** Midterm descriptive/objective exams. Each descriptive/objective exam consists of **120** minutes duration for **25** marks. The average of the best two out of three Mid exams will be taken for the assessment of internal marks.
   The first Midterm examination to be conducted usually after **5** weeks of instruction, the second Midterm examination to be conducted usually after **11** weeks of instruction and the third Midterm examination will be conducted usually after **17** weeks of instruction. Each Midterm question paper shall contain **4** questions, out of 4 questions first question is objective type which

contains 10 questions with 1 mark each (10 x 1 =10M) and remaining 3 questions are descriptive type (3 x 10= 30M). The student should answer all **4** questions.

(ii)   Pattern for External End Examinations (70 marks):
(a) There shall be an external examination for every theory course and consists of two parts   (part-A and part-B). The   duration of the time for this end examination is 3 hours.
(b) Part-A shall contain 10 marks , which is compulsory. It has 10 short questions with 1 mark each (10x1=10M). Two questions will be given from each unit.
(c)Part-B of the question paper shall have descriptive type questions for 60 marks. There shall be two questions from each unit with internal choice. Each question   carries 12 marks. Each course shall consist of 5 units of syllabus.

5.2   Laboratory Course:
(i) **(a)** For practical subjects there shall be continuous evaluation during the semester for **25**   internal marks and **50** semester end examination marks. Out of the **25** marks for internal: **10** marks for day to day work, **5** for record and **10** marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.
(b)   For the benefit of the students, two advanced labs are introduced with some specialized areas in each B.Tech. Program.
(ii.)   For the course having design and / or drawing, (such as Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for day – to – day work, and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests.

5.3   Project Work:
Out of a total of 200 marks for the project work, **60** marks shall be for Project Internal Evaluation and **140** marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee.

5.4 Self Study course:
Four Periods per week (which includes library, e-learning, Internet and presentation) are allotted for this course. Self Study shall be evaluated for 75 Marks.
Out of **75** Marks, **25** marks for day-to-day evaluation and **50** marks on the basis of end examination conducted by internal committee consisting of Head of the Department, Two Senior faculty Members of the department concerned. There shall be no external examination for self-study.

5.5 Audit Course:
Audit course is one among the compulsory courses and does not carry any credits. The audit courses will start from the II year I- semester onwards. The list of audit courses are shown below:
i)   Professional Ethics and Morals
ii) IPR & Patents

5.6 Employability Skills:
Employability skills shall be evaluated for **75** marks. **25** marks for day-to-day evaluation and **50** marks on the basis of end (internal) examination. There is no external examination for employability skills.

5.7 Internship:
All the students shall undergo the internship period of **4** weeks and the students have an option of choosing their own industry which may be related to their respective branch. A self study report for

the internship shall be submitted and evaluated during the IV year II-Semester and will be evaluated for a total of **75** marks consists of **25** marks for internal assessment and **50** marks for end examination.

Internal assessment for **25** marks shall be done by the internship supervisor. Semester end examination for **50** marks shall be conducted by committee consists of Head of the Department, internal supervisor and an external examiner.

6. Attendance Requirements:

(i) A student shall be eligible to appear for End Semester examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.

(ii) Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below 75%) in each semester with genuine reasons and shall be approved by a committee duly appointed by the college. The condonation approved otherwise it can be reviewed by the College academic committee.

(iii) A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

(iv) Shortage of Attendance below **65%** in aggregate shall in NO case be condoned.

(v) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

(vi) A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

7. Minimum Academic Requirements:
7.1 Conditions for pass and award of credits for a course:

A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks (Internal & Semester end examination marks put together), subject to a minimum of 35% marks in semester end examination.

a) On passing a course of a programme, the student shall earn assigned credits in that Course.

7.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Grade Points	Letter Grade
90-100%	10	S
80-89%	9	A
70-79%	8	B
60-69%	7	C
50-59%	6	D
40-49%	5	E
< 40%	0	F (Fail)

7.3 Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$SGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR}$$ (for all courses passed in semester)

Where CR = Credits of a Course

GP = Grade points awarded for a course

*SGPA is calculated for the candidates who passed all the courses in that semester.

7.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$CGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(For entire programme)}$$

Where CR = Credits of a course

GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	Class Awarded
≥ 7.75	First Class with distinction
≥ 6.75 and < 7.75	First Class
≥ 5.75 and < 6.75	Second Class
≥ 5.00 and < 5.75	Pass Class
< 5	Fail

7.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

7.6 Conditions for Promotion:

(i) A student will be promoted to second year, if he/she put up the minimum attendance requirement.

(ii) A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if number credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

(iii) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

(iv) A student shall register and put up minimum attendance in all **180** credits and earn all **180** credits, marks obtained in **180** credits shall be considered for the calculation of percentage of marks.

8. Course pattern:

(i) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii) A student is eligible to appear for the end examination in a subject, but absent for it or failed in the end examinations may appear for that subject's **supplementary** examinations, when offered.

(iii) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold good with the regulations he/she first admitted.

9. Minimum Instruction Days:

The minimum instruction days for each semester shall be **95** clear instruction days.

10. There shall be no branch transfer after the completion of admission process.

11. General:

(i) Where the words "he" "him" "his", occur in the regulations, they include "she", "her", "hers".

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

(iii) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

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

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT: TEKKALI
SRIKAKULAM-532201, Andhra Pradesh (India)
Academic Regulations 2014 for B. Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2014- 2015 and onwards)

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

A student will be declared eligible for the award of the B. Tech. Degree if he / she fulfill the following academic regulations.

(a.)   Pursued a course of study for not less than three academic years and not more   than   six academic years.

(b)   Registered for **131** credits and must secure **131** credits.

2.   Students, who fail to complete their three year Course of study within six years or fail to acquire the **131** Credits for the award of the degree within **6** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. **Promotion Rule:**

(a) A lateral entry student will be promoted to II year to III year if he puts up the minimum required attendance in II year.

(b) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations , whether the candidate takes the examinations or not.

4. Minimum Academic Requirements:

4.1 Conditions for pass and award of credits for a course:

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks (Internal & Semester end examination marks put together), subject to a minimum of 35% marks in semester end examination.

b) On passing a course of a programme, the student shall earn assigned credits in that Course.

4.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on   his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Grade Points	Letter Grade
90-100%	10	S
80-89%	9	A
70-79%	8	B
60-69%	7	C
50-59%	6	D
40-49%	5	E
< 40%	0	F (Fail)

4.3 Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}}$$ (for all courses passed in semester)

Where CR = Credits of a Course

GP = Grade points awarded for a course

 *SGPA is calculated for the candidates who passed all the courses in that semester.

4.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(for entire programme)}$$

Where CR = Credits of a course
GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	Class Awarded
≥ 7.75	First Class with distinction
≥ 6.75 and < 7.75	First Class
≥ 5.75 and < 6.75	Second Class
≥ 5.00 and < 5.75	Pass Class
< 5	Fail

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

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or students in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.
3	If the student impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all

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

		semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the student possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.
10	If the student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT (AUTONOMOUS), TEKKALI
B.TECH (CIVIL ENGINEERING)
Course Structure

I YEAR

S. No.	Codes	Theory / Labs	L	T	P	C	Marks Int	Marks Ext	Total

		I Semester							
S. No.	**Codes**	**Theory / Labs**	**L**	**T**	**P**	**C**	**Int**	**Ext**	**Total**
1	13HS1001	English –I	3	1		3	30	70	100
2	13BS1001	Engineering Mathematics –I	3	1		3	30	70	100
3	13BS1002	Engineering Mathematics – II	3	1		3	30	70	100
4	13CS1001	Computer Programming	3	1		3	30	70	100
5	13ME1001	Engineering Drawing	1		3	3	30	70	100
6	13BS1004	Engineering Physics	3	1		3	30	70	100
7	13CS1101	Computer Programming Lab			3	2	25	50	75
8	13ME1101	Engineering Workshop			3	2	25	50	75
9	13BS1101	Engineering Physics Lab			3	2	25	50	75
		Total Credits	16	5	12	**24**	255	570	825

		II Semester							
S. No.	**codes**	**Theory / Labs**	**L**	**T**	**P**	**C**	**INT**	**EXT**	**Total**
1	13HS1002	English – II	2	1		2	30	70	100
2	13HS1003	Environmental Studies	3	1		3	30	70	100
3	13BS1003	Engineering Mathematics – III	3	1		3	30	70	100
4	13EE1002	Basic Electrical &Electronics Engineering	3	1		3	30	70	100
5	13ME1003	Engineering Mechanics	3	1		3	30	70	100
6	13BS1005	Engineering Chemistry	3	1		3	30	70	100
7	13HS1101	Basic English Language Communication Skills Lab			3	2	25	50	75
8	13BS1102	Engineering Chemistry Lab			3	2	25	50	75
9	13CS1103	Information Technology Workshop Lab			3	2	25	50	75
10	13EE1102	Electrical &Electronics Engg. Lab			3	2	25	50	75
		Total Credits	17	6	12	**25**	280	620	900

II YEAR

I Semester

S. No.	codes	Theory / Labs	L	T	P	C	Marks		Total
							INT	EXT	
1	13BS2007	Complex Variables and Statistical Methods	3	1		3	30	70	100
2	13CE2001	Strength of Materials-I	3	1		3	30	70	100
3	13CE2002	Surveying	3	1		3	30	70	100
4	13CE2003	Engineering Geology	3	1		3	30	70	100
5	13CE2004	Fluid mechanics	3	1		3	30	70	100
6	13CE2101	Engineering Geology Lab	1		3	2	25	50	75
7	13CE2102	Strength of Material Lab			3	2	25	50	75
8	13CE2103	Surveying Lab-I			3	2	25	50	75
9	13HS2102	Advanced English Language Communication Skills Lab			3	2	25	50	75
10	13CE2201	Self Study course-I **(4)**				1	75	-	75
		Total	16	5	12	**24**	325	550	875

II Semester

S. No.	Codes	Theory / Labs	L	T	P	C	Marks		Total
							INT	EXT	
1	13HS2004	Managerial Economics &Financial Analysis	3	1		3	30	70	100
2	13CE2005	Construction Materials and Practice	3	1		3	30	70	100
3	13CE2006	Strength of Materials-II	3	1		3	30	70	100
4	13CE2007	Hydraulics and Hydraulic Machinery	3	1		3	30	70	100
5	13CE2008	Structural Analysis-I	3	1		3	30	70	100
6	13CE2009	Concrete Technology	3	1		3	30	70	100
7	13CE2104	MOF & Hydraulic Machinery Lab			3	2	25	50	75
8	13CE2105	Concrete Technology Lab			3	2	25	50	75
9	13HS2201	Professional Ethics & Morals	2						
		Total Credits	20	6	6	**22**	230	520	750

I Semester

S. No.	codes	Theory / Labs	L	T	P	C	INT	EXT	Total
							Marks		
1	13CE3010	Building Drawing and Planning	3	1		3	30	70	100
2	13CE3011	Transportation Engineering	3	1		3	30	70	100
3	13CE3012	Design and Drawing of Concrete Structures-I	3	1		3	30	70	100
4	13CE3013	Geotechnical Engineering – I	3	1		3	30	70	100
5	13CE3014	Structural Analysis-II	3	1		3	30	70	100
6	13CE3106	Surveying Lab –II			3	2	25	50	75
7	13CE3107	Computer Aided Engineering Drawing Practice			3	2	25	50	75
8	13CE3108	Transportation Engineering Lab			3	2	25	50	75
9	13CE3202	Self study course-II **(4)**				1	75	-	75
	Total Credits		15	5	9	**22**	300	500	800

II Semester

S. No.	Codes	Theory / Labs	L	T	P	C	INT	EXT	Total
							Marks		
1	13CE3015	Design of Concrete Structures-II	3	1		3	30	70	100
2	13CE3016	Design of Steel Structures	3	1		3	30	70	100
3	13CE3017	Geotechnical Engineering –II	3	1		3	30	70	100
4	13CE3018	Transportation Engineering-II	3	1		3	30	70	100
5	13CE3019	Water Resources Engineering	3	1		3	30	70	100
6		**Elective 1**	3	1		3	30	70	100
	13CE3020	I. Earthquake Resistant Design							
	13CE3021	II. Industrial Waste and Waste Water Management							
	13CE3022	III. Traffic Engineering							
	13CE3023	IV. Prestressed Concrete							
7	13CE3109	Drawing of Concrete and steel Structures			3	2	25	50	75
8	13CE3110	STAAD Pro lab			4	3	25	50	75
9	13HS3202	IPR & Patents	2						
	Total Credits		20	6	7	**23**	230	520	750

| S. No. | Codes | Theory / Labs | L | T | P | C | Marks | | Total |
							INT	EXT	
1	13CE4024	Environmental Engineering	3	1		3	30	70	100
2	13CE4025	Estimation and Quantity Surveying	3	1		3	30	70	100
3	13CE4026	Remote Sensing and GIS Applications	3	1		3	30	70	100
4		**Elective 2**	3	1		3	30	70	100
	13CE4027	I. Water Resources System Planning and Management							
	13CE4028	II. Air Pollution and Control							
	13CE4029	III. Ground Improvement Techniques							
	13CE4030	IV. Hydraulic Structures and Irrigation Design & Drawing							
5		**Open Elective**	3	1		3	30	70	100
	13OE4001	I. Air Quality Management							
	13OE4002	II. Cyber Laws							
	13OE4003	III. Entrepreneur Development							
	13OE4004	IV. Industrial Safety & Environment							
	13OE4005	V.MEMS							
	13OE4006	VI. Optimization Techniques							
	13OE4007	VII. Renewable Energy							
	13OE4008	VIII. Smart Materials							
	13OE4009	IX. Total Quality Management							
6	13CE4111	Environmental Engineering Lab			3	2	25	50	75
7	13CE4112	Geotechnical Engineering Lab			3	2	25	50	75
8	13CE4113	GIS Lab			4	3	25	50	75
9	13HS4203	Employability Skills			3	2	75	-	75
Total Credits			15	5	13	**24**	300	500	800

S. No.	Codes	Theory / Labs	L	T	P	C	Marks INT	Marks EXT	Total
		II Semester							
1	13CE4031	Finite Element Methods	3	1		3	30	70	100
2		**Elective 3**	3	1		3	30	70	100
	13CE4032	I. Advanced Structural Design							
	13CE4033	II. Ground Water Development and Management							
	13CE4034	III. Environmental Impact Assessment and Management							
	13CE4035	IV. Soil Dynamics and Machine Foundations							
3		**Elective 4**	3	1		3	30	70	100
	13CE4036	I. Water Shed Management							
	13CE4037	II. Pavement Analysis and Design							
	13CE4038	III. Advanced Structural Analysis							
	13CE4039	IV. Bridge Engineering							
4	13CE4203	Internship				1	25	50	75
5	13CE4204	Project work				6	60	140	200
		Total Credits	9	3		**16**	175	400	575

I YEAR

		I Semester							
S. No.	**Codes**	**Theory / Labs**	**L**	**T**	**P**	**C**	**Marks**		**Total**
							Int	**Ext**	
1	13HS1001	English –I	3	1		3	30	70	100
2	13BS1001	Engineering Mathematics –I	3	1		3	30	70	100
3	13BS1002	Engineering Mathematics – II	3	1		3	30	70	100
4	13CS1001	Computer Programming	3	1		3	30	70	100
5	13ME1001	Engineering Drawing	1		3	3	30	70	100
6	13BS1004	Engineering Physics	3	1		3	30	70	100
7	13CS1101	Computer Programming Lab			3	2	25	50	75
8	13ME1101	Engineering Workshop			3	2	25	50	75
9	13BS1101	Engineering Physics Lab			3	2	25	50	75
		Total Credits	16	5	12	**24**	255	570	825

ENGLISH – I
(Common to All Branches)

Subject Code: 13HS1001   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- To improve the language proficiency of a technical under-graduate in English with emphasis on LSRW skills.
- To provide learning environment to practice listening, speaking, reading and writing skills.
- To effectively integrate English language learning with employability skills and training.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.
- To expose the students to a variety of self-instructional modes of language learning.

Course Outcomes
- Students will be able to **use** English language in their day-to-day life.
- Students will be able to **employ** LSRW skills within and beyond the classroom environment.
- Students will be able to **integrate** English Language Learning with employability skills.
- Students will be able to **demonstrate** better with more observation and practice.
- Students will be able to **relate** classroom language learning to the real life situations.
- Students will be able to **interpret** things and draw **inferences** accordingly.

Syllabus
Unit-I: *Lost Forests* by Johannes V Jensen
       Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-II: *More Than 100 Million Women Missing* by Amartya Sen
       Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-III: *Three Days to See* by Helen Keller
       Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-IV: *Reaching the Stars* by Kalpana Chawla
       Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-V: *Kalahandi* by Jagannath Prasad Das
       Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
References:
1. "Musings on Vital Issues". Ed. P.J. George Pub: Orient Blackswan
2. *My Story* by Helen Keller
3. *Kalpana Chawla: A Life* by Padmanabham, Anil
4. Word *Power Made Easy* by Norman Lewis

ENGINEERING MATHEMATICS-I
(Common to All Branches)

Subject Code: 13BS1001 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives
- Solve the 1st order differential equations choosing suitable method and apply to estimate population, temperature, quantity and trajectory.
- Solve a 2nd and higher order differential equations with constant coefficients, choosing suitable rule & apply to LCR Circuits and Simple Harmonic equations.
- Write Taylor series and Mc Laurent's series for two variable functions and calculate extreme values of two variable functions, three variable functions with constraints.
- Solve the single, multiple integrals, calculate surface and volume of solids choosing suitable integral, calculate the moment of inertia.
- Calculate gradient, divergence, curl of a function. To solve line, surface and volume integrals and apply to calculate work done, area volume. Evaluate multiple integrals using suitable vector integral theorems.

Course Outcomes
- Can solve the 1st order differential equations choosing suitable method and apply to estimate population, temperature, quantity and trajectory.
- Can solve a 2nd and higher order differential equations with constant coefficients, choosing suitable rule & apply to LCR Circuits and Simple Harmonic equations.
- Can identify Taylor series and Mc Laurent's series for two variable functions and calculate extreme values of two variable functions, three variable functions with constraints.
- Can solve the single, multiple integrals, calculate surface and volume of solids choosing suitable integral, and calculate the moment of inertia.
- Can calculate gradient, divergence, curl of a function, solve line, surface and volume integrals and apply to calculate work done, area, volume. Evaluate the multiple integrals by integrating suitable vector integral theorems.

Unit – I
Linear Differential Equations of first order:
Linear differential equations of first order and first degree – exact, linear and Bernoulli. Applications: Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

Unit-II
Linear Differential Equations of Second and higher order:
Linear differential equations of second and higher order with constant coefficients- Complete solution, Operator D, Rules for finding complementary function, Inverse operator D, Rules for finding particular integral with RHS term of the type e ^{ax} , Sin ax, cos ax, polynomials in x, e ^{ax} V(x), xV(x). Method of variation of parameters.
Applications: LCR circuit, Simple Harmonic motion

Unit-III
Partial Differentiation:
Introduction-Total derivative - Chain rule - Generalized Mean Value theorem for single variable (without proof)-Taylors and Mc Laurent's series for two variables – Functional dependence – Jacobian.
Application: Maxima and Minima of functions of two variables with constraints and without constraints.

Unit-IV
Multiple Integrals:
Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates.
Multiple integrals - double and triple integrals – change of variables – Change of order of Integration-Cartesian and Polar coordinates.
Application: Moment of inertia

Unit-V
Vector Calculus:
Vector Differentiation:Gradient- Divergence- Curl - Laplacian and second order operators- Vector identies.
Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals.
Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems.
Applications: Work done, Force.

Text Books:
1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics, Volume-I, 11th editions respt., 2012, Dr. T.K.V.Iyengar & others, S. Chand Publishers.

Reference Books:
1. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
2. A Text Book of Engineering Mathematics – I & II, 2nd edition, 2011, U. M. Swamy & others – Excel Books, New Delhi.
3. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt.Ltd, Noida.

ENGINEERING MATHEMATICS – II
(Common to all branches)

Subject Code: 13BS1002   **Internal Marks: 30**
Credits: 3   **External Marks:70**

Course Objectives
- Solve the algebraic and transcendental equations, using different numerical method. Estimate the best curve for a given data.
- Calculate the value of dependent variable for a particular x by deducing the unknown function y=f(x) for an evenly or unevenly spaced points, estimate the value of derivatives, evaluate the definite integrals using different numerical methods.
- To calculate the numerical solution of an ordinary differential equation i.e IVP .
- Deduce Laplace transform of continuous functions using Laplace transform formulae & properties. Apply Laplace transform to solve I.V.P &B.V.P
- Solve linear and non-linear 1st order partial differential equation. Evaluate wave equations & heat equations, using method of separation of variables.

Course Outcomes
- Can solve the algebraic and transcendental equations by different numerical methods and estimate a linear and non-linear curve to the given data by the method of least squares.
- Can calculate the value of dependent variable for a particular x by deducing the unknown function y = f(x) for an evenly or unevenly spaced points, estimate the value of derivatives, evaluate the definite integrals using different numerical methods.
- Can calculate the numerical solution of an ordinary differential equation i.e IVP .
- Can deduce Laplace transform of continuous functions using Laplace transform formulae & properties. Apply Laplace transform to solve I.V.P & B.V.P
- Can solve linear and non-linear 1st order partial differential equation. Evaluate wave equations & heat equations using method of separation of variables.

Unit – I
Algebraic and Transcendental Equations and Curve fitting:
Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.
Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.
Unit-II
Interpolation and Numerical Differentiation and Integration:
Interpolation**:** Introduction – Finite differences- Forward Differences – Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial – Newton's formulae for interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula.
Numerical Differentiation and Integration – Differentiation using finite differences – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.
Unit-III
Numerical solution of Ordinary Differential equations:
Solution by Taylor's series – Picard's Method of successive Approximations – Euler's and Modified Euler's Method – Runge – Kutta Methods – Predictor – Corrector Methods – Milne's Method.

Unit-IV
Laplace and Inverse Laplace transforms:
Laplace transforms of standard functions – Shifting Theorems, Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem.
Application: Solution of ordinary differential equations using Laplace transforms.
Unit-V
Partial Differential equations:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and non-linear (standard type) equations. Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables.
Applications: One dimensional Wave and Heat equations.
Text Books:
1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.
Reference Books:
1. Mathematical Methods, 6th edition, 2011, Dr. T. K.V.Iyengar & others S. Chand Publications.
2. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
3. Engineering Mathematics Volume-II, 6th edition, 2012, T.K.V Iyengar, &others, S.Chand Co. New Delhi.

COMPUTER PROGRAMMING
(Common to all branches)

Subject Code: 13CS1001   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To impart the knowledge about pointers which is the backbone of effective memory handling
- To study the advantages of user defined data type which provides flexibility for application development
- To teach the basics of preprocessors available with C compiler.

Course Outcomes
- Understand the fundamentals of C programming.
- Choose the loops and decision making statements to solve the problem.
- Implement different operations on arrays and solve problems using functions.
- Understand pointers, structures and unions.
- Implement file operations in C programming for a given application.

UNIT I:
Problem Solving*:* Definition of a Problem, A Framework for Problem Solving, Classification of Problems, Algorithms / Pseudo code- Definition, Properties, Flowchart- Introduction, Introduction to RAPTOR Tool, Flowchart examples for simple computational problems, Program Development Steps, Computer Languages- Machine, Symbolic and High-level, Creating and Running Programs: writing, editing, compiling, linking and executing.

C Fundamentals, Character set, C tokens (Identifier and Keywords, Data types, Constants, variables), Declarations, Expressions, Statements

C Operators: Arithmetic, Unary, Relational and Logical, Assignment and Conditional Operators, Library Functions. Bit Operations and Boolean Logic

UNIT II:
CONTROL STRUCTURES: if statement, if…else statement-various forms of if, nested if.
ITERATIVE LOOPS: while, do-while and for statements, initialization and updating, event and counter controlled loops, looping applications, break statement, continue statement, goto statement, switch statement, nested switch statement, comma statement.

UNIT III:
FUNCTIONS – MODULAR PROGRAMMING: Functions, basics, parameter passing, Storage classes-extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions, header files, example c programs. Passing 1-D arrays, 2-D arrays to functions, parameter passing mechanisms (passing by value), storage classes (auto, register, extern, static), scope of variable
ARRAYS: Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings concepts, String handling functions and string manipulations, 1-D arrays, 2-D arrays and character arrays, Multidimensional arrays , Array applications: Matrix Operations

UNIT IV:
POINTERS: Pointer definition, pointers concepts, initialization of pointer variables, pointers and function arguments, passing by address, dangling memory, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.
ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications.

UNIT V:
FILE HANDLING: Input and output – concept of a file, Creating, processing, opening and closing – Bitwise Operations, text files and binary files, Formatted I/o, file I/o operations, example programs. C pre-processor

Text Books:
    1. The C – Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI
    2. Let Us C, Yashwant Kanitker, Second Edition

Reference Books:
    1. C and data structures: A Snap Shot Oriented Treatise Using Live Engineering Examples" by Dr. N.B. Venkateswarlu, S Changd & Co, New Delhi.
    2. C Programming: A Problem- Solving Approach", Forouzan, E. V. Prasad, Giliberg, Cengage, 2010.
    3. Programming in C, Stephen G. Kochan, 3/e Pearson, 2007
    4. Web-link http://raptor.martincarlisle.com/

ENGINEERING DRAWING
(Common to all branches)

Subject Code: 13ME1001   **Internal Marks: 30**
Credits: 3   **External Marks:70**

Course Objectives
• Able to develop drawing skill and representation of I angle and III angle projection, isometric Projection, Isometric drawing**.**

Course Outcomes
• An ability to apply knowledge of engineering drawing principles in other subjects in Mechanical Engineering and other Engineering disciplines.
• Should be able to understand the Machine & Component drawing skill in other semesters.

UNIT I
Lettering and Dimensioning: Introduction to various terms; instruments IS 9609 provision, lettering practice. Elements of dimensioning and systems of dimensioning**.**
Construction of scales: Plain Scale, Diagonal & Vernier Scales**.**
Geometric Constructions and Engineering Curves: Construction of Polygons, Construction of Conic sections–parabola, ellipse and hyperbola using General Method, construction of ellipse using oblong, arc's of circles and concentric circles methods.

UNIT II
Orthographic Projections: First and Third Angle Projections - Projections of Points - Projections of Straight Lines inclined to one reference plane.

UNIT III
Projections of planes - Perpendicular planes & planes inclined to one reference plane and both reference planes.

UNIT IV
Projections of solids: Classification of solids. Projections of Prism, Cylinder, Pyramid and Cone inclined to one reference plan**e.**

UNIT V
Conversion of Orthographic Projections to Isometric Projections: Conversion of Orthographic View to Isometric views
Conversion of Isometric Projection to Orthographic Projections: Conversion of Isometric view to Orthographic views

Text Books:
   1. Engineering Drawing, by N. D. Bhat & V. M Panchall, Charotar Publishing House.
   2. Engineering Drawing, by K.L.Narayana & P.Kanniah

Reference Books:
   1. K. Venugopal, Engineering Drawing and Graphics, 2nd Ed. New Age International.
   2. Luzadder, Warren, J. and Jon. D. M., "Fundamentals of Engineering Drawing", 11th Edition, Prentice Hall India.

ENGINEERING PHYSICS
(Common to all branches)

Subject Code: 13BS1004 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives
- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers and Fiber Optics
- To appreciate general principles of crystal and molecular structures and infer X-ray diffraction as an experimental method for determining crystal structures
- To possess an insight on Magnetic Properties and Dielectric Materials pertaining to Material Fabrication
- To define the shortcoming of classical physics and describe the need for modifications to classical theory

Course Outcomes
Will be able to
- CO1 apply the principles of optics in designing optical devices
- CO2 outline the Principles of Lasers and Fiber Optics
- CO3 explain general principles of crystal and molecular structures and infer X-ray diffraction as an experimental method for determining crystal structures
- CO4 Interpret the knowledge of Magnetic Properties and Dielectric Materials in Material Fabrication
- CO5 resolve the discrepancies in classical estimates through quantum principles

UNIT- I
WAVE OPTICS
Interference -Introduction, Principle of Superposition of Waves, Coherence –Young's Double Slit Experiment – Intensity Distribution and Fringe Width, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light.
Diffraction - Introduction, Types of Diffraction [Fresnel & Fraunhofer], Fraunhofer Diffraction due to Single Slit – Intensity Distribution Differences between Interference and Diffraction.

UNIT-II
LASERS & FIBER OPTICS
Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission; Einsteins's Coefficients, Population Inversion, Optical Resonator and Lasing Action, Ruby Laser, Helium-Neon Laser, Applications of Lasers in Industry, Scientific and Medical Fields.
Fiber Optics -Introduction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Optical Fiber Construction, Types of Optical Fibers – Step Index Fibers and Graded Index Fibers, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Advantages of Optical Fibers in Communications.

UNIT-III
INTRODUCTORY SOLID STATE PHYSICS

Crystal Structure - Introduction, Basic Terms – Lattice, Basis, Crystal Structure, Coordination Number, Atomic Radius, Packing Fraction, Free Volume, Lattice Parameters, Unit Cell and Primitive Cell, Crystal Systems and Bravais Lattices, Structure and Packing Fractions of Simple Cubic, Body Centered Cubic and Face Centered Cubic Crystal Structures.

X-Ray Diffraction -Crystal Planes, Directions and Miller Indices, Distance of Separation between successive hkl Planes – Inter Planar Spacing, Diffraction of X-Rays by Crystal Planes – Bragg's Law.

UNIT-IV
ESSENTIALS OF MATERIAL SCIENCE

Magnetic Properties -Introduction, Basic Terms – Magnetic Flux (φ), Magnetic Flux Density or Magnetic Field Induction (B), Magnetic Field Intensity or Magnetic Field Strength (H), Intensity of Magnetization (I), Permeabilty (μ) & Relative Permeability (μ_r) and Susceptibility (χ), Relation between B, H & I, Relation between Relative Permeability and Susceptibility, Origin of Magnetic Moment – Bohr Magneton, Classification of Magnetic Materials – Dia, Para and Ferro, Domain Theory of Ferromagnetism – Hysteresis Curve; Soft and Hard Magnetic Materials.

Dielectric Properties - Introduction, Basic Terms – Electric Field (E), Electric Dipole, Electric Dipole Moment (μ_e), Polarizability (α), Polarization Vector (P), Displacement Vector (D), Permittivity (ε) and Relative Permittivity or Dielectric Constant (ε_r), and Electric Susceptibility (χ_e), Relation between D, E & P, Relation between Relative Permittivity and Susceptibility, Electronic Polarizability, Ionic Polarizability, Orienational Polarizability and Total Polarizability, Definitions of Ferro Electricity and Piezoelectricity.

UNIT-V
FREE ELECTRON THEORY & PRELIMINARY QUANTUM MECHANICS

Free Electron Theory -Introduction, Classical Free Electron Theory, Mean free path, Relaxation time, Drift velocity, Mobility, Current Density and Electrical Conductivity.

Preliminary Quantum Mechanics - Introduction, Waves and Particles, Wave Particle Duality and De-Broglie Hypothesis, Experimental Verification – G. P. Thomson Experiment, Time independent Schrödinger wave equation, Physical Significance of Wave Function, Particle in One Dimensional Potential Box.

Text Books:
1. Engineering Physics by Mani Naidu, Pearson Publications Chennai
2. A Text Book of Engineering Physics by Ksheera Sager and Avadhanulu
3. Engineering Physics by Gaur and Gupta

Reference Books:
1. University Physics by Young and Freedman 12th Edition.
2. Fundamental of Physics by Resnick, Halliday and Walker

COMPUTER PROGRAMMING LAB
(Common to all branches)

Subject Code: 13CS1101 **Internal Marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives
- To provide the student with the necessary skills to write and debug programs using the C programming language
- To provide coverage of basic structure of c programming language
- To provide an understanding of the major modules of c programming language

Course Outcomes
On successful completion of this module, students should be able to:
- Solve the given problem using the syntactical structures of C language
- Develop , execute solution for various problems using the Control structures of C language
- Design programs involving arrays.
- Implement modularity and code reusability concepts using functions.
- To read and write C program that uses pointers, structures and Unions
- Implement the C programs using files

Exercise 1
a) Write C programs for calculating • Temperature conversions • Income tax • Area of triangle
b) Write a C program that reads an integer 'n' and rotate 'n' bit positions
c) Write a C program to swap contents of two variables without using third variable.

Exercise 2
a) Write a C program to find the student's grade for given marks.
b) Write a C program to find the greatest of 3 given numbers.
c) Write a C program which takes two integer operands and one operator from the user, perform the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 3
a) Write a C program to find the sum of individual digits of a positive integer.
b) Write a C program to generate the first 'n' terms of the Fibonacci sequence.
c) Write a C program to generate all the prime numbers between 1 and 'n'.
d) Write a C program to find the reverse a given number.

Exercise 4
a) Write a C program for Addition and multiplication of two Matrices.
b) Write a C program to find the transpose of a matrix in in-place manner.

Exercise 5
Write a C program that uses functions to perform the following operations:
a) To insert a sub-string in to given main string from a given position.
b) To delete n Characters from a given position in a given string.
c) Simple programming examples to manipulate strings.
d) Verifying a string for its palindrome property

Exercise 6

Write C programs that use both recursive and non-recursive functions for the following

a) To find the factorial of a given integer.

b) To find the GCD (greatest common divisor) of two given integers.

Exercise 7

a) Write a C functions to find both the largest and smallest number of an array of integers.

b) Write a C function that uses functions to perform the following:

  i) that displays the position/ index in the string S where the string T begins, or –1 if S doesn't contain T.

  ii) to count the lines, words and characters in a given text.

Exercise 8

a) Write a C function to generate Pascal's triangle.

b) Write a C function to construct a pyramid of numbers.

c) Write a C function to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$

Exercise 9

a. Write a C program Pointer based function to exchange value of two integers using passing by address.

b. Write a C program which explains the use of dynamic arrays.

c. Write a C program to enlighten dangling memory problem (Creating a 2-D array dynamically using pointer to pointers approach.

Exercise 10

Write a C programs for Examples which explores the use of structures, union and other user defined variables

Exercise 11

Write a C program that uses functions to perform the following operations using Structure:

  a) Reading a complex number   b) Writing a complex number

  c) Addition of two complex numbers   d) Multiplication of two complex numbers

Exercise 12

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line)

Reference Books:

1. C and data structures – Dr. N.B Venkateswarlu, B.S. Publications.

2. C Programming: A Problem - Solving Approach, Forouzan, E. V. Prasad, Giliberg, Cengage, 2010.

3. Programming in C, Stephen G. Kochan, 3/e Pearson, 2007

4. The C – Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI

ENGINEERING WORKSHOP
(Common to all branches)

Subject Code: 13ME1101   **Internal Marks: 30**
Credits: 2   **External Marks:70**

Course Objectives
- The Engineering Workshop Practice for engineers is a training lab course spread over entire year. The modules include training on different trades like Fitting, Carpentry, Black smithy etc… which makes the students to learn how various joints are made using wood and other metal pieces**.**

Course Outcomes
- Student will be able to make various joints in the given object with the available work material.
- Student will be able to know how much time a joint will take for the assessment of time

I. Wood Working Technology - Familiarity with different types of woods used and tools used in wood Working technology.
Tasks to be performed:

1) To make Half – Lap joint	2) To make Mortise and Tenon joint
3) To make Corner Dovetail joint	4) To make Briddle joint.

II. Sheet Metal Working – Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.
Tasks to be performed:

1) To make Square Tray	2) To make Taper side Tray
3) To make Conical Funnel	4) To make Elbow Pipe.

III. Forging Technology – Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...
Tasks to be performed:

1) To make round M.S rod to square bar	2) To make L bend in given M.S. Rod.
3) To make S bend in given M.S. Rod.	4) To perform heat treatment tests like annealing, normalizing etc...

IV. Fitting Technology – Familiarity with different types of tools used in fitting technology.
Tasks to be performed:

1) To make "V" – fitting	2) To make square fitting
3) To make Dovetail fitting	4) To make Straight fitting

V.HOUSE WIRING
1) Tube light connection
2) Staircase connection

Note: Any two jobs from each trade must be performed by the student.

ENGINEERING PHYSICS LAB
(Common to all branches)

Subject Code: 13BS1101   **Internal Marks: 30**
Credits: 2   **External Marks: 70**

Course Objectives
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To use classic experimental techniques to understand the Phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties
- To operate optical systems and design Instrumentation thereof with targeted accuracy with physical measurements
- To attain ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To characterize magnetic, dielectric and semiconducting material devices

Course Outcomes
Will be able to
- infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- apply classic experimental techniques to comprehend the Phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties
- demonstrate the ability to measure properties of optical systems and design Instrumentation thereof with targeted accuracy for physical measurements
- llustrate Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- evaluate characteristics of magnetic, dielectric and semiconducting material devices

LIST OF EXPERIMENTS (Any Twelve Experiments have to be completed)
1. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
2. Verification of Laws of Transverse vibrations in Stretched Strings using Sonometer
3. Wedge method – Determination of Thickness of Thin Object (hair)
4. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
5. Determination of Acceleration due to Gravity (g) using Compound Pendulum
6. Determination of Energy Band Gap using the given Semiconductor Diode
7. Newton's Rings – Determination of the Radius of Curvature of given Convex Lens
8. Slit Width Determination with Single Slit Diffraction Phenomena using LASER
9. Determination of Thermal Coefficient using Thermistor
10. Determination of Wavelength of Monochromatic Source using LASER Diffraction
11. Determination of the Frequency of the given Tuning Fork using Volume Resonator
12. Study of the variation of Magnetic Field along the axis of a Circular Coil using Stewart and Gee's Method.
13. Diffraction Grating - Normal Incidence Method; Determination of Wavelength of given Source of Light using Spectrometer

14. Melde's Experiment – Determination of the Frequency of the Electrically Driven Tuning Fork
15. AC Sonometer – Determination of Frequency of AC Supply

 Manual / Record Book
1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.
2. Lab Manual of Engineering Physics by Dr.Y. Aparna and Dr. K. Venkateswara Rao (VGS
   books links, Vijayawada)

**II Semester**

S. No.	codes	Theory / Labs	L	T	P	C	Marks INT	Marks EXT	Total
1	13HS1002	English – II	2	1		2	30	70	100
2	13HS1003	Environmental Studies	3	1		3	30	70	100
3	13BS1003	Engineering Mathematics – III	3	1		3	30	70	100
4	13EE1002	Basic Electrical &Electronics Engineering	3	1		3	30	70	100
5	13ME1003	Engineering Mechanics	3	1		3	30	70	100
6	13BS1005	Engineering Chemistry	3	1		3	30	70	100
7	13HS1101	Basic English Language Communication Skills Lab			3	2	25	50	75
8	13BS1102	Engineering Chemistry Lab			3	2	25	50	75
9	13CS1103	Information Technology Workshop Lab			3	2	25	50	75
10	13EE1102	Electrical &Electronics Engg. Lab			3	2	25	50	75
\multicolumn{3}{c	}{**Total Credits**}	17	6	12	**25**	280	620	900

ENGLISH – II
(Common to all branches)

Subject Code: 13HS1002   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- To improve the language proficiency of a technical under-graduate in English with emphasis on LSRW skills.
- To provide learning environment to practice listening, speaking, reading and writing skills.
- To assist the students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.
- To expose the students to a variety of self-instructional modes of language learning.
- To develop learner autonomy.

Course Outcomes
- Students will be able to **use** English language in their day-to-day life.
- Students will be able to **employ** LSRW skills within and beyond the classroom environment.
- Students will be able to **integrate** English Language Learning with employability skills.
- Students will be able to **demonstrate** better with more observation and practice.
- Students will be able to **relate** classroom language learning to the real life situations.
- Students will be able to **interpret** things and draw **inferences** accordingly.

Unit – I
Globalization by *Joseph Stiglitz*
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

Unit – II
My Early Days by *Dr. A. P. J. Abdul Kalam*
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

Unit – III
I have a Dream by *Martin Luther King*
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

Unit – IV
The Cop and the Anthem by O. Henry
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

Unit – V
Telephone Conversation by *Wole Soyinka*
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

Text Books:
1. Musings on Vital Issues" Ed. P. J. George Pub: Orient Blackswan
2. Wings of Fire – APJ Abdul Kalam

Reference Books:
1. Short Stories – O. Henry
2. 30 days to a more Powerful Vocabulary by Norman Lewis and Wilfred Funk.

ENVIRONMENTAL STUDIES
(Common to Civil, Mech. & CSE)

Subject Code: 13HS1003   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- Memorize the overall knowledge of the environment; differentiate the resources, reserves, importance and conservation.
- Identify the significance, arrangement, causes of annihilation of ecosystems and biodiversity; recognize the importance of their protection and preservation.
- Discriminate various causes, effects of a range of environmental pollutions and describe the appropriate control methods.
- Identify the sustainable development; evaluate the different environmental management issues and environmental legal issues.
- Describe the variations in population growth, recognizes the human health problems and evaluate the environmental assets.

Course Outcomes
- Recognize the general issues of environment and know how to conserve the environment, speaks well again on various resources, present status and their better usage.
- Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
- Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their ecofriendly disposal methods.
- Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.
- Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.

UNIT – I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Environmental components – Atmosphere – Hydrosphere – Lithosphere – Biosphere.

Natural Resources: Resources classification – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems on Tribal population & Environment - Mineral resources: Use and exploitation, Tribal & environmental effects of extracting and using mineral resources**,** case studies**. - Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity – concept of sustainable agricultural methods, case studies**. – Energy resources**: Growing energy needs, non-renewable energy sources - coal, crude oil, natural gas - use of renewable and alternate energy sources, case studies**. Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

UNIT – II
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. Food chains, food webs and ecological pyramids. - Energy flow and nutrient flow in the ecosystems - Ecological succession - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem   b. Grassland ecosystem
c. Desert ecosystem   d. Aquatic ecosystems (lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - **Value of biodiversity:** consumptive use, productive use, social, ethical, aesthetic and option values - India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Case studies.

UNIT – III
Environmental Pollution: Definition, Cause, effects and control measures of:
a. Air pollution   b. Water pollution   c. Soil pollution
d. Marine pollution   e. Noise pollution   f. Thermal pollution   g. Nuclear hazards
Solid waste Management: Causes, effects and control measures of urban, Industrial and bio-medical wastes. - Pollution case studies. Role of individual in prevention of pollution - Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV
Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Urbanization and Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. - World summits on environment. -Wasteland reclamation. -EIA methodologies. – Environment Protection Act. -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation.

UNIT – V
Human Population and the Environment: Population growth, variation among nations. Population problems and control -Environment and human health. Role of information Technology in Environment and human health. – Case Studies.
Field work: Visit to a local area to document environmental assets River/forest/ grassland/hill/mountain - Visit to a local polluted site Urban/Rural/industrial/ Agricultural - Study of common plants, insects, and birds. -Study of simple ecosystems pond, river, hill slopes, etc.

Text Books:
1. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt., Ltd., Hyderabad.
2. Dr. S. Keerthinarayana & Dr. C. Daniel Yesudian. 2004, *Principles of EnvironmentalScience and Engineering*, First edition, Anuradha Publications (P) Ltd., Kumbakonam.
3. P. Anandan & R. Kumaravelan. 2010, *Environmental Science & Engineering*, Sixth reprint, Scitech Publications (India) (P) Ltd., Chennai.
4. Anubha Kaushik & C. P. Kaushik. 2011, *Environmental Studies*, Third edition, New Age International (P) Ltd., New Delhi.
5. Dr. Surinder Deswal & Dr. Anupama Deswal. 2008-09, *A Basic Course in Environmental* Studies, Second revised edition, Dhanpat Rai & Co (P) Ltd., New Delhi.

Reference Books:
1. Odum, E.P. 1971, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.

2. P.D. Sharma. 1996, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd.,

3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*. TMH.

4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill International edition.

5. Dr. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi.

6. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications.

ENGINEERING MATHEMATICS – III
(Common to all branches)

Subject Code: 13BS1003	**Internal Marks: 30**
Credits: 3	**External Marks: 70**

Course Objectives
- Calculate the rank of a matrix, solve linear system of equations by different methods and apply the knowledge to find the current in an electric circuit.
- Understand the concept of eigen values, eigen vectors, Cayley's Hamilton theorem and its applications. Also to acquire the knowledge of reduction of quadratic to canonical form and its applications.
- Determine the Fourier series expansion, half range series of different functions in different intervals, Fourier & Inverse Fourier transforms of different functions and apply the same to solve problems.
- Acquire the knowledge of Z- transforms and inverse Z-transforms of different functions, study their properties and solve difference equations.
- Study the Beta and Gamma functions, their properties and apply to solve improper integrals.

Course Outcomes
- Can calculate the rank of a matrix, solve a linear system of equations and apply the knowledge to calculate the current in a electrical circuit.
- Can calculate the eigen values, eigen vectors, use Cayley's Hamilton theorem to calculate inverse and powers of a matrix. Reduce a quadratic form to canonical form and find its nature and calculate solution of free vibration of two mass systems.
- Can find the Fourier series, half range series expansion of different functions in different intervals, Fourier & inverse Fourier transforms of different functions and apply to solve definite integrals.
- Can calculate the z- transforms and inverse z-transforms of different functions and apply the same to solve the difference equations.
- Can apply Beta and Gamma functions to solve improper integrals.

UNIT – I
Matrices: Rank of Matrix- Echelon form, Normal form – Solution of Linear System of equations – Direct methods, Gauss elimination, Gauss Jordan and Gauss Seidal Methods.

UNIT – II
Eigen values - Eigen vectors – Properties – Cayley -Hamilton Theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem -Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.
Applications: Free vibration of a two mass system.

UNIT – III
Fourier series and Fourier Transforms: Fourier series: Determination of Fourier coefficients (without proof) – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series.

Fourier integral theorem (only statement) – Fourier sine and cosine integrals - Fourier transform – sine and cosine transforms – properties – inverse Fourier transforms – Finite Fourier transforms.

UNIT – IV
Z- Transforms: Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems - Inverse z-transform – Partial fractions, Convolution theorem.
Application: Solution of Difference equations by Z-transforms.

UNIT – V
Special functions: Gamma and Beta Functions – Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.
Application: Evaluation of integrals.

Text Books:
1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics Volume - II, 6th editions respt., 2012, T.K.V Iyengar, & others, S.Chand Co. New Delhi.

Reference Books:
1. Mathematical Methods, 4th edition, 2009, B.V Ramana, Tata McGraw Hill, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.
3. Dean G. Duffy, Advanced engineering mathematics with MatLab, CRC Press.
4. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt.Ltd, Noida.

BASIC ELECTRICAL AND ELECTRONICS
(Common to Civil & Mech)

Subject Code: 13EE1002   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- To provide students basic practical knowledge of electric devices and components.
- To provide students knowledge about DC and AC machines.
- To provide students knowledge about Instruments.
- To make students learn the characteristics of devices like PN junction diode

Course Outcomes

- Ability to analyze electrical circuits for both DC and AC

- Identify and Define different types of dc generators

- Ability to generalize AC machines.

- Classify different types of measuring instruments

- To outline semiconductor devices

UNIT-I
ELECTRICAL CIRCUITS: Basic definitions, Types of elements, Ohm's Law, elements R, Land C and their V-I relationships & symbols, Resistive networks, Kirchhoff's Laws, Inductive networks, Capacitivenetworks, Series, Parallel circuits and Star-delta and delta-star transformations, simple problems.

UNIT II
DC MACHINES: Principle of operation of DC Generator, construction, emf equation, types & characteristics of DC generators, Principle of operation of DC motor, types, torque equation , characteristics losses, efficiency, testing of DC motors, applications, three point starter.

UNIT III
TRANSFORMERS & AC MACHINES: Principle of operation of single phase transformers, emf equation, losses, efficiency and regulation. Principle of operation of alternator, emf equation, regulation by synchronous impedance method. Principle of operation of induction motor, slip, torque characteristics, applications.

UNIT IV
INSTRUMENTS: Basic Principle of indicating instruments, types of instruments, operation of permanent magnet moving coil and moving iron instruments.

UNIT V
DIODE AND TRANSISTOR CHARACTERISTICS: P-N junction diode, symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems). P-N-P and N-P-N Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

Text Books:
1. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin
2. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.

Reference Books:
1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - Dr.K.B.Madhu Sahu

ENGINEERING MECHANICS
(Common to Civil, CSE, ECE, EEE & IT)

Subject Code: 13ME1003   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- To provide knowledge on system of forces, free body diagram.
- To provide knowledge on friction between two matting surfaces.
- To provide knowledge on centre of gravity and moment of inertia for different sections.

Course Outcomes
- Able to know system of forces, free body diagram
- Able to know the friction between two matting surfaces
- Able to calculate centre of gravity and moment of inertia for different sections.

UNIT I
SYSTEMS OF FORCES: Introduction – parallelogram law – Forces and components - Resultant of coplanar concurrent forces – component forces - vector notation – moment of force – principle of moments – couples - Resultant of planar force systems.

UNIT II
EQUILIBRIUM OF FORCE SYSTEMS: Equilibrium – free body diagrams – Equations of equilibrium – equilibrium of planar systems – graphical methods and analytical methods for equilibrium of planar systems – Moment of a Force and its applications, Varignon's theorem

UNIT III
FRICTION: Introduction, limiting friction – types of friction and friction laws – application of friction - Inclined plane, friction of screw and nuts – screw jack.
CENTROIDS AND CENTER OF GRAVITY: Centre of gravity – centroids of area and lines – determination of centroids by integration – centroids of composite figures – theorems of Pappus.

UNIT IV
AREA MOMENT OF INERTIA : Moment of inertia – polar moment of Inertia – Radius of gyration - Transfer theorem for moment of Inertia – Moment of inertia of composite areas – product of inertia – Transfer formula for product of Inertia.
MASS MOMENT OF INERTIA : Moment of inertia of masses –Radius of gyration – Transfer formula for mass moment of inertia – Mass moment of Inertia by Integration**.**

UNIT V
KINEMATICS : Rectilinear motion-curvilinear motion – Rectangular components of curvilinear motion - Normal and Tangential components of acceleration, Radial and transverse components - Kinematics of rigid bodies - angular motion – fixed axis rotation – Definition and analysis of plane motion.

KINETICS: Kinetics of rigid bodies – equation of planes motion – fixed axis rotation – rolling bodies (simple examples) - general plane motion (Simple examples).

Text Books:
1. I.B. Prasad: Applied Mechanics, Khanna Publishers, 19th Edition, 2009.
2. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.
3. A.K. Tayal: Engineering Mechanics, Umesh Publishers, 13th Edition, 2008.

Reference Books:
1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008.
2. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010.
3. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009.
4. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill.
5. Engineering Mechanics by S.S. Bhavikati & J.G. Rajasekharappa.

ENGINEERING CHEMISTRY
(Common to all branches)

Subject Code: 13BS1005   **Internal Marks: 30**
Credits: 3   **External Marks: 70**

Course Objectives
- To become familiar in moulding methods of preparation of different types of plastic materials.
- To understand the determination of hardness of water sample by EDTA method.
- To understand the methods of prevention of corrosion of metal.
- To become familiar about different lubricantion techniques.
- To understand about constructing the PV cell.

Course Outcomes
- Student will differentiate different moulding techniques of plastic materials.
- Students can able to determine total hardness of water by EDTA method.
- Students can able to design the metallic materials to prevent corrosion.
- Student will apply suitable lubrication mechanisms for various machinery parts.
- Students will demonstrate the working of PV cell.

UNIT-I
POLYMERS: Polymerization reactions – Basic concepts, types of polymerization – addition and condensation polymerizations, plastics – thermosetting and thermoplastics – differences. Compounding and Moulding of plastics – Compression, injection, transfer and extrusion moulding methods. Preparation, properties and engineering uses of the following: PE, PVC, Teflon, Bakelite, Nylon, Polyesters.
BUILDING MATERIALS: Cement – Classification; Portland cement – raw materials, manufacture of Portland cement, chemical constitution of Portland cement, Setting and Hardening of Portland Cement.

UNIT-II
WATER TECHNOLOGY: Introduction – Hardness of Water – Temporary and Permanent hardness, Units and inter conversions of Units. Estimation of hardness by EDTA Methods.Problems on Temporary and Permanent hardnesses. Disadvantages of Hard Water, Methods of Treatment of Water for Domestic Purposes – Sedimentation, Coagulation, Filtration, Disinfection – Sterilization, Chlorination, Break Point chlorination, Ozonisation –Industrial Water Treatment – Desalination, Reverse Osmosis Treatment - Lime-Soda Process, Zeolite Process, Ion-Exchange Process.

UNIT-III
SCIENCE OF CORROSION: Definition, examples, Types of corrosion: Theories of corrosion and Mechanism – Dry corrosion (Direct chemical attack), Wet corrosion (Electrochemical theory) Principles of corrosion, Galvanic series, Galvanic corrosion, Concentration cell corrosion, mechanism of wet corrosion – Hydrogen evolution type, oxygen absorption type. Factors influencing corrosion control of corrosion – proper design, use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and impressed current. Modifying the environment, use of inhibitors.

UNIT-IV
FUEL TECHNOLOGY: Introduction to Liquid Fuels-Classification of Crude Oil-Fractional Distillation-Cracking (Thermal &Catalytic), Synthetic Petrol (Fischer-Tropschs & Bergius Process) - Polymerization-Refining &Reforming –Knocking –Anti Knocking Agents-Octane & Cetane Number.
LUBRICANTS: Principle and functions of lubricants – Types of lubrication and mechanism – Thick film or Hydrodynamic lubrication, Thin film lubrication, extreme pressure lubrication. Classification and

properties of lubricants – Viscosity, flash and fire points, cloud and pour points, aniline points, neutralization number and mechanical strength.

UNIT-V
SOLAR ENERGY: Introduction – harnessing solar energy – photo voltaic cells – Concentrated   Solar Power Plants – green house concepts.

GREEN CHEMISTRY: Introduction-12 principles of green chemistry – green synthesis - Engineering Applications

NANO CHEMISTRY: Introduction to Nano materials-preparation of few Nano materials (Carbon Nano Tubes,Fullerenes etc- Top down and Bottom up concepts - Properties of Nano materials- Silver and Gold Nano particles - Engineering & Biomedical applications.

Text Books:
1. Engineering Chemistry - P.C.Jain and Monica Jain, DhanpatRai Publications, Co., New Delhi 15th Edition.
2. A Text Book of Engineering Chemistry - S.S. Dara, S.S.Umare, S.Chand& Co., Ltd., 12th Edition.

Reference Books:
1 A Text Book of Engineering Chemistry by Dr.Sunita Rattan, S.K. Kataria& Sons (2012).
2 A Text Book of Engineering Chemistry by S. Nagarajan, R. Gopalan, D.Venkatappayya, 3rd edition, Vikas Publishing House.
3 Engineering Chemistry by Wiley India Editorial Team, Wiley Publishers (2011).
4 A Text Book of Nano Science and Nano technology, by T. Pradeep, Tata Mc.Graw Hills (2012).

BASIC ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Common to all branches)

Subject Code: 13HS1101   **Eternal Marks:25**
Credits: 2   **External Marks: 50**

Course Objectives
- To improve the communication skills through Listening & Practising the structures of language.
- To make the students to adopt themselves to the situations and converse using their spontaneity.
- To make the students acquiring the language proficiency.
- To provide the real life situations to emulate the language properly.
- To make them realize the importance of Stress, Intonation and Rhythm of language.
- To make the students to improve pronunciation, vocabulary, language skills, communication skills, body language and grammar to fulfill the demands of the employer.

Course Outcomes
- Students will be able to **transform** themselves into effective speakers of English.
- Students will be able to emulate the language properly and **relate** it to the real life situations.
- Students will be able to acquire and make **use** of LSRW skills rather productively.
- Students will be able to **point out** stress on the words and apply rhythm in their speech.
- Students will be able to **apply** know-how of vocabulary efficiently depending on the context words are used in.

List of Sessions

Unit – I:
Introduction to Phonetics, Sentences and its applications and listening skills.

Unit – II:
Consonant Sounds, Parts of Speech & Speaking skills.

Unit – III:
 Vowel Sounds, Tenses & Writing skills.

Unit – IV:
Syllable & Stress, voice & Writing skills.

Unit – V:
Rhythm & Intonation, Reported Speech & Situational Dialogues.

Text Books:
1. Speak Well by K. Nirupa Rani, Jayashree Mohan Raj, B. Indira, Orient Blackswan, Hyderabad (2012)
2. Strengthen your Steps by Dr. M. Hari Prasad, Dr. John Varghese, Dr. R. Kishore Kumar, Maruthi Publications, Hyderabad (2010)

Reference Books:
1 A Text Book of English Phonetics: For Indian Students by T. Balasubramanian, Macmillan Publishers India (2000)
2 Better English pronunciation by J.D. O'Connor, Cambridge Unviersity Press, 23-Oct- 1980.
3 Practical English Usage by Michael Swan.

ENGINEERING CHEMISTRY LAB
(Common to all branches)

Subject Code: 13BS1102   **Internal Marks: 25**
Credits: 2   **External Marks: 50**

Course Objectives
The students completing this course are expected to understand:
- To understand the determination of D.O., Turbidity of water sample.
- To become familiar about the determination of viscosity, flash point and acid value of oil.
- To learn concepts about the pH and conductometric titrations.
- To understand the determination of hardness of water sample by EDTA method.
- To become familiar about all the instruments in the chemistry laboratories.

Course Outcomes
The students are expected to:
- Students can able to determine D.O., Turbidity etc of water sample.
- Students can explain the importance of viscosity, Flash point and Acid value of a lubricant.
- Students will determine the amount of acid or base by pHmetric and conductometric titrations.
- Students have the capacity to determine the hardness of various water samples.
- Students can able to operate all the instruments in the chemistry laboratory.

LIST OF EXPERIMENTS   (Any Twelve Experiments have to be completed)

1) Determine the Acid Value present in the given lubricating oil.

2) Determine the Flash and Fire points of given Oil Sample.

3) Determine the Kinematics Viscosity of a given oil sample by using Viscometer.

4) Estimate the amount of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
5) Determine the Total Hardness present in the given water sample by using EDTA Method.

6) Estimate the amount of Turbidity present in the given water sample by using Turbidity meter.

7) Estimate the Viscosity of an Organic Solvent by using Ostwald Viscometer.

8) Prepare Phenol-Formaldehyde Resin and calculate its weight.

9) pH metric Titrations between Strong acid and Strong base.

10) pH metric Titrations between Strong acid and Weak base.

11) Conductometric Titrations between Strong acid and strong base.

12) Conductometric Titrations between Strong acid and Weak base.

13) Colorimetric estimation of Iron (III).

14) Estimate the amount of Calcium present in given cement sample.

Text Books:
1. Practical Engineering Chemistry by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011)
2. Lab Manual on Engineering Chemistry by Dr.Sudharani, DhanpatRai Publications, Co., New Delhi. (2010)

Reference Books:
1. Engineering Chemistry Lab Manual: SCITECH, ShuchiTiwari (2010)
2. Vogel Text Book of Quantitative Chemical Analysis, 6th Edition by G.J.Jeffery, J.Bassett, J.Mendham, R.C. Denney, Longman Scientific & Technical Publications, Newyork.
3. A Text Book of Engineering Chemistry by R.N.Goyal and HarmendraGoel, Ane Books, India.
4. A Text Book on experiments and calculations Engineering, S.S. Dara S.Chand& Co., Ltd., (2003)
5. Instrumental methods of Chemical Analysis, Chatwal, Anand, 5th Edition, Himalaya Publications.

INFORMATION TECHNOLOGY WORKSHOP LAB
(Common to all branches)

Subject Code: 13CS1103   **Internal Marks: 25**
Credits: 2   **External Marks: 50**

Course Objectives
- PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
- All the DOS commands would be covered for maintains of the Operating system.
- Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered.
- Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools.

Course Outcomes
- Students gain knowledge on computer system such as system Unit, input devices, and output devices connected to the computer.
- Students gain knowledge to understand the booting process that includes switching on the system, and familiar with all the commands of an operating system.
- Students gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers and search engines etc.
- Students get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
- Students get familiarize with parts of Excel window, to create and save a workbook with single and/or multiple worksheets, to apply operations on range of cells using built-in formulae, etc.
- Students get familiarize with parts of PowerPoint win, to create and save a new presentation, apply design templates to a presentation, to insert, edit and delete a slide , etc.

PC Hardware

Week 1 – Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 2 – Task 2: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 3 – Task 3: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva. Several mini tasks would be that covers Basic commands in Linux and Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, Using wildcards

Week 4 – Task 4: <u>**Hardware Troubleshooting**</u>: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

<u>**Software Troubleshooting**</u>: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

<u>**Internet & World Wide Web**</u>

Week 5 - Task 1: <u>**Orientation & Connectivity Boot Camp**</u>: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 6 - Task 3: **Search Engines & Netiquette**: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors.

Task 4: **Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

<u>**Word**</u>

Week 7 – <u>Word Orientation</u> : The mentor needs to give an overview of Microsoft/ equivalent (FOSS) tool word : Importance of MS/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1: Using word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both Word.

Week 8 - Task 2 : Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes.

Task 3: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Week 9 - Task 4: Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel

Week 10 - Excel Orientation : The mentor needs to tell the importance of MS/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources

    Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 11 -Task 2: Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP / VLOOKUP

    Task 3: Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Week 12 - Task 4: Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, and Data Validation

MS/equivalent (FOSS) tool Power Point

Week 13 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in Power-point.

Week 14 - Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts, Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

Week 15 - Task 3: Entire week concentrates on presentation part of power point. Topic covered during this week includes -Using Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing.

Publisher

Week 16: Help students in preparing their personal website using Microsoft/ equivalent (FOSS) tool publisher. Topic covered during this week includes - Publisher Orientation, Using Templates, Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, Hosting website.

Text Books:
1. Comdex Information Technology course tool kit by Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book by 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology by ITL Education Solutions limited, Pearson Education.
4. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)
5. All others related material is available at
   (a) www.sssolutions.in
   (b) www.sontisoftsolutions.org

Electrical and Electronic Engineering Lab
(Common to, MECH & CIVIL)

Subject Code: 13EE1102   **Internal Marks: 25**
Credits: 2   **External Marks: 50**

Course Objectives
- To understand the working of different DC machines, AC Machines, Transformers and their performance characteristics with the help of suitable tests.

Course Outcomes

On completion of this course, students should be able to

- Analyze DC electrical circuits.
- Determine performance of DC machines.
- Interpret performance of AC Machines.
- Understand the transistor characteristics.
- Distinguish the full wave rectifier with and without filters.

LIST OF EXPERIMENTS   (All Experiments have to be conducted)

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).

2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)

3. Brake test on 3-phase Induction motor (Determination of performance characteristics)

4. Regulation of alternator by Synchronous impedance method.

In addition to the above four experiments, any one of the experiments from the following list is required to be conducted.

5. Speed control of D.C. Shunt motor by

a) Armature Voltage control b) Field flux control method

6. Brake test on D.C Shunt Motor

7. Transistor CE Characteristics (Input and Output)

8. Full wave Rectifier with and without filters.

9. CE Amplifiers.

10. RC Phase Shift Oscillator

Additional Experiments:

11. Class A Power Amplifier

12. Micro Processor

II YEAR

		I Semester							
S. No.	**codes**	**Theory / Labs**	**L**	**T**	**P**	**C**	**Marks**		**Total**
							INT	**EXT**	
1	13BS2007	Complex Variables and Statistical Methods	3	1		3	30	70	100
2	13CE2001	Strength of Materials-I	3	1		3	30	70	100
3	13CE2002	Surveying	3	1		3	30	70	100
4	13CE2003	Engineering Geology	3	1		3	30	70	100
5	13CE2004	Fluid mechanics	3	1		3	30	70	100
6	13CE2101	Engineering Geology Lab	1		3	2	25	50	75
7	13CE2102	Strength of Material Lab			3	2	25	50	75
8	13CE2103	Surveying Lab-I			3	2	25	50	75
9	13HS2102	Advanced English Language Communication Skills Lab			3	2	25	50	75
10	13CE2201	Self Study course-I **(4)**				1	75	-	75
		Total	16	5	12	**24**	325	550	875

Complex Variables and Statistical Methods

Subject Code: 13HS2007   **External marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- Test if a function is analytic, harmonic and then find a harmonic conjugate via the Cauchy-Riemann equations, evaluate contour integrals.
- Identify and classify zeros and singular points of functions, calculate the residues by Laurent Series & residue theorem. Also, apply residue theorem to evaluate various contour integrals.
- Find the images of different complex functions and mapping from z-plane to w-plane and determine the bilinear transformations.
- Apply Baye's theorem to solve industry related problems, understand the properties of Discrete and Continuous distributions.
- Calculate the characteristics of probability distribution under different conditions using Binomial, Poisson and Normal. Also, define the hypothesis, identify appropriate test and apply in a range of statistical test..

COURSE OUTCOMES:
- Can identify an analytic function, harmonic function, find harmonic conjugate function via Cauchy-Riemann equations, evaluate contour integrals using the Cauchy Integral Theorem.
- Can identify and classify zeros and singular points of functions, calculate the residues by Laurent Series & residue theorem. Also, apply residue theorem to evaluate various contour integrals.
- Can find the images of different complex functions and mapping from z-plane to w-plane and determine the bilinear transformations.
- Can apply Baye's theorem to solve industry related problems, understand the properties of Discrete and Continuous distributions.
- Can identify here to use the certain standard probability distributions. Also, define the hypothesis, identify appropriate test and apply in a range of statistical test.

UNIT I
Analytic Functions and Integrations - Functions of a complex variable-Continuity-Differntiability-analyticity-Properties-Cauchy-Reimann equations in Cartesian and polar coordinates (with out proof).Harmonic and conjugate harmonic functions-Milne-Thompson method. Cauchy's integral theorem-Cauchy's integral formula-Generalized Cauchy's integral formula.

UNIT II
Integration using Residues - Singular point-isolated singular point-pole of order m- essential singularity. Residue- Evaluation of residue by formula and by Laurent series-Residue theorem. Evaluations of integrals of the type

(a) Improper real integrals $\int\limits_{-\infty}^{\infty} f(x)dx$ (b) $\int\limits_{C}^{C+2\pi} f(\cos\theta, \sin\theta)d\theta$ (c) $\int\limits_{-\infty}^{\infty} e^{imx} f(x)dx$ (d) Integrals by indentation.

UNIT III
Conformal Mapping - Conformal mapping: Transformation by e^z , Inz, z^2, z^n (n is positive integer), Sinz, Cosz, z+a/z. Translation, rotation, inversion and bilinear transformation-fixed point-cross ratio-properties-invariance of circles and cross ratio-determination of bilinear transformation mapping 3 given points.

UNIT IV

Statistical and Sampling Distributions - Conditional Probability-Baye's theorem, Binomial, Poisson, Normal distribution-related properties. Moment generating function. Population and Samples. Sampling distribution of mean (with known and without known variance) proportions, variances. Sampling distribution of sums and differences.

UNIT V

Test of Hypothesis using Normal and Non-Normal Distributions -Statistical Hypothesis- Error of Type I and Type-II Error and calculation. One tail, two tail tests .Test of hypothesis concerning means, proportions and their differences using Z-test. Test of hypothesis using Student's t-test, F-test, and χ^2 –test.

Text Books:

1. Engineering Mathematics Volume-III T.K.V.Iyengar,B.Krishna Gandhi and Others, S.Chand & Company.
2. Probability and Statistics for Engineers, Miller and John E.Freund, Prentice Hall of India
3. Higher Engineering Mathematics B.S.Grewel

Reference Books:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt.Ltd.
Probability and Statistics, Athanasios-Papoulis-Pearson edn

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Strength of Materials-I

Subject Code: 13CE2001   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study the simple stresses & strains and stress-strain diagram of mild steel..
- to study the shear force and bending moments of the Simply supported, cantilever and over hanging beams for the loads of point load , UDL and UVL.
- to study the flexural stresses which include bending equation, section modulus of rectangle, circular and I sections, composite sections.
- to study the derivation of shear stress formula and shear stress distribution across various sections include rectangle, circular and I sections.
- to learn the deflection of simply supported and cantilever beams which are solved by double integration method, Macaulay's method and moment area method.

COURSE OUTCOMES:
Students will get ability
- to understand the simple stresses & strains and stress-strain diagram of mild steel..
- to learn the shear force and bending moments of the Simply supported, cantilever and over hanging beams for the loads of point load , UDL and UVL.
- to understand the flexural stresses which include bending equation ,section modulus of rectangle, circular and I sections, composite sections.
- to learn the derivation of shear stress formula and shear stress distribution across various sections include rectangle, circular and I sections.
- to understand the deflection of simply supported and cantilever beams which are solved by double integration method, Macaulay's method and moment area method.

UNIT – I
Simple stresses and strains : Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic modulie and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

UNIT – II
Shear force and bending moment : Definition of beam –Types of supports - Types of beams – Concept of shear force(S.F.) and bending moment (B.M.) – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III
Flexural stresses : Theory of simple bending – Assumptions – Derivation of bending equation - Neutral axis – Determination bending stresses – section modulus of rectangular, circular sections (Solid and Hollow), I, T and Channel sections –Composite sections.

UNIT – IV
Shear stresses: Derivation of formula – shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and H sections.

UNIT – V
Deflection of beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration, Moment area method (Mohr's theorems), Macaulay's method – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads and U.D.L

Text Books:

1. Introduction to text book of Strength of materials by R.K.Bansal – Laxmi publications Pvt. Ltd., New Delhi.

2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.

3. Strength of materials by R. Subramanian, Oxford university press, New Delhi

Reference Books:

1. Mechanics of Solid, by Ferdinandp Beer and others – Tata Mc.Grawhill Publications 2000.

2. Strength of Materials by Schaum's out line series – Mc. Grawhill International Editions.

3. Strength of Materials by S. Ramakrishna and R.Narayan – Dhanpat Rai publications.

4. Strength of materials by R.K.Rajput, S.Chand & Co, New Delhi.

5. Strength of Materials by A.R.Basu, Dhanpat Rai & Co, Nai Sarah, New Delhi.

6. Strength of Materials by L.S.Srinath et al., Macmillan India Ltd., Delhi.

7. Strength of Materials by Bhavi Katti**.**

Surveying

COURSE OBJECTIVES:

Students will have

- to study the overview of plain surveying, objectives, principles and classification of surveying , linear measurements, angular measurements , errors and adjustments.
- to study the concepts and terminology of leveling, temporary and permanent adjustments of level and method of leveling.
- to study the characteristics and uses of contours, methods of conducting contour surveys and their plotting.
- to study the parts of Theodolite, description , uses, temporary and permanent adjustments of theodolite, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling, Traversing.
- to study the Stadia and tangential methods of tacheometry, distance and elevation formulae for Staff vertical position.
- to study how to calculate areas and volumes regular and irregular boundaries of the field, Embankments and cutting for a level section, determination of the capacity of reservoir, volume of barrow pits.
- to study types of curves, design and setting out of simple and compound curves

COURSE OUTCOMES:

Students will get ability

- to learn the overview of plain surveying, objectives, principles and classification of surveying , linear measurements, angular measurements , errors and adjustments.
- to understand the concepts and terminology of leveling, temporary and permanent adjustments of level and method of leveling.
- to learn the characteristics and uses of contours, methods of conducting contour surveys and their plotting.
- to understand the parts of Theodolite, description, uses temporary and permanent adjustments of theodolite, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling, Traversing.
- to learn the Stadia and tangential methods of tacheometry, distance and elevation formulae for Staff vertical position.
- to understand how to calculate areas and volumes regular and irregular boundaries of the field, Embankments and cutting for a level section, determination of the capacity of reservoir, volume of barrow pits.
- to learn types of curves, design and setting out of simple and compound curves

UNIT – I

Introduction: Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications. Distances and direction: Distance measurement conventions and methods; use of chain and tape, Meridians, Azimuths and Bearings, declination, computation of angles -Errors and adjustments -Terminology of EDM.

UNIT – II

Leveling and contouring: Concept and Terminology, Temporary and permanent adjustments- method of leveling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT – III

Theodolite: Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling, Traversing. Tacheometric surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

UNIT – IV

Computation of areas and volumes: Area from field notes, computation of areas along Irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

AR-13 – B.Tech – CIVIL   **II Year I Sem**

UNIT – V
Curves: Types of curves, design and setting out of simple and compound curves.

Text Books:
  1. "Surveying (Vol – 1, 2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
  2 . Duggal S K, "Surveying (Vol – 1, 2 & 3), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Reference Books:
  1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
  2. Arora, K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004
  3. Chandra A M, "Higher Surveying", New Age International Pvt. Ltd., New Delhi.

<div align="center">**Engineering Geology**</div>

Subject Code: 13CE2003   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
  - to study the importance of geology from civil engineering point of view, brief study of case   histories of failure of some civil engineering constructions due to geological draw   backs.
  - to study the different methods of study of minerals, physical properties of common rock forming minerals and economic minerals.
  - to study the geological classification of Igneous, Sedimentary and Metamorphic rocks, common structures and textures of Igneous, Sedimentary and Metamorphic rocks and megascopic study of rocks
  - to study the common geological structures associating with the rocks such as folds, faults, unconformities and joints and their important types.
  - to study the importance of Geophysical studies, principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and importance of electrical resistivity methods & seismic refraction methods.

COURSE OUTCOMES:
Students will get ability
  - to understand the importance of geology from civil engineering point of view, brief study of case histories of failure of some civil engineering constructions due to geological draw   backs.
  - to learn the different methods of study of minerals, physical properties of common rock forming minerals and economic minerals.
  - to understand the geological classification of Igneous, Sedimentary and Metamorphic rocks, common structures and textures of Igneous, Sedimentary and Metamorphic rocks and megascopic study of rocks
  - to learn the common geological structures associating with the rocks such as folds, faults, unconformities and joints and their important types.
  - to understand the importance of Geophysical studies, principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and importance of electrical resistivity methods & seismic refraction methods.

UNIT - I
Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.

UNIT - II
Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Physical properties of Minerals. Study of physical properties of following common rock forming minerals:Feldspar, Quartz , Flint , Jasper, Olivine , Augite , Hornblende, Muscovite,Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economic minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

UNIT - III
Petrology: Definition of rock**,** Geological classification of Igneous, Sedimentary and Metamorphic rocks. Dykes and sills, common structures and textures of Igneous, Sedimentary and Metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss,Schist, Quartzite, Marble and Slate.

UNIT – IV
Structural geology: Out crop, strike and dip, Study of common geological structures associating with the rocks such as folds, faults, unconformities and joints - their important types.

UNIT – V
Geophysical investigation: Importance of Geophysical studies, Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods. Importance of Electrical resistivity methods and seismic refraction methods.

Text Books:
1) Principles of Engineering Geology by K.V.G.K. Gokhale – B.S. publications, 2009.
2) Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005.
3) Engineering and General Geology by Parbin Singh, SK Katria & Sons, 2009.

Reference Books:
1. F.G. Bell, Fundamentals of Engineering Geology, Butterworths Publications, New Delhi, 1992.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution

Fluid Mechanics

Subject Code: 13CE2004   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have

- to study the physical properties of fluids, Pascal's law, Hydrostatic law, measurement pressure and manometers
- to study the Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces , Center of Pressure and Derivations
- to study the fundamentals of kinematics , classification of flows, equation of continuity and flow net analysis.
- to study the Euler's, Bernoulli's equations, Navier, Stokes equations and Reynolds's experiment
- to study the laws of fluid friction, Darcy's equation, Major and Minor losses, pipes in series, pipes in parallel and pipe network problems.
- to study about the Pitot tube, Venturi meter and Orifice meter, classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches, Broad crested weirs.

COURSE OUTCOMES:
Students will get ability

- to understand the physical properties of fluids, Pascal's law, Hydrostatic law, measurement pressure and manometers
- to learn the Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces , Center of Pressure and Derivations
- to understand the fundamentals of kinematics , classification of flows, equation of continuity and flow net analysis.
- to learn the Euler's, Bernoulli's equations, Navier, Stokes equations and Reynolds's experiment
- to understand the laws of fluid friction, Darcy's equation, Major and Minor losses, pipes in series, pipes in parallel and pipe network problems.
- to learn about the Pitot tube, Venturi meter and Orifice meter, classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches, Broad crested weirs.

UNIT I
Introduction : Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers**.**

UNTI – II
Fluid Statics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces –Center of Pressure. Derivations and Problems.

UNTI – III
Fluid kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and rotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis**.**

UNIT – IV
Fluid dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Navier – Stokes equations (Explanation) Momentum equation and its application – forces on pipe bend. Reynold's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes**.**

UNIT – V
Closed conduit flow: Laws of Fluid friction – Darcy's equation, Major and Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynolds number – Moody's Chart.
Measurement of flow: Pitot tube, Venturi meter and Orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches –Broad crested weirs.

Text Books:
1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K. Som & G. Biswas, Tata McGraw Hill Pvt. Ltd.

Reference Books:
1. Fluid Mechanics by Merie C. potter and David C. Wiggert, Cengage learning
2. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P.Schaffer,   Oxford University Press, New Delhi
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi

AR-13 – B.Tech – CIVIL   **II Year I Sem**
                              Engineering Geology Lab

Subject Code: 13CE2101   **External Marks: 50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
 Students will have
  - to study the physical properties and identification of minerals referred under theory.
  - to study the megascopic description and identification of rocks referred under theory.
  - to interpret and draw the sections geological maps showing tilted beds, faults, unconformities etc.,
  - to do structural geological problems

COURSE OUTCOMES:
Students will get ability
  - to understand physical properties and identification of minerals referred under theory.
  - to understand megascopic description and identification of rocks referred under theory.
  - to interpret and draw the sections geological maps showing tilted beds, faults, unconformities etc.,
  - to do structural geological problems

LIST OF EXPERIMENTS
1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.

LAB EXAMINATION PATTERN:
1. Description and identification of SIX minerals
2. Description and identification of Six Rocks (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.

Strength of Materials Lab

Subject Code: 13CE2102   **External Marks: 50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
 Students will have
- to practice tension test, bending test on cantilever beam
- to practice bending test on simple support beam,
- to practice torsion test, hardness test, spring test
- to practice compression test on wood/steel/brick, impact test, shear test, bending on UTM
- to verify Maxwell's Reciprocal theorem on beams
- to practice deflect test on continuous beam

COURSE OUTCOMES:
Students will get ability
- to do the tension test, bending test on cantilever beam
- to do the bending test on simple support beam,
- to do the torsion test, hardness test, spring test
- to do compression test on wood/steel/brick, impact test, shear test, bending on UTM
- to verify Maxwell's Reciprocal theorem on beams
- to do deflect test on continuous beam

List of experiments
1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or steel or Brick
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Continuous beam – deflection test.
12. Bending test on UTM

Note: Minimum ten experiments should be completed

Surveying Lab-I

Subject Code: 13CE2103   **External Marks:50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
- to measure survey of an area by chain survey and plotting
- to take chaining across obstacles,
- to prepare residential building by perpendicular offset, introduction of tie lines
- to do temporary adjustments of prismatic compass
- to find distance between two inaccessible points with compass, a given are by prismatic compass.
- to practice radiation method, intersection methods, two point and three point problem by plane table survey
- to practice Fly leveling, check leveling, contouring

COURSE OUTCOMES:
Students will get ability
- to understand how to measure survey of an area by chain survey and plotting
- to understand how to take chaining across obstacles,
- to learn how to prepare residential building by perpendicular offset, introduction of tie lines
- to understand how to do temporary adjustments of prismatic compass
- to understand how to find distance between two inaccessible points with compass, a given are by prismatic compass.
- to understand how to do radiation method, intersection methods, two point and three point problem by plane table survey
- to understand how to do Fly leveling, check leveling, contouring
.

LIST OF EXERCISES:
1. Survey of an area by chain survey (closed traverse) & Plotting
2. Chaining across obstacles
3. Preparation of residential building by perpendicular offset, introduction of tie lines.
4. Introduction to prismatic compass-Temporary adjustments.
5. Determination of distance between two inaccessible points with compass.
6. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
7. Radiation method, intersection methods by plane Table survey
8. Two point and three point problems in plane table survey
9. Introduction to leveling instrument, leveling staff. Reading of level staff, temporary adjustments of leveling instrument.
10. Fly leveling (differential leveling)
11. Check leveling - L.S. & C.S. of a road profile.
12. One exercise on contouring**.**

Note: Minimum ten experiments should be completed

ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Subject Code: 13HS2102   **External Marks: 50**
Credits: 2   **Internal Marks: 25**

<u>**Objectives**</u>
- Aware to different kinds of Learner-friendly approaches of language to an array of self-instructional learning (Computer based).
- Achieving reasonably good level of competency in Group Discussions, Presentations and Public speaking.
- Facilitating in how to face interviews.
- Providing a wide range of vocabulary to perform better in International tests like GRE, TOEFL, and IELTS etc.
- Gathering ideas and organize them relevantly and coherently.

<u>**Outcomes**</u>
- Students will be able to **recognize** and **compare** various socio-cultural and professional contexts appropriately.
- Students will be able to **evaluate** their own performance participating well in GDs and other language-related activities.
- Students will be able to **experiment** language more effectively and carry out various competitive examinations well.
- Students will be able to **compose** the ideas relevantly and coherently.
- Students will be able to **discuss** and **report** various situations efficiently.

<u>**List of Sessions**</u>

Unit – I: Vocabulary Development

Unit – II: Reading Comprehension

Unit – III: Presentation Skills

Unit – IV: Group Discussions

Unit – V: Resume Writing & Interview Skills

<u>**Text Books**</u>:
3. "Speak Well" by K. Nirupa Rani, Jayashree Mohan Raj, B. Indira, Orient Blackswan, Hyderabad (2012)
4. "Strengthen your Steps" by Dr. M. Hari Prasad, Dr. John Varghese, Dr. R. Kishore Kumar, Maruthi Publications, Hyderabad (2010)

<u>**References**</u>:
4   A Text Book of English Phonetics: For Indian Students by T. Balasubramanian, Macmillan Publishers India (2000)
5   How to Prepare for Verbal Ability and Reading Comprehension for CAT by Arun Sharma

Self Study Course-I

Subject Code: 13CE2201   **External Marks: 0**
Credits: 1   **Internal Marks: 75**

COURSE OBJECTIVES

- Identify sources of information.

- Collecting relevant information.

- Ability to interpret information

- Ability to move from problem to solution.

COURSE OUTCOMES:

- Acquires ability to locate sources of information.

- Acquires ability to filter and select relevant information

- Apply information to real world problems and solve them.

Syllabus

1.   Data collection through Internet

2.   Data collection from Library and other sources

3.   Seminar Presentation on advanced topics , Design and Analysis of Structures

4.   Group discussion

S. No.	Codes	Theory / Labs	L	T	P	C	Marks		Total
							INT	EXT	
1	13HS2004	Managerial Economics &Financial Analysis	3	1		3	30	70	100
2	13CE2005	Construction Materials and Practice	3	1		3	30	70	100
3	13CE2006	Strength of Materials-II	3	1		3	30	70	100
4	13CE2007	Hydraulics and Hydraulic Machinery	3	1		3	30	70	100
5	13CE2008	Structural Analysis-I	3	1		3	30	70	100
6	13CE2009	Concrete Technology	3	1		3	30	70	100
7	13CE2104	MOF & Hydraulic Machinery Lab			3	2	25	50	75
8	13CE2105	Concrete Technology Lab			3	2	25	50	75
9	13HS2201	Professional Ethics & Morals	2						
		Total Credits	20	6	6	**22**	230	520	750

(Table title: II B.Tech -II Semester)

Managerial Economics and Financial Analysis

Subject Code: 13HS2004   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To explain the nature and scope of economics.
- Study the conditions under which a firm has to operate.
- How decision making is done in business.
- Financial accounts preparation, practice, interpretation and analysis.

COURSE OUTCOMES:
On completion of the course the student will be able to,
- Understand demand and its importance
- Understand various demand forecasting techniques.
- Understand market structures and pricing policies.
- Learn break-even analysis and cost analysis
- Understand design of organizational structures to suit the nature and type of business
- Learn capital budgeting and methods of budgeting. Sources of finance.
- Prepare accounts, interpret and analyze financial statements. Latest developments in international standards.

Unit I
Introduction to Economics-Definition of Economics, Characteristics and Scope –Economics and its relation with other subjects- Basic economic tools, macro and microeconomics, concept of national income. Economic indicators
Demand Analysis & Demand Forecasting- Meaning of Demand, Demand determinants, Law of Demand and its exceptions.
Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting (survey method, Delphi method, Collective opinion, Analysis of Time series and Trend projections, Economic Indicators, Controlled experiments and Judgmental approach) - Forecasting demand for new products-
Elasticity of Demand -Definition -Types of Elasticity of demand - Measurement of price elasticity of demand: Point method and Arc method- importance of Elasticity of Demand.

Unit-II
Theory of Production- Production Function- Law of variable proportions, Isoquants and Isocosts,- Least Cost Combination of Inputs, Law of returns to scale, Cobb-Douglas Production function - Economies of Scale.
Cost Analysis: Cost concept, revenues and costs, types of costs and their suitability for application.- Determination of Break-Even Point - Managerial importance and limitations of BEP.

UNIT-III
Introduction to Markets-
Pricing Policies: Market structures: Types of markets and types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition -

Pricing methods: Methods of Pricing-Marginal Cost Pricing, Limit Pricing, Market Skimming, Penetration Pricing, Bundling Pricing and Peak Load Pricing. Internet Pricing Models: Flat rate pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model,

Types of Industrial Organizations & Introduction to business cycles:
Evolution of organization structures. Features of Sole Proprietorship, Partnership, Joint Stock Companies and Public Enterprises. Introduction to business cycles: - Features of business cycles. Phases of business cycles.

Unit IV
Capital and Capital Budgeting: Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (NPV method). Preparation of changes in working capital statement and fund flow statement

Unit V
Introduction to Financial Accounting: financial accounting principles, Introduction to Double-entry system, Journal, Ledger, Trial Balance- Final Accounts with adjustments- Limitations of Financial Statements.
Interpretation and analysis of Financial Statements: Ratio Analysis – Liquidity ratios, Capital Structure ratios, Profitability ratios and solvency ratios –. Accounting conventions. International financial reporting standards.

Text Books:
1. **R G Lipsey K A Chrysal   ECONOMICS   OUP   10/e**
2. **S N Maheshwari Financial accounting S Chand & co** , New Delhi, 2011

Reference Books:
1. A R Aryasri **-** Managerial Economics and Financial Analysis, TMH 2011
2. Craig. H. Peterson , W. Cris Lewis & Sudhir .k. Jain,   Managerial Economics 4/e   Pearson
   H L Ahuja   Advanced economic theory   S Chand&co

Construction Materials and Practice

Subject Code: 13CE2005
External Marks:70
Credits: 03
Internal Marks: 30

COURSE OBJECTIVES:
Students will have
- to study the physical properties of construction materials which include Rocks , Stones, Bricks , Lime, Pozzolanas, Cement, Ceramic Products, Timber
- to study the uses of construction materials which include Mortar, Concrete, Paints and Varnishes, Glass, Metals and alloys, Plastics, Fiber reinforced plastics, Glass reinforced plastics.
- to study about foundations, masonry structures, partitions and proofing materials
- to study about floors ,doors, Hollow Block and Ferro Cement Constructions Stairs, Floors and flooring, Roof, Weathering course, Introduction to prefabricated elements.
- to study about Pointing, Plastering, finishes, washing, distempering, Termite proofing, Scaffolding, Shoring, under pinning and Form work

COURSE OUTCOMES:
Students will get ability
- to learn the physical properties of construction materials which include Rocks , Stones, Bricks , Lime, Pozzolanas, Cement, Ceramic Products, Timber
- to learn the uses of construction materials which include Mortar, Concrete, Paints and Varnishes, Glass, Metals and alloys, Plastics, Fiber reinforced plastics, Glass reinforced plastics.
- to understand about foundations, masonry structures, partitions and proofing materials
- to understand about floors ,doors, Hollow Block and Ferro Cement Constructions Stairs, Floors and flooring, Roof, Weathering course, Introduction to prefabricated elements.
- to learn about Pointing, Plastering, finishes, washing, distempering, Termite proofing, Scaffolding, Shoring, under pinning and Form work

CONSTRUCTION MATERIALS:
Unit I
 Physical properties of materials, Rocks and Stones, Bricks , Lime and Pozzolanas, Cement, Ceramic Products, Timber and Timber Products.

Unit II
 Mortar, Concrete, Paints and Varnishes, Glass, Metals and alloys, Plastics, Fiber reinforced plastics, Glass reinforced plastics.

CONSTRUCTION PRACTICE:

Unit III
Foundation, Stone masonry, Brick masonry, Water Proofing and Damp Proofing Material, Advanced water proofing systems – Types of partitions.

Unit IV
Doors, Windows and ventilators, Hollow Block and Ferro Cement Constructions, Stairs, Floors and flooring, Roof, Weathering course, Introduction to prefabricated elements.

Unit V
Pointing, Plastering, External & Internal finishes, White washing, Colour washing & distempering, Termite proofing, Scaffolding, Shoring and under pinning, Form work

Text Books:
1. P.C.Varghese, "Building Materials", Prentice-Hall of India (P) Ltd., .
2. S.K.Duggal, "Building Materials", New Age International (P) Ltd.
3. S.C.Rangwala, " Building Materials",Charotar Publishing House,.

Reference Books:
1. Dr. B.C. Punmia, "Building Construction", Laxmi publications (p)Ltd New Delhi.
2. Ashokkumar Jain, "Building Construction", Laxmi publications (p)Ltd Chennai.
3. I S 2185 Part I & II PWD & CPWD Specifications

Strength of Materials-II

Subject Code: 13CE2006   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study the thin cylinders which include thin seamless cylindrical shells, derivation of formula for longitudinal and circumferential stresses, hoop, longitudinal and volumetric strains, thin spherical shells
- to study the thick cylinder which include Lame's theory, derivation of Lame's formulae, distribution of hoop and radial stresses across thickness, thick spherical shells
- to study principal stress and strain which include Stresses on an inclined section of a bar under axial loading compound stresses, Normal and tangential stresses Mohr's circle of stresses, Analytical and graphical solutions
- to study the torsion of circular shafts which include, Assumptions made in the theory of pure torsion, derivation of torsion equation, torsion moment of resistance, polar section modulus, power transmitted by shafts, combined bending, torsion and end thrust, design of shafts according to theories of failure
- to study Columns and struts which include types of columns, short, medium and long columns, axially loaded compression members, crushing load, Euler's theorem for long columns, derivation of Euler's critical load formulae for various end conditions.

COURSE OUTCOMES:
- to understand the thin cylinders which include thin seamless cylindrical shells, derivation of formula for longitudinal and circumferential stresses, hoop, longitudinal and volumetric strains, thin spherical shells
- to learn the thick cylinder which include Lame's theory, derivation of Lame's formulae, distribution of hoop and radial stresses across thickness, thick spherical shells
- to understand principal stress and strain which include Stresses on an inclined section of a bar under axial loading compound stresses, Normal and tangential stresses Mohr's circle of stresses, Analytical and graphical solutions
- to learn the torsion of circular shafts which include, Assumptions made in the theory of pure torsion, derivation of torsion equation, torsion moment of resistance, polar section modulus, power transmitted by shafts, combined bending, torsion and end thrust, design of shafts according to theories of failure
- to understand Columns and struts which include types of columns, short, medium and long columns, axially loaded compression members, crushing load, Euler's theorem for long columns, derivation of Euler's critical load formulae for various end conditions.

UNIT I
Thin cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

UNIT II
Thick cylinders : Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells**.**

UNIT III

Principal stresses and strains : Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

UNIT IV

Torsion of circular shafts : Theory of pure torsion – Assumptions made in the theory of pure torsion-Derivation of Torsion equation– Torsion moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending, torsion and end thrust – Design of shafts according to theories of failure.

UNIT V

Columns and struts : Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load– Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions –Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Perry's formula-Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

Text Books:
1. A Text book of Strength of materials by R.K.Bansal –Laxmi Publications (P) ltd., New Delhi
2. Introduction to Strength of Materials by U.C. Jindal, Galgotia publications.
3. Strength of Materials by B.C. Punmia

Reference Books:
1. Mechanics of Solid, by Ferdinandp Beer and others – Tata Mc.Grawhill Publications 2000.
2. Strength of Materials by Schaum's out line series – Mc. Graw hill International Editions.
3. Strength of Materials by S. Ramakrishna and R.Narayan – Dhanpat Rai publications.
4. Strength of materials by R.K.Rajput, S.Chand & Co, New Delhi.

Hydraulics and Hydraulic Machinery

Subject Code: 13CE2007   **External Marks: 70**
Credits:03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study the dimensional Analysis which include dimensions, dimensional homogeneity, methods of dimensional analysis Rayleigh method, Buckingham π –method, number of dimensionless groups in a complete set of variables. superfluous and omitted variables.
- to study Open channel flow which include energy and momentum correction factors, Chezy's, Manning's; and Bazin formulae for uniform flow, most economical sections, computation of critical depth, critical sub-critical and super critical flows-Non uniform flow, dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes.
- to study Basics of turbo machinery which include hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet.
- to study hydraulic turbines which include layout of a typical Hydropower installation, classification of turbines pelton wheel, francis turbine, Kaplan turbine-working, , velocity diagram, work done and efficiency, draft tube, Governing of turbines-surge tanks.
- to study Centrifugal pumps which include classification-work done, manometric head-minimum starting speed losses and efficiencies, specific speed multistage pumps-pumps in parallel, performance of pumps, characteristic curves, NPSH, cavitations.

COURSE OUTCOMES:
- to understand the dimensional Analysis which include dimensions, dimensional homogeneity, methods of dimensional analysis Rayleigh method, Buckingham π –method, number of dimensionless groups in a complete set of variables. superfluous and omitted variables.
- to learn Open channel flow which include energy and momentum correction factors, Chezy's, Manning's; and Bazin formulae for uniform flow, most economical sections, computation of critical depth, critical sub-critical and super critical flows-Non uniform flow, dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes.
- to understand Basics of turbo machinery which include hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet.
- to learn hydraulic turbines which include layout of a typical Hydropower installation, classification of turbines pelton wheel, francis turbine, Kaplan turbine-working, , velocity diagram, work done and efficiency, draft tube, Governing of turbines-surge tanks.
- to understand centrifugal pumps which include classification-work done, manometric head-minimum starting speed losses and efficiencies, specific speed multistage pumps-pumps in parallel, performance of pumps, characteristic curves, NPSH, cavitations.

UNIT – I
Dimensional Analysis: Introduction, Dimensions, Dimensional Homogeneity, Methods of dimensional analysis – Rayleigh method, Buckingham π –method, Number of dimensionless groups in a complete set of variables. Superfluous and omitted variables.

UNIT – II
Open channel flow: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections.

Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows-Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT – III
Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

UNIT – IV
Hydraulic turbines: Layout of a typical Hydropower installation – Heads and efficiencies-classification of turbines pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency-Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitations.

UNIT – V
Centrifugal pumps: Pump installation details-classification-work done- Manometric head-minimum starting speed losses and efficiencies-specific speed multistage pumps-pumps in parallel- performance of pumps-characteristic curves-NPSH-cavitations.

Text Books:
1. Open Channel flow by K,Subramanya . Tata Mc.Grawhill Publishers
2. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi
3. Fluid Mechanics & Fluid Power Engineering by D.S. Kumar Kataria & Sons.
4. Fluid mechanics and fluid machines by R.K. Rajput, S.Chand &Co.

Reference Books:
1. Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
2. Elements of Open channel flow by Ranga Raju, Tata Mc.Graw Hill, Publications.
3. Open Channel flow by V.T.Chow, Mc.Graw Hill book company.
4. Hydraulic Machines by Banga & Sharma Khanna Publishers.

Structural Analysis-I

Subject Code: 13CE2008   **External Marks:70**
Credits:03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about Analysis of pin jointed plane frames which include determination of forces in members of plane, pin-jointed, , perfect trusses by method of joints and method of sections. Analysis of cantilever and simply supported trusses.
- to study about three hinged arches elastic theory of arches, Eddy's theorem, determination of horizontal thrust, bending moment, normal thrust and radial shear, effect of temperature
- to study about propped cantilever beam which include analysis of propped cantilever beam with U.D.L, central point load, eccentric point load, and number of point loads, Shear force and bending moment diagrams**.**
- to study about the Fixed Beams statically indeterminate beams with U.D.L, central point load, eccentric point load, number of point loads, Shear force and bending moment diagrams.
- to study about the continuous beams which include Clapeyron's theorem of three moments, analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, shear force and Bending moment diagrams.
- to study about the moving Loads which include , maximum S.F. and B.M. at a given section and absolute maximum S.F. and B.M. due to single concentrated load, UDL longer than span , UDL shorter than span.
- to study about the Influence Lines which include influence line reactions , influence line for S.F., influence line for B.M., load position for maximum S.F. at a section, load position for maximum B.M. at sections, single point load .

COURSE OUTCOMES:
Students will get ability
- to understand Analysis of pin jointed plane frames which include determination of forces in members of plane, pin-jointed, , perfect trusses by method of joints and method of sections. Analysis of cantilever and simply supported trusses.
- to learn three hinged arches elastic theory of arches, Eddy's theorem, determination of horizontal thrust, bending moment, normal thrust and radial shear, effect of temperature
- to understand propped cantilever beam which include analysis of propped cantilever beam with U.D.L, central point load, eccentric point load, and number of   point loads, Shear force and bending moment diagrams**.**
- to understand about the Fixed Beams statically indeterminate beams with U.D.L, central point load, eccentric point load, number of point loads, Shear force and bending moment diagrams.
- to learn about the continuous beams which include Clapeyron's theorem of three moments, analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, shear force and Bending moment diagrams.
- to understand about the moving Loads which include , maximum S.F. and B.M. at a given section and absolute maximum S.F. and B.M. due to single concentrated load, UDL longer than span , UDL shorter than span.
- to learn about the Influence Lines which include influence line reactions , influence line for S.F., influence line for B.M., load position for maximum S.F. at a section, load position for maximum B.M. at sections, single point load .

UNIT – I
Introduction to Static and Kinematic indeterminacy
ANLYSIS OF PIN JOINTED PLANE FRAMES: Determination of forces in members of plane, pin-jointed, , perfect trusses by (i)   method of joints and (ii) method of sections. Analysis of cantilever and simply supported trusses.

UNIT – II
Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature

UNIT – III
Propped Cantilever Beam: Analysis of propped cantilever beam with U.D.L, central point load, eccentric point load, and number of   point loads – Shear force and bending moment diagrams**.**
Fixed Beams: Introduction to statically indeterminate beams with U.D.L, central point load, eccentric point load, number of point loads- Shear force and bending moment diagrams.

UNIT – IV
Continuous Beams : Introduction-Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans, shear force and Bending moment diagrams.

UNIT – V
Moving Loads –Introduction, maximum S.F. and B.M. at a given section and absolute maximum S.F. and B.M. due to single concentrated load, UDL longer than span , UDL shorter than span.
Influence Lines : Definition of influence line , of influence line reactions , influence line for S.F., influence line for B.M.-Load position for maximum S.F. at a section – Load position for maximum B.M. at sections, single point load .

Text Books:
1. Analysis of Structures-Vol I & Vol II by V.N. Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
3. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan & Dr. P.Perumal- Laxmi publications pvt. Ltd., New Delhi
4. Basic structural Analysis by C.S. Reddy, Tata Mcgrawhill, New Delhi
5. Theory of Structures by S.Ramamrutam.

Reference Books:
1. Mechanics of Structures by S.B.Junnarkar, Charotar Publishing House, Anand, Gujrat
2. Theory of Structures by Gupta, Pandit & Gupta; Tat Mc.Graw – Hill Publishing Co.Ltd., New Delhi.
3. Theory of Structures by R.S. Khurmi, S. Chand Publishers
4. Strength of Materials and Mechanics of Structures- by B.C.Punmia, Khanna Publications, New Delhi.
5. Introduction to structural analysis by B.D. Nautiyal, New age international publishers, New Delhi

Concrete Technology

Subject Code: 13CE2009   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about cements & admixtures which include portland cement, chemical composition, hydration, setting of cement, structure of hydrate cement, test on physical properties, different grades of cement , admixtures, mineral and chemical admixtures.
- to study about aggregates which include classification of aggregates, particle shape and texture, bond, strength and other mechanical properties of aggregates, sieve analysis fineness modulus, grading curves, gap graded and well graded aggregate as per relevant IS code.
- to study about fresh concrete which include workability, factors affecting workability , measurement of workability by different tests, setting times of concrete segregation & bleeding , Mixing and vibration of concrete, steps in manufacture of concrete, quality of mixing water.
- to study about hardened concrete which include water / Cement ratio, Abram's Law, gelspace ratio, nature of strength of concrete, maturity concept, strength in tension & compression, factors affecting strength, relation between compression & tensile strength, curing.
- to study about testing of hardened concrete which include compression tests, tension tests, factors affecting strength, flexure tests, splitting tests, non-destructive testing methods, codal provisions for NDT.
- to study about elasticity, creep & shrinkage which include modulus of elasticity, Dynamic modulus of elasticity, Posisson's ratio, Creep of concrete, factors influencing creep, relation between creep & time, nature of creep, effects of creep, shrinkage, types of shrinkage.
- to study about the mix design factors in the choice of mix proportions, durability of concrete, quality control of concrete, statistical methods, acceptance criteria Proportioning of concrete mixes by various methods, BIS method of mix design.

COURSE OUTCOMES:
Students will get ability
- to understand about cements & admixtures which include portland cement, chemical composition, hydration, setting of cement, structure of hydrate cement, test on physical properties, different grades of cement , admixtures, mineral and chemical admixtures.
- to learn about aggregates which include classification of aggregates, particle shape and texture, bond, strength and other mechanical properties of aggregates, sieve analysis fineness modulus, grading curves, gap graded and well graded aggregate as per relevant IS code.
- to understand about fresh concrete which include workability, factors affecting workability , measurement of workability by different tests, setting times of concrete segregation & bleeding , Mixing and vibration of concrete, steps in manufacture of concrete, quality of mixing water.
- to learn about hardened concrete which include water / Cement ratio, Abram's Law, gelspace ratio, nature of strength of concrete, maturity concept, strength in tension & compression, factors affecting strength, relation between compression & tensile strength, curing.
- to understand about testing of hardened concrete which include compression tests, tension tests, factors affecting strength, flexure tests, splitting tests, non-destructive testing methods, codal provisions for NDT.
- to learn about elasticity, creep & shrinkage which include modulus of elasticity, Dynamic modulus of elasticity, Posisson's ratio, Creep of concrete, factors influencing creep, relation between creep & time, nature of creep, effects of creep, shrinkage, types of shrinkage.

- to understand about the mix design factors in the choice of mix proportions, durability of concrete, quality control of concrete, statistical methods, acceptance criteria Proportioning of concrete mixes by various methods, BIS method of mix design.

UNIT I
Cements & admixtures: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

UNIT II
Aggregates: Classification of aggregates-particle shape and texture-Bond, strength and other mechanical properties of aggregates –sieve analysis –fineness Modulus-Grading curves-Gap graded and well graded aggregate as per relevant IS code.
Fresh concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT III
Hardened concrete : Water / Cement ratio – Abram's Law – Gelspace ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.
Testing of hardened concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – codal provisions for NDT.

UNIT IV
Elasticity, creep & shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

UNIT V
Mix design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Text Books:
1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co.; 2004

Reference Books:
1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

<div align="center">**Mechanics of Fluids and Hydraulic Machinery Lab**</div>

Subject Code: 13CE2104   **External Marks: 50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have

- to study how to calibrate of venturimeter & orifice meter
- to study how to determine of coefficient of discharge for a small orifice by a constant head method.
- to study how to determine of coefficient of discharge for an external mouth piece by variable head method.
- to study how to calibrate of contracted Rectangular Notch and /or Triangular Notch
- to study how to determine Coefficient of loss of head in a sudden contraction and friction factor.
- to study how to verify bernoulli's equation.
- to practice impact of jet on vanes
- to study how to introduce concepts of fluid flow and hydraulic machines to make the students gainful.

COURSE OUTCOMES:
Students will get ability
- to understand how to calibrate of venturimeter & orifice meter
- to learn how to determine of coefficient of discharge for a small orifice by a constant head method.
- to understand how to determine of coefficient of discharge for an external mouth piece by variable head method.
- to learn how to calibrate of contracted Rectangular Notch and /or Triangular Notch
- to understand how to determine Coefficient of loss of head in a sudden contraction and friction factor.
- to learn how to verify bernoulli's equation.
- to do impact of jet on vanes
- to understand how to introduce concepts of fluid flow and hydraulic machines to make the students gainful.

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

Concrete Technology Lab

Subject Code: 13CE2105   **External Marks: 50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
- to do tests on cement which include, determination of fineness of cement, determination of specific gravity of cement, determination of normal consistency of cement, determination of soundness of cement, determination of compressive strength of cement
- to do tests on aggregate which include determination of fineness modulus and zone of sand determination of fineness modulus of coarse aggregate, determination of bulk density of fine aggregate, determination of bulk density of coarse aggregate, determination of Specific Gravity of Fine aggregate, determination of specific gravity of coarse aggregate, determination of bulking of sand , determination of water absorption of Coarse aggregate
- to do tests on fresh concrete which include determination of workability of concrete by slump cone test , determination of workability of concrete by compaction factor test, determination of workability of concrete by vee-bee consistometer test, determination of workability of concrete by flow table test.
- to do tests on hardened concrete which include, determination of compressive Strength and youngs modulus of concrete cube, determination of compressive strength and youngs modulus of concrete cylinder, determination of flexural tensile strength of concrete prism, determination of split tensile strength of concrete cylinder.
- to know how to demonstrate the non-destructive testing of concrete (rebound hammer), determination of moisture content in fine aggregate by Rapid moisture Meter.

COURSE OUTCOMES:
Students will get ability
- to understand tests on cement which include, determination of fineness of cement, determination of specific gravity of cement, determination of normal consistency of cement, determination of soundness of cement, determination of compressive strength of cement
- to understand tests on aggregate which include determination of fineness modulus and zone of sand determination of fineness modulus of coarse aggregate, determination of bulk density of fine aggregate, determination of bulk density of coarse aggregate, determination of Specific Gravity of Fine aggregate, determination of specific gravity of coarse aggregate, determination of bulking of sand , determination of water absorption of Coarse aggregate
- to understand tests on fresh concrete which include determination of workability of concrete by slump cone test , determination of workability of concrete by compaction factor test, determination of workability of concrete by vee-bee consistometer test, determination of workability of concrete by flow table test.
- to understand tests on hardened concrete which include, determination of compressive Strength and youngs modulus of concrete cube, determination of compressive strength and youngs modulus of concrete cylinder, determination of flexural tensile strength of concrete prism, determination of split tensile strength of concrete cylinder.
- to learn how to demonstrate the non-destructive testing of concrete (rebound hammer), determination of moisture content in fine aggregate by Rapid moisture Meter.

LIST OF EXPERIMENTS

TESTS ON CEMENT
1. (a) Determination of Fineness of Cement.
   (b) Determination of Specific Gravity of Cement.
2. (a) Determination of Normal Consistency of Cement.
   (b) Determination of Initial and Final Setting time of Cement.
3. (a) Determination of Soundness of Cement.
   (b) Determination of Compressive Strength of Cement.

TESTS ON AGGREGATE
4. (a) Determination of Fineness Modulus and Zone of Sand.
   (b) Determination of Fineness Modulus of Coarse Aggregate.
5. (a) Determination of Bulk Density of Fine aggregate.
   (b) Determination of Bulk density of Coarse aggregate.
6 (a) Determination of Specific Gravity of Fine aggregate.
   (b) Determination of Specific Gravity of Coarse Aggregate.
7. (a) Determination of Bulking of Sand.
   (b) Determination of Water absorption of Coarse Aggregate.

TESTS ON FRESH CONCRETE
8. (a) Determination of Workability of Concrete by Slump Cone test.
   (b) Determination of Workability of Concrete by Compaction
       Factor test .
9. (a) Determination of Workability of Concrete by Vee-bee Consistometer test.
   (b) Determination of Workability of Concrete by Flow table test.

TESTS ON HARDENED CONCRETE
10. (a) Determination of Compressive Strength and Youngs Modulus of Concrete cube.
    (b) Determination of Compressive Strength and Youngs Modulus of Concrete cylinder.
11. (a) Determination of Flexural Tensile Strength of Concrete Prism.
    (b) Determination of Split tensile strength of Concrete cylinder.

DEMONSTRATION
12. (a) Non-destructive testing of Concrete (Rebound hammer).
    (b) Determination of moisture content in fine aggregate by Rapid moisture Metre.

PROFESSIONAL ETHICS AND MORALS

Subject Code: 13HS2201   **External Marks: 0**
Credits: 0   **Internal Marks: 0**

COURSE OBJECTIVES:
- To educate the students how to governance the professional behavior in their carrier as employs.
- To make aware of culture when they are working in different organizations

COURSE OUTCOMES:
- Upon completion of this course students can aware of ethical behavior in the work place
- To shapen the students by the end of this curriculum with appropriate behavior in the society

UNIT – I
INTRODUCTION TO VALUES AND MORALS: Theory of Evolution – Ethics as a necessity for spiritual evolution-- Description of Human Values & Morals ---- Values --- Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others, 7 Ways of Misusing Truth -- Work Culture, Social Responsibility, Responsibilities as a Citizen, Cooperation and Commitment, Caring and Sharing--- Religion vs. Spirituality, Philosophy, Customs and Practices --- Impediments to Responsibility – Self-Interest, Fear, Self-Deception, Ignorance, Ego, Narrow Vision,   Uncritical Acceptance of Authority, Group Thinking.

UNIT – II
MIND AND ITS MYSTERIES: What is Mind? Mind and Body, Mind and Food--- Mental faculties, Theory of perception, Memory, Tendencies, Thought Creates the World -- Power of Thought, Thought-Culture, Desires, Pleasure and Pain -- Cultivation of Virtues, Control of Senses and Mind -- Discrimination, Dispassion, Sacrifice – Concentration, Meditation and Enlightenment.

UNIT – III
RISK, SAFETY AND ENVIRONMENT: Difficulties in Estimating Risk -- Approach to Acceptable Risk, Regulator's Approach to Risk – Engineer's Liability, Changing Legal Rights of the Employees -- Organizational Disobedience by Contrary Action, by Non-Participation, by Protest -- Environmental Laws and Judicial Intervention in Related Matters -- Environmental Movements.

UNIT – IV
NON-ETHICAL PRACTICES IN VOGUE: Engineer's Responsibility for Rights - Respect for Authority – Conflict of Interests - Occupational crime -- Global Issues – How Multinational Corporations Influence Government Decisions, Risk and Public Policy --- Engineers as Managers, Advisors and Experts, Engineers as Moral Leaders --- Problem of Bribery, Extortion, Grease Payments, Nepotism ----Nexus between Politicians and Industrialists ---- Case Study – Chinese Minister Sentenced to Death for Corruption.

UNIT – V
CASE STUDIES – VARIETY OF MORAL ISSUES IN PROFESSION: Chernobyl nuclear disaster, Air bags, Cadillac Chips, Nuclear Power Generation Plant, Highway Safety, Microwaves, Renewable Energy, Training Fire Fighters.

TEXTBOOKS:
1. Charles E Harris, Micheal J Rabins, "Engineering Ethics, Cengage Learning
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw Hill
3. Mind, Its Mysteries and Control, Swami Sivananda, Divine Life Society Pub.

III B.Tech - I Semester									
S. No.	codes	Theory / Labs	L	T	P	C	Marks		Total
							INT	EXT	
1	13CE3010	Building Planning and Drawing	3	1		3	30	70	100
2	13CE3011	Transportation Engineering-I	3	1		3	30	70	100
3	13CE3012	Design and Drawing of Concrete Structures-I	3	1		3	30	70	100
4	13CE3013	Geotechnical Engineering – I	3	1		3	30	70	100
5	13CE3014	Structural Analysis-II	3	1		3	30	70	100
6	13CE3106	Surveying Lab –II			3	2	25	50	75
7	13CE3107	Computer Aided Engineering Drawing Practice			3	2	25	50	75
8	13CE3108	Transportation Engineering Lab			3	2	25	50	75
9	13CE3202	Self study course-II **(4)**				1	75	-	75
Total Credits			15	5	9	**22**	300	500	800

Building Planning and Drawing

Subject Code: 13CE3010   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:

- to study about building byelaws and regulations which include terminology, objectives of building byelaws, floor area ratio (FAR), floor space Index (FSI), principles underlying building byelaws classification of bye buildings, open space requirements, built up area limitations, height of buildings, wall thickness, lighting and ventilation requirement.
- to study about residential buildings which include minimum standards for various parts of buildings ,requirements of different rooms and their grouping, characteristics of various types of residential buildings.
- to study about public buildings which include planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation.
- to study about CPM and PERT which include planning of construction projects, scheduling and monitoring bar chart, CPM and PERT Network planning, computation of times and floats, their significance.
- to know how to draw Sign conventions and bonds which include brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin, white lead etc., earth, rock, timber and marble. english bond & flemish bond odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.
- to know how to draw Doors windows, ventilators and roofs which include paneled door , paneled and glazed door, glazed windows , paneled windows, swing ventilator, fixed ventilator, couple roof ,collar roof king post truss, queen post truss
- to know how to draw Sloped and flat roof buildings, given line diagram with specification to draw, plan, sections section and elevation

COURSE OUTCOMES:

- to understand about building byelaws and regulations which include terminology, objectives of building byelaws, floor area ratio (FAR), floor space Index (FSI), principles underlying building byelaws classification of bye buildings, open space requirements, built up area limitations, height of buildings, wall thickness, lighting and ventilation requirement.
- to understand about residential buildings which include minimum standards for various parts of buildings ,requirements of different rooms and their grouping, characteristics of various types of residential buildings.
- to understand about public buildings which include planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation.
- to understand about CPM and PERT which include planning of construction projects, scheduling and monitoring bar chart, CPM and PERT Network planning, computation of times and floats, their significance.
- to learn how to draw Sign conventions and bonds which include brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin, white lead etc., earth, rock, timber and marble. english bond & flemish bond odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

- To learn how to draw Doors windows, ventilators and roofs which include paneled door , paneled and glazed door, glazed windows , paneled windows, swing ventilator, fixed ventilator, couple roof ,collar roof king post truss, queen post truss
- to learn how to draw Sloped and flat roof buildings, given line diagram with specification to draw, plan, sections section and elevation

Part A

UNIT – I
Building Byelaws and Regulations: Introduction – Terminology – Objectives of building byelaws – Floor area ratio (FAR) – Floor space Index (FSI) – Principles underlying building byelaws – classification of bye buildings – Open space requirements – built up area limitations – Height of Buildings – Wall thickness – lighting and ventilation requirement.

UNIT – II
Residential Buildings: Minimum standards for various parts of buildings – requirements of different rooms and their grouping – characteristics of various types of residential buildings.
Public Buildings: Planning of Educational institutions, hospitals, dispensaries, Office buildings, banks, industrial buildings, hotels and motels, buildings for recreation.

UNIT – III
CPM and PERT: Planning of construction projects – scheduling and monitoring Bar chart – CPM and PERT Network planning –computation of times and floats – their significance.

Part B
UNIT – IV
Sign conventions and bonds: Brick, Stone, Plaster, Sand filling, Concrete, Glass, Steel, Cast iron, Copper alloys, Aluminum alloys etc., Lead, Zinc, tin, white lead etc., Earth, Rock, Timber and Marble. English bond & Flemish bond odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.
Doors windows, ventilators and roofs: Paneled Door – paneled and glazed door, glazed windows – paneled windows – Swing ventilator – Fixed ventilator-Couple roof – Collar roof – Kind Post truss – Queen post truss.

UNIT – V
Sloped and flat roof buildings, given line diagram with specification to draw, plan, sections section and elevation

Final Examination pattern :
The end examination paper should consist of part A and part B. Part A consist of five questions in planning portion out of which three questions are to be answered .Part B should consist of two questions from drawing part out which one is to be answered in drawing sheet. Weightage for Part A is60% and Part B is 40%

Text Books:
1. Construction Planning, Equipment and methods by R.L. Peurifoy etal. – Tata Mc. Graw Hill Publications.
2. PERT and CPM – Project planning and control with by Dr.B.C.Punmia & Khandelwal – Laxmi publications.
3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

Reference Books
1. Building by bye laws state and Central Governments and Municipal corporations.

Transportation Engineering-I

Subject Code: 13CE3011   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- to study about highway development and planning which include highway development in India, different road development plans, classification of roads, highway alignment, factors affecting Alignment, engineering surveys.
- to study about highway geometric design which include importance of geometric design, design controls and criteria, sight distance elements, design of horizontal alignment, design of super elevation and extra widening, design of transition curves, design of vertical alignment, gradients, vertical curves.
- to study about traffic engineering which include basic parameters of traffic, volume, speed and density, Parking Studies and Parking characteristics, road accidents, accident data recording – condition diagram and collision diagrams.
- to study about traffic regulation and management which include road traffic signs , types and specifications, road markings, need for road markings, types of road markings, design of traffic Signals ,Webster Method , IRC Method.
- to study about at grade intersection design which include types of intersections, conflicts at intersections, Types of At-Grade Intersections, canalization, Objectives, traffic Islands and design criteria, rotary types.
- to study about grade separated inter section design which include types of grade Separated Intersections, rotary Intersection, flyovers, ROB, cloverleaf (partial, full). criteria for selection, advantage, disadvantages of grade separated intersection.

COURSE OUTCOMES:
- to understand about highway development and planning which include highway development in India, different road development plans, classification of roads, highway alignment, factors affecting Alignment, engineering surveys.
- to learn about highway geometric design which include importance of geometric design, design controls and criteria, sight distance elements, design of horizontal alignment, design of super elevation and extra widening, design of transition curves, design of vertical alignment, gradients, vertical curves.
- to understand about traffic engineering which include basic parameters of traffic, volume, speed and density, Parking Studies and Parking characteristics, road accidents, accident data recording – condition diagram and collision diagrams.
- to learn about traffic regulation and management which include road traffic signs , types and specifications, road markings, need for road markings, types of road markings, design of traffic Signals ,Webster Method , IRC Method.

- to understand about at grade intersection design which include types of intersections, conflicts at intersections, Types of At-Grade Intersections, canalization, Objectives, traffic Islands and design criteria, rotary types.
- to learn about grade separated inter section design which include types of grade Separated Intersections, rotary Intersection, flyovers, ROB, cloverleaf (partial, full). criteria for selection, advantage, disadvantages of grade separated intersection.

UNIT -I
Highway development and planning: Highway development in India – Necessity for Highway Planning-Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment-Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT – II
Highway geometric design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance. Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

UNIT – III
Traffic engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.

UNIT – IV
Traffic regulation and management: Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method.

UNIT – V
At Grade intersection design : Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Canalization: Objectives –Traffic Islands and Design criteria – Rotary - Types.
Grade separated inter section design : Types of Grade Separated Intersections- Rotary Intersection – Flyovers,ROB, Cloverleaf (partial, full). Criteria for selection, Advantage,disadvantages of grade separated intersection.

Text Books:
1. S.K.Khanna & C.E.G.Justo "Highway Engineering", Nemchand & Bros., 7th Edition, 2000.
2. L.R.Kadiyali and Lal "Principles & Practices of Highway Engineering" Khanna Publications, 4th Edition, 2004.
3. V.N.Vazirani and S.P.Chandra, "Transportation Engineering- Vol. I", Khanna Publications, 4th Edition, 1994.

Reference Books:
1. S.P.Bindra, "Highway Engineering" Dhanpat Rai & Sons. – 4th Edition (1981)
2. Dr.L.R.Kadyali, "Traffic Engineering & Transportation Planning", Khanna publications – 6th Edition – 1997.
3. NPTEL Videos
4. Indian Road Congress, Ministry of Road Transport and Highways, and Special Publications

Design and Drawing of Concrete Structures-I

Subject Code: 13CE3012   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have

- to study introduction of RCC which include materials for reinforced concrete, design codes and handbooks, loads, working stress method of design of singly and doubly reinforced beams.
- to study introduction of limit state design which include concepts of limit state design, loads, strain curves for cold worked deformed bars and mild steel bars, Assumptions in limit state design.
- to study about design for flexure, shear, torsion and bond which include limit state analysis, I.S. code provisions, Design examples in simply supported and continuous beam, detailing.
- to study design of compression members which include Effective length of a column, design of short and long columns, under axial loads, uniaxial bending and biaxial bending ,braced columns, I S code provisions.
- to study about slabs which include classification of slabs, design of one - way slabs, two way slabs, and continuous slabs using IS coefficients (conventional), design of waist-slab staircase.
- to study how to draw the reinforcement detailing of T-beams, L-beams and continuous beams, reinforcement detailing of columns, detailing of one-way, two-way and continuous slabs and waist-slab staircase

COURSE OUTCOMES:
Students will get ability

- to understand introduction of RCC which include materials for reinforced concrete, design codes and handbooks, loads, working stress method of design of singly and doubly reinforced beams.
- to understand introduction of limit state design which include concepts of limit state design, loads, strain curves for cold worked deformed bars and mild steel bars, Assumptions in limit state design.
- to learn about design for flexure, shear, torsion and bond which include limit state analysis, I.S. code provisions, Design examples in simply supported and continuous beam, detailing.
- to do design of compression members which include Effective length of a column, design of short and long columns, under axial loads, uniaxial bending and biaxial bending ,braced columns, I S code provisions.
- to learn about slabs which include classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS coefficients (conventional), design of waist-slab staircase.
- to draw the reinforcement detailing of T-beams, L-beams and continuous beams, reinforcement detailing of columns, detailing of one-way, two-way and continuous slabs and waist-slab staircase

UNIT-I
Introduction: materials for reinforced concrete, design codes and handbooks, loading standard – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams.

UNIT-II
Introduction of Limit State Design: concepts of limit state design-Basic statical principles- characteristic loads – characteristic strength – partial load and safety factors – representative stress – strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress – block parameters – limiting moment of Resistance

UNIT-III
Design for Flexure, Shear, Torsion and Bond: limit state analysis and design of singly reinforced, doubly reinforced and flanged (T and L) beam sections. Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beam, detailing.

UNIT-IV
Design of Compression Members: Effective length of a column, design of short and long columns- under axial loads, uniaxial bending and biaxial bending – braced columns – I S Code provisions.

UNIT – V
Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

NOTE: All the designs to be taught in Limit State Method (IS456-2000 and SP 16)
Following plates should be prepared by the students.
1. Reinforcement detailing of T-beams, L-beams and continuous beams.
2. Reinforcement detailing of columns.
3. Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

Text Books:
1. Reinforced concrete design by S.Unnikrishna Pillai & Devdas Menon, Tata Mc.Graw Hill, New Delhi.
2. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi
4. Design of reinforced concrete foundations by P.C. Varghese, PHI Learning private Limited

Text Books:
1. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.
2. Reinforced concrete structural elements – behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures – Arthus H.Nilson, David Darwin, and Chorles W. Dolar, Tata Mc.Graw-Hill,3rd Edition, 2005.
4. Reinforced Concrete Structures by Park and Pauley, John Wiley and Sons.
5. Reinforced concrete structures – I.C. Syal & A.K.Goel, S.Chand Publishers
6. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, New Delhi.

Geotechnical Engineering –I

Subject Code: 13CE3013   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study introduction which include soil formation, soil structure and clay mineralogy, adsorbed water, mass, volume relationship, relative density
- to study about index properties of soils which include grain size analysis, sieve and hydrometer methods , consistency limits and indices, I.S. classification of soils
- to study about permeability which include soil water, capillary rise, flow of water through soils, Darcy's law, permeability , laboratory determination of coefficient of permeability , permeability of layered systems.
- to study about seepage through soils which include total, neutral and effective stresses –quick sand condition , seepage through soils, flownets, characteristics and Uses
- to study about stress distribution in soils which include Boussinesq's and Wester gaard's theories for point loads and areas of different shapes, Newmark's influence chart
- to study about compaction which include mechanism of compaction, factors affecting, effects of compaction on soil properties, field compaction equipment, compaction control
- to study about consolidation which include stress history of clay; e-p and e-log p curves, magnitude and rate of 1-D consolidation ,Terzaghi's theory
- to study about shear strength of soils**,** Mohr ,Coulomb Failure theories, types of laboratory strength tests, strength tests based on drainage conditions , shear strength of sands, critical void ratio, liquefaction, shear strength of clays

COURSE OUTCOMES:
Students will get ability
Students will have
- to understand introduction which include soil formation, soil structure and clay mineralogy, adsorbed water, mass, volume relationship, relative density
- to learn about index properties of soils which include grain size analysis, sieve and hydrometer methods , consistency limits and indices, I.S. classification of soils
- to understand about permeability which include soil water, capillary rise, flow of water through soils, Darcy's law, permeability , laboratory determination of coefficient of permeability , permeability of layered systems.
- to learn about seepage through soils which include total, neutral and effective stresses –quick sand condition , seepage through soils, flownets, characteristics and Uses
- to understand about stress distribution in soils which include Boussinesq's and Wester gaard's theories for point loads and areas of different shapes, Newmark's influence chart
- to learn about compaction which include mechanism of compaction, factors affecting, effects of compaction on soil properties, field compaction equipment, compaction control
- to understand about consolidation which include stress history of clay; e-p and e-log p curves, magnitude and rate of 1-D consolidation ,Terzaghi's theory
- to learn about shear strength of soils**,** Mohr ,Coulomb Failure theories, types of laboratory strength tests, strength tests based on drainage conditions , shear strength of sands, critical void ratio, liquefaction, shear strength of clays

UNIT I
Introduction: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density.
Index properties of soils: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

UNIT II
Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting – laboratory determination of coefficient of permeability –Permeability of layered systems.
Seepage through soils: Total, neutral and effective stresses –quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT III
Stress distribution in soils: Boussinesq's and Wester gaard's theories for point loads and areas of different shapes – Newmark's influence chart .

UNIT – IV
Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties. – Field compaction Equipment - compaction control.
Consolidation: stress history of clay; e-p and e-log p curves – magnitude and rate of 1-D consolidation – Terzaghi's Theory.

UNIT –V
Shear strength of soils : Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays

Text Books:
1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New Delhi
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

Text Books:
1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork.
3. Geotechnical Engineering by Purushotham Raj
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.

Structural Analysis – II

Subject Code: 13CE3014   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about two hinged arches which include determination of horizontal thrust, bending moment, normal thrust and radial shear for parabolic arches with point load and uniformly distributed load, approximate method of structural analysis, Portal method and Cantilever method.
- to study about slope deflection method which include Derivation of slope deflection equations, application to continuous beams, beam with and without settlement of supports and also single bay portal frame including side sway.
- to study about moment distribution method which include stiffness and carry over factors, distribution factors, analysis of continuous beams with and without sinking of supports, storey portal frames, including sway-substitute frame analysis by two cycle.
- to study about analysis of continuous beams which include settlement of supports and single bay portal frames with side sway by Kani's method, Flexibility methods.
- to study about analysis of continuous settlement of supports and single bay portal frames with side sway by stiffness method. (Maximum of two unknowns)

COURSE OUTCOMES:
Students will get ability
- to do two hinged arches which include determination of horizontal thrust, bending moment, normal thrust and radial shear for parabolic arches with point load and uniformly distributed load, approximate method of structural analysis, Portal method and Cantilever method.
- to do slope deflection method which include Derivation of slope deflection equations, application to continuous beams, beam with and without settlement of supports and also single bay portal frame including side sway.
- to do moment distribution method which include stiffness and carry over factors, distribution factors, analysis of continuous beams with and without sinking of supports, storey portal frames, including sway-substitute frame analysis by two cycle.
- to do analysis of continuous beams which include settlement of supports and single bay portal frames with side sway by Kani's method, Flexibility methods.
- to do analysis of continuous settlement of supports and single bay portal frames with side sway by stiffness method. (Maximum of two unknowns

UNIT I
Two hinged arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear for parabolic arches with point load and uniformly distributed load.
Approximate method of structural analysis, application to building frames. (i) Portal method and (ii) Cantilever method.

UNIT – II
Slope deflection method: Derivation of slope deflection equations, application to continuous beams, beam with and without settlement of supports and also single bay portal frame including side sway.

UNIT – III
Moment Distribution method – Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – storey portal frames – including Sway-Substitute frame analysis by two cycle.

UNIT – IV
Analysis of continuous beams – including settlement of supports and single bay **portal frames** with side sway by Kani's method.-Flexibility methods (maximum of two unknowns)

UNIT – V
Analysis of continuous beams – including settlement of supports and single bay **portal frames** with side sway by stiffness method. (Maximum of two unknowns)

TEXT BOOKS:
1. Analysis of Structures – Vol. I & 2 by Bhavikathi, Vikas publications
2. Analysis of structures by Vazrani & Ratwani – Khanna Publications.
3. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi
4. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan & Dr. P.Perumal- Laxmi publications pvt. Ltd., New
Delhi

REFERENCES :
1. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata Mc.Graw Hill publishers.
2. Theory of structures by Ramamuratam
3. Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi

Surveying-II Lab

Subject Code: 13CE3016   **External Marks:50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
. Students will have
- to study how to measure horizontal angles by repetition and reiteration methods
- to study how measure distance between two inaccessible points by making use of theodolite
- to study how to do trigonometric Leveling, heights and distance problem
- to study how to measure heights and distances using principles of tachometric surveying
- to study how to set the curves on the field
- to study how to determine area, traversing, contouring, remote height and Distance, gradient, Difference, height between two inaccessible points using total stations
- to study how to do experiments using GPS

COURSE OUTCOMES:
Students will get ability
- to measure horizontal angles by repetition and reiteration methods
- to measure distance between two inaccessible points by making use of theodolite
- to do trigonometric Leveling, heights and distance problem
- to to measure heights and distances using principles of tachometric surveying
- to set the curves on the field
- to determine area, traversing, contouring, remote height and Distance, gradient, Difference, height between two inaccessible points using total stations
- to do experiments using GPS

List of exercises:
1. Measurement of Horizontal Angles by Repetition and Reiteration methods.
2. Distance between two inaccessible points by making use of theodolite.
3. Trigonometric Leveling - Heights and distance problem
4. Heights and distances using Principles of tachometric surveying
5. Curve setting .
6. Determine of area using total station
7. Traversing using total station
8. Contouring using total station
9. Determination of remote height using total station
10. Distance, gradient, Difference, height between two inaccessible points using total stations
11. Minimum two Experiments using GPS

Computer Aided Engineering Drawing Practice

Subject Code: 13CE3107   **External Marks:50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
. Students will have
- to practice introduction to computer aided drafting which include points, lines, curves, polygons and dimensioning
- to practice types modeling which include object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,**.**
- to practice computer aided solid modeling which include Isometric projections, orthographic projections of isometric projections, Modeling of simple solids.
- to practice building drawings which include Plan, Front Elevation and Sectional Elevation of buildings
- to practice building drawings which include 3D drawings of buildings

COURSE OUTCOMES:
Students will get ability
- to do computer aided drafting which include points, lines, curves, polygons and dimensioning
- to do types modeling which include object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,**.**
- to do computer aided solid modeling which include Isometric projections, orthographic projections of isometric projections, Modeling of simple solids.
- to do building drawings which include Plan, Front Elevation and Sectional Elevation of buildings
- to do building drawings which include 3D drawings of buildings.

UNIT – I
INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, Dimensioning.

UNIT – II
TYPES OF MODELING: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,**.**

UNIT-III
COMPUTER AIDED SOLID MODELING: Isometric projections, orthographic projections of isometric projections ,Modeling of simple solids.

UNIT-IV
BUILDING DRAWINGS: Plan, Front Elevation and Sectional Elevation of buildings.

UNIT-V
BUILDING DRAWINGS: 3D drawings of buildings.

TEXT BOOKS:
1. Engineering Graphics, K.C. john, PHI Publications
2. Machine Drawing, K.LNarayana ,P. Kannaiah and K.venkata reddy / New age International publishers.

REFERENCES:
1. Autocad 2009, Galgotia publications, New Delhi
2. Text book of Engineering Drawing with Auto-CAD, K.venkata reddy/B.S. Publications.
3. Engineering drawing by N.D Bhatt , Charotar publications.

Transportation Engineering Lab

Subject Code: 13CE3018   **External Marks:50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
. Students will have
  - to practice tests on road aggregates which include, aggregate crushing value, aggregate impact Test, specific gravity and water absorption, attrition test, abrasion test, shape tests
  - to practice tests on bituminous materials which include ,viscosity test., ductility test., softening point test, flash and fire point tests, penetration test, stripping test

COURSE OUTCOMES:
Students will get ability
  - to do tests on road aggregates which include, aggregate crushing value, aggregate impact Test, specific gravity and water absorption, attrition test, abrasion test, shape tests
  - to do tests on bituminous materials which include ,viscosity test., ductility test., softening point test, flash and fire point tests, penetration test, stripping test
  .

LIST OF EXPERIMENTS

A) ON ROAD AGGREGATES:
1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

B) ON BITUMINOUS MATERIALS:
1. Viscosity Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Penetration test
6. Stripping test

Self Study Course-II

Subject Code: 13CE3202   **External Marks: 0**
Credits: 1   **Internal Marks: 75**

COURSE OBJECTIVES

- Identify sources of information.

- Collecting relevant information.

- Ability to interpret information

- Ability to move from problem to solution.

COURSE OUTCOMES:

- Acquires ability to locate sources of information.

- Acquires ability to filter and select relevant information

- Apply information to real world problems and solve them.

Syllabus

1. Data collection through Internet

2. Data collection from Library and other sources

3. Seminar Presentation on advanced topics, Design and Analysis of structures

4. Group discussion

S. No.	Codes	Theory / Labs	L	T	P	C	Marks		Total
							INT	EXT	
	III B.Tech - II Semester								
1	13CE3015	Design of Concrete Structures-II	3	1		3	30	70	100
2	13CE3016	Design of Steel Structures	3	1		3	30	70	100
3	13CE3017	Geotechnical Engineering –II	3	1		3	30	70	100
4	13CE3018	Transportation Engineering-II	3	1		3	30	70	100
5	13CE3019	Water Resources Engineering	3	1		3	30	70	100
6		**Elective 1**	3	1		3	30	70	100
	13CE3020	I. Earthquake Resistant Design							
	13CE3021	II. Industrial Waste and Waste Water Management							
	13CE3022	III. Traffic Engineering							
	13CE3023	IV. Prestressed Concrete							
7	13CE3109	Drawing of Concrete and steel Structures			3	2	25	50	75
8	13CE3110	CAD Lab			4	3	25	50	75
9	13HS3202	IPR & Patents	2						
		Total Credits	20	6	7	**23**	230	520	750

Design of Concrete Structures –II

Subject Code: 13CE3015   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about footings which include types of footings, distribution of base pressure, general design considerations for footings, design of isolated rectangular, square footing, circular footing and. combine footing with slab.
- to study about slabs which include circular slabs, simply supported and fixed end conditions with uniformly distributed loads, flat slabs
- to study about bridges which include components of a bridge in sub structure and superstructure, classification of bridges, loadings or forces acting on a bridge, highway loading standards, design of solid slabs for IRC loadings.
- to study about piles and pile caps which include design of bored cast-in-situ piles, under reamed piles, design of pile cap for three and four piles using bending method.
- to study about water tanks Impermeability requirements, design of rectangular and circular water tanks resting on ground, elevated water tank

COURSE OUTCOMES:
Students will get ability
- to do design of footings which include types of footings, distribution of base pressure, general design considerations for footings, design of isolated rectangular, square footing, circular footing and. combine footing with slab.
- to do design of slabs which include circular slabs, simply supported and fixed end conditions with uniformly distributed loads, flat slabs
- to do design of bridges which include components of a bridge in sub structure and superstructure, classification of bridges, loadings or forces acting on a bridge, highway loading standards, design of solid slabs for IRC loadings.
- to do design of piles and pile caps which include design of bored cast-in-situ piles, under reamed piles, design of pile cap for three and four piles using bending method.
- to do design of water tanks Impermeability requirements, design of rectangular and circular water tanks resting on ground, elevated water tank

UNIT-I:
Footings: types of footings. Distribution of base pressure. General Design considerations   for footings. Design of Isolated rectangular, square footing , circular footing and. Combine footing with slab.

UNIT-II
Slabs: circular slabs – Simply supported and Fixed end conditions with Uniformly Distributed Loads , Flat slabs.

UNIT-III
Bridges: components of a bridge in sub structure and superstructure. Classification of bridges. Loadings or forces acting on a bridge. Highway loading standards. Design of solid slabs for IRC loadings.

UNIT-IV
Piles and pile caps: Design of bored cast-in-situ piles (bearing and friction types), under reamed piles. Design of Pile cap for three and four piles using bending method.

UNIT V
Water Tanks: (working stress method): Impermeability requirements, Design of rectangular and circular water tanks resting on ground, Elevated water tank.

NOTE- All Designs Should be in LIMIT STATE METHOD

Text Books:
1. Varghese P.C., "Advanced Reinforced Concrete Design", Prentice Hall India, 2007.
2. Sinha N.C.and Roy S.K., "Fundamentals of Reinforced Concrete", S.Chand Company, 1998.
3. Ashok.K.Jain, "Reinforced Concrete Design", Nem Chand and Bros, 1993.
4. Limit State of Design of Reinforced Concrete – P.C. Vergheese
5. Reinforced Concrete Limit State Design – A.K. Jain.
6. Design of reinforced Concrete Structures – P. Dayaratnam

Reference Books:
1. Krishnaraju N., "Design of Reinforced Concrete Structures ",Tata McGraw Hill, 2000.
2. Unnikrishnan Pillai S.& Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill, 2007.

IS Codes:
1. IS456 - 2000
2. IS 875 –I,II,III
3. IS: 3370 I,II,III,IV -2009(Code of Practice for Concrete Structures for the Storage of Liquids)
4. IS 2911 (Part 1/Sec 3) : 2010 (Standard specifications and code of practice for road bridges section III cement concrete(plain and reinforced)(Third revision)
5. IRC:6-2010 (Standard Specifications and Code of Practice for Road Bridges, Section-2: loads and stress)

*These codes are permitted in the examinations.

Design of Steel Structures

Subject Code: 13CE3016   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about welded connections which include advantages and disadvantages of welding, strength of welds, butt and fillet welds, permissible stresses, design of welds , fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints, beam to beam and beam to Column connections
- to study about beams which include allowable stresses, design requirements, design of simple and compound beams, Curtailment of flange plates, beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally supported and unsupported beams
- to study about tension members and compression members which include general design of members subjected to direct tension and bending, effective length of columns, slenderness ratio, design of compression members, struts, Built up compression members lacings and battens, design Principles of Eccentrically loaded columns, splicing of columns
- to study how to design gantry girder which include impact factors, longitudinal forces
- to study how to design plate girder which include Design consideration, I S Code recommendations, welded, curtailment of flange plates stiffeners, splicing and connections

COURSE OUTCOMES:
Students will get ability
- to understand about welded connections which include advantages and disadvantages of welding, strength of welds, butt and fillet welds, permissible stresses, design of welds , fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints, beam to beam and beam to Column connections
- to understand about beams which include allowable stresses, design requirements, design of simple and compound beams, Curtailment of flange plates, beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally supported and unsupported beams
- to understand about tension members and compression members which include general design of members subjected to direct tension and bending, effective length of columns, slenderness ratio, design of compression members, struts, Built up compression members lacings and battens, design Principles of Eccentrically loaded columns, splicing of columns
- to do design of gantry girder which include impact factors, longitudinal forces
- to do design of plate girder which include Design consideration, I S Code recommendations, welded, curtailment of flange plates stiffeners, splicing and connections

UNIT - I
Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of welds fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints, beam to beam and beam to Column connections.

UNIT – II
Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally supported and unsupported beams.

UNIT –III
Tension members and compression members: General Design of members subjected to direct tension and bending – effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc. Design of Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, splicing of columns.

UNIT – IV
Gantry girder: impact factors - longitudinal forces, Design of Gantry girders.

UNIT – V
Plate Girder: Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates stiffeners – splicing and connections

NOTE- All Designs Should be in LIMIT STATE Method

Text Books:
1. Design of Steel Structures by Ramachandra. Vol – 1, Universities Press. KAKINADA
2. Structural Design and Drawing by N.Krishna Raju; University Press, KAKINADA.
3. Design of steel structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi

Reference Books:
1. Comprehensive Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications,
New Delhi.
2. Structural design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi
3. Design of Steel Structures by P.Dayaratnam; S. Chand Publishers
4. Design of Steel Structures by M.Raghupathi, Tata Mc. Graw-Hill
IS Codes:
1) IS -800 – 2007, 2) IS – 875 – Part I,II&III, 3) Steel Tables.

*These codes and steel tables are permitted in the examinations.

Geotechnical Engineering-II

Subject Code: 13CE3017   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
  - to study about soil exploration which include need , methods of soil exploration boring and sampling methods , field tests , penetration tests , plate load test , pressure meter .
  - to study about earth slope stability which include infinite and finite earth slopes , types of failures, stability analysis by Swedish arc method, standard method of slices, Bishop's simplified method, Taylor's stability number, stability of slopes of earth dams under different conditions.
  - to study about earth pressure theories which include Rankine's theory of earth pressure , earth pressures in layered soils , Coulomb's earth pressure theory , Culmann's graphical method
  - to study about shallow foundations which include types , Terzaghi, Meyerhof, Skempton and IS methods, safe bearing pressure based on N- value safe bearing capacity and settlement from plate load test, allowable settlements of structures , settlement analysis
  - to study about pile foundation which include types of piles, load carrying capacity of piles based on static pile formulae, pile load tests, load carrying capacity of pile groups in sands and clays .

COURSE OUTCOMES:
Students will get ability
  - to understand about soil exploration which include need , methods of soil exploration boring and sampling methods , field tests , penetration tests , plate load test , pressure meter .
  - to learn about earth slope stability which include infinite and finite earth slopes , types of failures, stability analysis by Swedish arc method, standard method of slices, Bishop's simplified method, Taylor's stability number, stability of slopes of earth dams under different conditions.
  - to understand about earth pressure theories which include Rankine's theory of earth pressure , earth pressures in layered soils , Coulomb's earth pressure theory , Culmann's graphical method
  - to learn about shallow foundations which include types , Terzaghi, Meyerhof, Skempton and IS methods, safe bearing pressure based on N- value safe bearing capacity and settlement from plate load test, allowable settlements of structures , settlement analysis
  - to understand about pile foundation which include types of piles, load carrying capacity of piles based on static pile formulae, pile load tests, load carrying capacity of pile groups in sands and clays

UNIT – I
Soil exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

UNIT – II
Earth slope stability: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number-Stability of slopes of earth dams under different conditions.

UNIT-III
Earth pressure theories: Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method

UNIT-IV
Shallow foundations: Types - choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi, Meyerhof, Skempton and IS Methods,Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures - Settlement Analysis

UNIT -V

Pile foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd, (2004).
2. Foundation Engineering by Varghese,P.C., Prentice Hall of India., New Delhi.
3. Soil Mechanics and Foundations by - by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

Reference Books:

1. Das, B.M., - (1999) Principles of Foundation Engineering –6th edition (Indian edition) Thomson Engineering
2. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, Newyork.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
4. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5. Teng,W.C – Foundation Design , Prentice Hall, New Jersy

Transportation Engineering-II

Subject Code: 13CE3018   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about Pavement design which include CBR, IRC and AASHO methods of flexible pavement design , IRC method of rigid pavement design, importance of joints in rigid pavements, types of joints, use of tie bars and dowel bars.
- to study about highway construction, maintenance and drainage which include highway construction, construction of joints in cement concrete pavements, highway Maintenance , failures of flexible and rigid pavements and their maintenance, highway drainage.
- to study about highway economics & finance which include highway user benefits, highway cost , economic analysis, highway finance.
- to study about railway engineering which include permanent way components, functions of various Components like Rails, Sleepers and Ballast, theories related to creep, turnouts left hand turnout, track, junctions, tracks drainage, railway stations and yards, signaling.
- to study about airport engineering which include factors affecting Selection of site for airport and layout design, computation of runway length, orientation of runway, wind rose diagram, runway Lighting system

COURSE OUTCOMES:
Students will get ability
- to understand about Pavement design which include CBR, IRC and AASHO methods of flexible pavement design , IRC method of rigid pavement design, importance of joints in rigid pavements, types of joints, use of tie bars and dowel bars.
- to understand about highway construction, maintenance and drainage which include highway construction, construction of joints in cement concrete pavements, highway Maintenance , failures of flexible and rigid pavements and their maintenance, highway drainage.
- to learn about highway economics & finance which include highway user benefits, highway cost , economic analysis, highway finance.
- to learn about railway engineering which include permanent way components, functions of various Components like Rails, Sleepers and Ballast, theories related to creep, turnouts left hand turnout, track, junctions, tracks drainage, railway stations and yards, signaling.
- to understand about airport engineering which include factors affecting Selection of site for airport and layout design, computation of runway length, orientation of runway, wind rose diagram, runway Lighting system

UNIT I
Pavement design: Pavement Design – CBR method of flexible pavement design – IRC method of flexible pavement design, AASHO method of flexible pavement design - IRC method of rigid pavement design – importance of joints in rigid pavements – types of joints – use of tie bars and dowel bars.

UNIT II
Highway construction, maintenance and drainage: Highway construction – construction of earth roads – gravel roads – WBM roads – Bituminous roads – cement concrete roads – reinforced concrete pavements – construction of joints in cement concrete pavements. Highway Maintenance – Failures of flexible and rigid pavements and their maintenance- strengthening of existing pavements. Highway drainage – importance of highway drainage – surface, sub surface drainage.

UNIT III
Highway economics & finance: Highway user benefits – Highway cost – Economic analysis – Highway finance.

UNIT – IV
Railway engineering: Permanent way components – Cross Section of Permanent Way –Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density - Rail joints, welding of rails and creep of rails. Turnouts – left hand turnout – track – junctions – points and crossings – tracks drainage – railway stations and yards – signaling.

UNIT – V
AIRPORT ENGINEERING: Factors affecting Selection of site for Airport and Layout Design – Computation of Runway length – Correction for Runway Length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system – Taxiways, Apron, Control tower terminal building.

Text Books:
1. S.K.Khanna & C.E.G.Justo, "Highway Engineering", Nemchand & Bros., 7th edition (2000).
2. S.P.chadula, "Railway Engineering – A text book of
Transportation Engineering" , S.Chand & Co. Ltd. (2001).
3. L.R.Kadiyali and Lal "Principles & Practices of Highway Engineering" Khanna Publications, 4th Edition, 2004.
4. S.K.Khanna and M.G.Arora, "Airport Planning and Design" Nemchand & Bros., 6th edition (1999).
5. Rangwala S.C & K.S. " Railway Engineering", Charotar Publications, 14th Edition, 2005.
6. Saxena S.C and Arora S.P "Railway Engineering", Dhanapat Rai Publications, 6th Edition, 2004.
7. Seetharaman "Dock & Harbour Engineering", Umesh Publications, 1st Edition, 2008.

Reference Books:
1. S.P.Bindra , "Highway Engineering", Dhanpat Rai & Sons.
2. Dr.L.R.Kadyali, "Traffic Engineering & Transportation Planning",Khanna publications, 6th Edition, 1997.
3. Virendhra Kumar & Statish Chandhra, "Air Transportation Planning & design", Gal Gotia Publishers, 1999.
4. Robert M. Horonjeff " Planning and Design of Airports", Mc Graw Hill Publications, 2008.
5. J. S. Mundrey, "Railway Track Engineering", Mc Graw Hill Publications, 4th Edition, 2010.
6. Indian Road Congress, Ministry of Road Transport and Highways, and Special Publications

Water Resources Engineering

Subject Code: 13CE3019   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about introduction to engineering hydrology and its applications, hydrologic cycle, , types and forms of precipitation, abstraction from rainfall-evaporation, infiltration, runoff-components etc,.
- to study about unit hydrograph, ,s-hydrograph, design discharge, flood frequency analysis, basic concepts of flood routing etc,.
- to study about ground water Occurrence, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, necessity and Importance of Irrigation, indian agricultural soils, preparation of land for Irrigation etc,.
- to study about soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies
- to study about classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

COURSE OUTCOMES:
Students will get ability
- to understand about introduction to engineering hydrology and its applications, hydrologic cycle, , types and forms of precipitation, abstraction from rainfall-evaporation, infiltration, runoff-components etc,.
- to learn about unit hydrograph, ,s-hydrograph, design discharge, flood frequency analysis, basic concepts of flood routing etc,.
- to understand about ground water Occurrence, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, necessity and Importance of Irrigation, indian agricultural soils, preparation of land for Irrigation etc,.
- to study about soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies
- to study about classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

UNIT I
Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data. Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation-evapotranspiration-Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices. Runoff-components of runoff, factors affecting runoff, stream gauging, effective rainfall, separation of base flow.

UNIT-II
Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph,S-hydrograph, IUH, Synthetic Unit Hydrograph. Design Discharge, Computation of design discharge-rational formula, SCS method, flood frequency analysis-Gumbel's method, log pearson III method, basic concepts of flood routing-hydraulic and hydrologic routing, channel and reservoir routing.

UNIT-III

Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, radial flow to wells in confined and unconfined aquifers. Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water.

UNIT-IV

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, Duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies.

UNIT-V

Classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

Text Books:
1. Engineering Hydrology by Jayaram Reddy, Laxmi publications pvt. Ltd., New Delhi
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi

Reference Books:
1. Elementary hydrology by V.P.Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House.
3. Irrigation Water Management by D.K. Majundar, Printice Hall of India.

Earthquake Resistant Design
(Elective 1)

Subject Code: 13CE3020   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about introduction to structural dynamics which include theory of vibrations, single degree of Freedom (SDOF) systems, multi-degree of freedom (MDOF) systems etc,.
- to study about earthquake analysis which include rigid base excitation, formulation of equations of motion for SDOF and MDOF Systems, earthquake response analysis of single and multi-storyed buildings, use of response spectra etc,.
- to study about design provisions which include review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings, earthquake design philosophy, Displacements and drift requirements etc,.
- to study about earthquake Engineering which include engineering seismology ,earthquake phenomenon , faults, elastic rebound theory , earthquake terminology ,seismic waves ,seismic zones , seismic zoning map of India ,seismograms and accelegrams etc,.
- to study about ductile detailing provisions which include review of the latest Indian seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings .

COURSE OUTCOMES:
Students will get ability
- to understand about introduction to structural dynamics which include theory of vibrations, single degree of Freedom (SDOF) systems, multi-degree of freedom (MDOF) systems etc,.
- to learn about earthquake analysis which include rigid base excitation, formulation of equations of motion for SDOF and MDOF Systems, earthquake response analysis of single and multi-storyed buildings, use of response spectra etc,.
- to understand about design provisions which include review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings, earthquake design philosophy, Displacements and drift requirements etc,.
- to learn about earthquake Engineering which include engineering seismology ,earthquake phenomenon , faults, elastic rebound theory , earthquake terminology ,seismic waves ,seismic zones , seismic zoning map of India ,seismograms and accelegrams etc,.
- to understand about ductile detailing provisions which include review of the latest Indian seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C

UNIT – I Introduction to Structural Dynamics : – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Concept of response spectrum. Multi-Degree of Freedom (MDOF) Systems : - Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

UNIT – II Earthquake Analysis : - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and
multi-storyed buildings – Use of response spectra.

UNIT – III Design Provisions : - Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods –Displacements and drift requirements – Provisions for torsion.

UNIT – IV Earthquake Engineering : - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicenter etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India – Seismograms and Accelegrams.

UNIT – V Ductile Detailing Provisions : - Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

Text Books:
1. Dynamics of Structures – Clough & Penzien, McGraw Hill – International Edition.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Printice Hall of India, New Delhi

Reference Books:
1. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.
2. Earthquake Tips by C.V.R.Murty, I.I.T. Kanpur.
3. Structural Dynamics by Mario Paaz.
IS Codes: IS:1893-2002, IS:4326 -1993 and IS:13920-1993 etc.

Industrial Waste and Waste Water Management
(Elective 1)

Subject Code: 13CE3021   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about principles of Industrial waste treatment , sources of pollution physical chemical, organic and biological properties, Introduction to hazardous waste , non- hazardous waste , bio-medical waste.
- to study about basic theories of industrial waste water management , volume reduction ,strength reduction , neutralization , equalization and proportioning, joint treatment of industrial wastes and domestic sewage , consequent problems.
- to study about industrial waste water discharges into streams, lakes and oceans and problems, recirculation of industrial wastes , use of municipal waste water in industries.
- to study about manufacturing process and design origin of liquid waste from textiles, paper and pulp industries, thermal power plants ,tanneries fertilizers, distillers etc,.
- to study about common effluent treatment plants(CETP) , advantages and suitability, limitations, effluent disposal methods.

COURSE OUTCOMES:
Students will get ability
- to understand about principles of Industrial waste treatment , sources of pollution physical chemical, organic and biological properties, Introduction to hazardous waste , non- hazardous waste , bio-medical waste.
- to learn about basic theories of industrial waste water management , volume reduction ,strength reduction , neutralization , equalization and proportioning, joint treatment of industrial wastes and domestic sewage , consequent problems.
- to understand about industrial waste water discharges into streams, lakes and oceans and problems, recirculation of industrial wastes , use of municipal waste water in industries.
- to learn about manufacturing process and design origin of liquid waste from textiles, paper and pulp industries, thermal power plants ,tanneries fertilizers, distillers etc,.
- to understand about common effluent treatment plants(CETP) , advantages and suitability, limitations, effluent disposal methods.

UNIT I
Principles of Industrial waste treatment - sources of pollution physical chemical, organic and biological properties, Introduction tohazardous waste , non- hazardous waste , bio-medical waste.

UNIT II
Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems.

UNIT III
Industrial waste water discharges into streams. Lakes and oceans and problems - Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries.

UNIT IV
Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants ,Tanneries Fertilizers, Distillers, Dairy Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants , Special Characteristics, Effects and treatment methods.

UNIT V
Common Effluent Treatment Plants(CETP) – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:
1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:
1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

Traffic Engineering
(Elective 1)

Subject Code: 13CE3022   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about traffic characteristics which include basic characteristics of traffic, volume, speed and density, relationship among traffic parameters.
- to study about traffic measurement which include traffic volume studies ,concept of PCU, speed studies , statistical methods for analysis of speed data.
- to study about highway capacity which include definition of capacity, importance of capacity , factors affecting capacity, concept of level of service, different levels of service, concept of service volume, peak hour factor.
- to study about traffic control & regulation which includes traffic problems in Urban areas, importance of traffic control and regulation, traffic regulatory measures ,canalization, traffic signals etc,.
- to study about Traffic & environment which include detrimental effect of traffic on environment, air pollution , pollutants due to traffic, measures to reduce air pollution due to traffic, noise pollution , measures to reduce noise pollution .
- to study about traffic signs and road markings which include types of traffic signs, cautionary, regulatory and informative signs- specifications, pavement markings etc,.

COURSE OUTCOMES:
Students will get ability
- to understand about traffic characteristics which include basic characteristics of traffic, volume, speed and density, relationship among traffic parameters.
- to learn about traffic measurement which include traffic volume studies ,concept of PCU, speed studies , statistical methods for analysis of speed data.
- to understand about highway capacity which include definition of capacity, importance of capacity , factors affecting capacity, concept of level of service, different levels of service, concept of service volume, peak hour factor.
- to learn about traffic control & regulation which includes traffic problems in Urban areas, importance of traffic control and regulation, traffic regulatory measures ,canalization, traffic signals etc,.
- to understand about Traffic & environment which include detrimental effect of traffic on environment, air pollution , pollutants due to traffic, measures to reduce air pollution due to traffic, noise pollution , measures to reduce noise pollution .
- to learn about traffic signs and road markings which include types of traffic signs, cautionary, regulatory and informative signs- specifications, pavement markings etc,.

UNIT I
Traffic characteristics: Basic characteristics of Traffic- Volume, Speed and Density- Relationship among Traffic parameters.

Traffic measurement: Traffic Volume Studies-Objectives- Types of Volume Studies –Concept of PCU-Data Collection and Presentation – Speed Studies – Types of Speeds- Objectives of Speed Studies- Methods of Conducting speed studies- Data collection and Presentation- Statistical Methods for Analysis of Speed Data.

UNIT II
Highway capacity: Definition of Capacity – Importance of capacity – Factors affecting Capacity- Concept of Level of Service- Different Levels of Service- Concept of Service Volume- Peak Hour Factor.

UNIT III
Traffic control & regulation: Traffic Problems in Urban areas- Importance of Traffic Control and regulation- Traffic Regulatory measures - Canalization- Traffic Signals- Saturation Flow - Signal Design by Webster Method – Signal Phasing and Timing Diagrams.

UNIT IV
Traffic & environment: Detrimental effect of traffic on environment – Air Pollution – Pollutants due to Traffic – Measures to reduce Air Pollution due to Traffic- Noise Pollution – Measures to reduce Noise Pollution.

UNIT V
Traffic signs and road markings: Types of Traffic Signs- cautionary, Regulatory and Informative Signs- Specifications- Pavement markings- Types of Markings – Lane markings and Object markings- Standards and Specifications for Road Markings.

Text Books:
1. Traffic Engineering and Transportation planning – LK kadiyali – Khanna publishers.

Reference Books:
1 Transportation Engineering – An Introduction – C. J. Khisty, Prentice Hall
2. Principles of Transportation Engineering – Partha Chakroborthy, Animesh Das – Prentice Hall of India.
3. Fundamentals of Transportation Engineering - C.S. Papacostas, Prentice Hall(India).
4. Highway Engineering and Traffic Analysis-Mannering and Kilareski, John wiley Publications.

Prestressed Concrete
(Elective 1)

Subject Code: 13CE3023   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have

- to study about introduction which include historic development, general principles of prestressing, pretensioning and post tensioning , I.S.Code provisions, Different systems of prestressing like hoyer system , magnel system etc,.
- to study about losses of Prestresses which include loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete etc,.
- to study about analysis of sections for flexure which include elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.
- to study about design of sections for flexure and Shear which include allowable stress, elastic design of simple rectangular and I-section for flexure, shear, and principal stresses , design for shear in beams .
- to study about analysis of end blocks which include Guyon's method and Mugnel method, anchorage zone reinforcement , transfer of prestress pre-tensioned members etc,.
- to study about composite section which include analysis of stress , differential shrinkage ,general designs considerations.
- to study about deflections of prestressed concrete beams which include importance of control of deflections, factors influencing deflections, short term deflections of uncracked members prediction of long term deflections.

COURSE OUTCOMES:
Students will get ability

- to understand about introduction which include historic development, general principles of prestressing, pretensioning and post tensioning , I.S.Code provisions, Different systems of prestressing like hoyer system , magnel system etc,.
- to learn about losses of Prestresses which include loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete etc,.
- to understand about analysis of sections for flexure which include elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.
- to learn about design of sections for flexure and Shear which include allowable stress, elastic design of simple rectangular and I-section for flexure, shear, and principal stresses , design for shear in beams .
- to understand about analysis of end blocks which include Guyon's method and Mugnel method, anchorage zone reinforcement , transfer of prestress pre-tensioned members etc,.
- to learn about composite section which include analysis of stress , differential shrinkage ,general designs considerations.
- to understand about deflections of prestressed concrete beams which include importance of control of deflections, factors influencing deflections, short term deflections of uncracked members prediction of long term deflections.

NOTE- ALL DESIGNS ARE SHOULD BE DESIGNED BY LIMIT STATE METHOD

UNIT – I
Introduction: Historic development – General principles of prestressing pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System,Freyssinet system and Gifford – Udall System- Prefabricated elements.

UNIT – II
Losses of Prestresses: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.
Analysis of sections for flexure: Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

UNIT – III
Design of Sections for Flexure and Shear: Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.
Analysis of End Blocks: by Guyon's method and Mugnel method, Anchorage zone strusses – Approximate method of design – Anchorage zone reinforcement – Transfer of prestress pre-tensioned members.

UNIT – IV
Composite section: Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

UNIT – V
Deflections of Prestressed Concrete Beams: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections.

Text Books:
1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

Text Books:
1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.
Codes: BIS code on prestressed concrete IS 1343 - 1980
Note: Code book is permitted to the examination

Drawing of Concrete and Steel structures

Subject Code: 13CE3109   **External Marks:50**
Credits: 02   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
  - to draw reinforcement detailing of flat slab, reinforcement detailing of combined footing-combined slab and combined beam & slab footing, reinforcement detailing of raft foundation and plain raft slab
  - to draw detailing of simple beams and detailing of compound beams including curtailment of flange plates
  - to draw detailing of column including lacing and battens, detailing of column bases, slab base and gusseted base
  - to draw detailing of steel roof trusses including particulars at joints and detailing of plate girder including curtailment, splicing and stiffeners

COURSE OUTCOMES:
Students will get ability
  - to know how to draw reinforcement detailing of flat slab, reinforcement detailing of combined footing-combined slab and combined beam & slab footing, reinforcement detailing of raft foundation and plain raft slab
  - to know how to draw detailing of simple beams and detailing of compound beams including curtailment of flange plates
  - to know how to draw detailing of column including lacing and battens, detailing of column bases, slab base and gusseted base
  - to know how to draw detailing of steel roof trusses including particulars at joints and detailing of plate girder including curtailment, splicing and stiffeners

Note: The students should prepare the following plates

Concrete Structures:
Plate 1 Reinforcement detailing of Flat slab
Plate 2 Reinforcement detailing of Combined footing-Combined slab and Combined beam and
        Slab footing
Plate 3 Reinforcement detailing of raft foundation – Plain raft slab

Steel Structures:
Plate 1 Detailing of simple beams
Plate 2 Detailing of Compound beams including curtailment of flange plates.
Plate 3 Detailing of Column including lacing and battens.
Plate 4 Detailing of Column bases – slab base and gusseted base
Plate 5 Detailing of steel roof trusses including particulars at joints.
Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

CAD LAB

Subject Code: 13CE3110   **External Marks:50**
Credits: 03   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
- to design 2-D frame analysis and 2-D frame design
- to design steel tabular truss analysis and steel tabular truss design
- to design 3-D frame analysis and 3-D frame design
- to design retaining wall analysis and retaining wall design
- to design tower analysis and simple tower design

COURSE OUTCOMES:
Students will get ability
- to know how to design 2-D frame analysis and 2-D frame design
- to know how to design steel tabular truss analysis and steel tabular truss design
- to know how to design 3-D frame analysis and 3-D frame design
- to know how to design retaining wall analysis and retaining wall design
- to know how to design tower analysis and simple tower design

EXCERCISIES:
1. 2-D Frame Analysis
2. 2-D Frame Design
3. Steel Tabular Truss Analysis
4. Steel Tabular Truss Design
5. 3-D Frame Analysis
6. 3-D Frame Design
7. Retaining Wall Analysis
8. Retaining Wall Design
9. Simple Tower Analysis
10. Simple tower Design

SOFTWARE:
1. STAAD Pro or EQUIVALENT

NTELLECTUAL PROPERTY RIGHTS AND PATENTS

Subject Code: 13HS3202   **External Marks: 0**
Credits: 0   **Internal Marks: 0**

COURSE OBJECTIVES:
- **Core concepts:** Students will have a basic competence in the core concepts of each of the forms of intellectual property (Patents, Copyright and Related Rights, Trademarks, Industrial Designs and Integrated Circuits, Geographical Indications, Protections Against Unfair Competitions, and Traditional Knowledge), including the nature and extent of the rights that are available to protect them.
- **Applying disciplinary contexts:** Students will be familiar with all the important doctrines of the field of laws and treaties governing intellectual property, and will have a good understanding of the most important standards for registering, obtaining, and enforcing intellectual property rights at national, regional, and international levels.
- **Connections:** Students will begin to see the connections between intellectual property rights protection and development of world economy. In addition, students will understand how intellectual property rights make it possible for the creators of innovations to establish themselves more readily.

COURSE OUTCOMES:
- Understand the scope of intellectual property rights.
- Understand the reasons behind the existence of intellectual property law.
- Understand the process of the historical development of intellectual property rights.
- Understand the distinct contribution of intellectual property law to the protection of human creativity, innovation, and effort.

Syllabus

UNIT I
Introduction to Intellectual Property Law – The Evolutionary Past – The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right.

UNIT II
Introduction to Trade mark – Trade mark Registration Process – Post registration procedures – Trade mark maintenance - Transfer of Rights - Inter parts.

UNIT III
Intellectual Property Law Basics – Types of Intellectual Property – Agencies responsible for Intellectual Property Registration - Cyber crime and E-commerce – International Aspects of Computer and Online Crime.

UNIT IV
Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent requirements - Ownership - Transfer - Patents Application Process – Patent Infringement - Patent Litigation.

UNIT V
International Patent Law – Double Patenting – Patent Searching – Patent Law Treaty - New developments in Patent Law – Invention Developers and Promoters.

Text Books:
1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: 'Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.

S. No.	Codes	Theory / Labs	L	T	P	C	Marks		Total
							INT	EXT	
		I Semester							
1	13CE4024	Environmental Engineering	3	1		3	30	70	100
2	13CE4025	Estimation and Quantity Surveying	3	1		3	30	70	100
3	13CE4026	Remote Sensing and GIS Applications	3	1		3	30	70	100
4		**Elective 2**	3	1		3	30	70	100
	13CE4027	I. Water Resources System Planning and Management							
	13CE4028	II. Air Pollution and Control							
	13CE4029	III. Ground Improvement Techniques							
	13CE4030	IV. Hydraulic Structures and Irrigation Design & Drawing							
5		**Open Elective**	3	1		3	30	70	100
	13OE4001	I. Air Quality Management							
	13OE4002	II. Cyber Laws							
	13OE4003	III. Entrepreneur Development							
	13OE4004	IV. Industrial Safety & Environment							
	13OE4005	V.MEMS							
	13OE4006	VI. Optimization Techniques							
	13OE4007	VII. Renewable Energy							
	13OE4008	VIII. Smart Materials							
	13OE4009	IX. Total Quality Management							
6	13CE4111	Environmental Engineering Lab			3	2	25	50	75
7	13CE4112	Geotechnical Engineering Lab			3	2	25	50	75
8	13CE4113	GIS Lab			4	3	25	50	75
9	13HS4203	Employability Skills			3	2	75	-	75
		Total Credits	15	5	13	**24**	300	500	800

Environmental Engineering

Subject Code: 13CE4024   External Marks: 70
Credits: 03   Internal Marks: 30

COURSE OBJECTIVES:

- To identify the objectives of water supply system.
- To understand the general principles of water/sewage treatment.
- To apply the professional knowledge of distribution system to design pipe network for water supply.
- To aim for employment in Municipalities and panchayats.
- To apply the professional, ethics, attitude, team work skills, multi disciplinary approach to contribute the needs of society in the field of environmental protection.

COURSE OUTCOMES:

- Able to solve water distribution of problems of cities/towns.
- Able to create awareness among the public on the need of protected water supply.
- Able manage the stream water quality by maintaining effluent standards.
- Able to get successful employment in organizations working for the protection of environment.
- Able to desing water/sewage treatment units for town & industries.

UNIT – I
Introduction : Objectives of water supply-Waterborne diseases – Population forecasts, design period – water demand –factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards. Comparison of sources of water from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT II
Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – Filtration – theory – working of slow and rapid gravity filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices.

UNIT-III
Distribution systems -Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

UNIT-IV
Conservancy and water carriage systems – sewage and storm water estimation– characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. equation. Design of sewers – shapes and materials – sewer appurtenances manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – ultimate disposal of sewage – sewage farming – dilution.

UNIT – V

Layout and general outline of various units in a waste water treatment plant – primary treatment- design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters –standard and high rate - Sludge digestion – factors effecting – design of Digestion tank – septic tank's working principles and design – soak pits.

TEXT BOOKS:

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons
   Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia,
    Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers

REFERENCES:

1. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.
2. Water and Waste Water Technology by Steel
3. Water and Waste Water Engineering by Fair Geyer and Okun
4. Waste water treatment- concepts and design approach by G.L. Karia and R.A.
   Christian, Prentice Hall of India
5. Waste water Engineering by Metcalf and Eddy.
6. Unit operations in Environmental Engineering by R. Elangovan and M.K.
    Saseetharan, New age International

Estimation and Quantity surveying

Subject Code: 13CE4025   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To identify standard specifications for detailed estimation of building.
- To understand the basic principles of working out qualities for detailed estimates.
- To apply the professional knowledge of estimates to prepare contract documents.
- To aim for employment in consultancy organizations which are preparing estimates for mega structures.

COURSE OUTCOMES:
- Able to prepare detailed estimates to small as well as mega structures.
- Able to maintain quality of building construction by adopting standard specifications.
- Able to get successful employment in construction field.
- Able to get the knowledge to calculate the quantity of reinforcement of different structure by bar bending schedule.

UNIT – I
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating- Detailed Estimates of Buildings.

UNIT – II
Earthwork for roads and canals.

UNIT – III
Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-IV
Reinforcement bar bending and bar requirement schedules.

UNIT – V
Contracts – Types of contracts – Contract Documents – Conditions of contract-Valuation of buildings-Standard specifications for different items of building construction.

TEXT BOOKS

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie

REFERENCES :

1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
4. National Building Code

Remote Sensing and GIS Applications

Subject Code: 13CE4026	**External Marks: 70**
Credits: 03	**Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study the basic components of remote sensing, Electromagnetic radiation, electromagnetic spectrum, Interaction with atmosphere, energy interactions with atmosphere.
- to study the sensors and Platforms which include passive sensor, active sensor, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats
- to study the image Analysis which include elements of visual interpretations, digital image processing, image enhancement, image classification, supervised classification, unsupervised classification
- to study the geographic information system which include key components, map projections, spatial data input, raster data models, vector data models, raster versus vector
- to study the spatial data analysis which include overlay function, overlay using a decision table.
- to study the RS and GIS Applications which include Land use and Land cover **,** agriculture, forestry, geology, geomorphology, urban applications, flood zone delineation and mapping

COURSE OUTCOMES:
Students will get ability
- to understand the basic components of remote sensing, Electromagnetic radiation, electromagnetic spectrum, Interaction with atmosphere, energy interactions with atmosphere.
- to learn the Sensors and Platforms which include passive sensor, active sensor, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats
- to understand the image Analysis which include elements of visual interpretations, digital image processing, image enhancement, image classification, supervised classification, unsupervised classification
- to learn the geographic information system which include key components, map projections, spatial data input, raster data models, vector data models, raster versus vector
- to understand the spatial data analysis which include overlay function, overlay using a decision table.
- to learn the RS and GIS Applications which include Land use and Land cover **,** agriculture, forestry, geology, geomorphology, urban applications, flood zone delineation and mapping

UNIT I
Introduction To Remote Sensing: Basic components of remote sensing, Electromagnetic radiation, electromagnetic spectrum, Interaction with atmosphere, energy interactions with atmosphere.

UNIT II
Sensors and Platforms: Introduction, passive sensor, active sensor, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats- band interleaved by pixel, band interleaved by line, band sequential.

UNIT III
Image Analysis: Introduction, elements of visual interpretations, digital image processing, image enhancement, image classification, supervised classification, unsupervised classification

UNIT IV
Geographic Information System: Introduction, key components, map projections, spatial data input, raster data models, vector data models, raster versus vector.

UNIT V

Spatial data analysis: Introduction, overlay function-vector overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table

RS and GIS Applications: Land use and Land cover **,** agriculture, forestry, geology, geomorphology, urban applications, flood zone delineation and mapping

TEXT BOOKS:

1. Remote Sensing and its applications by LRA Narayana University Press 1999.

2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael

A. Mc Donnell, Oxford Publishers 2004.

REFERENCES:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.

2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU KAKINADA 2001, B.S.Publications.

3. GIS by Kang – tsung chang, TMH Publications & Co.,

4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.

5. Fundamental of GIS by Mechanical designs John Wiley & Sons.

Water resources system planning and management
(Elective –2)

Subject Code: 13CE4027   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- Describe and predict for a given water resources system the main hydrological, hydraulic, chemical and biological processes and how these processes are dynamically linked with aquatic ecosystems as well as with human activities such as land and water use and pollution.
- Describe and explain the main concepts and instruments for analysing and influencing formal and informal arrangements for water quality management, including policies, laws and institutions, and by adopting a historical perspective.
- Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of aquatic ecosystems and describe the challenges of such approaches.
- Describe concepts to determine the value of water for various uses and users in (amongst others) economic and ecological terms and explain how these concepts can be used in water resources planning at various spatial and temporal scales.
- Distinguish the spatiotemporal scales and river basin development phases in a water resources planning process.

COURSE OUTCOMES:
- From this students can learn about the proper management of water resources and planning of various water resource systems.
- Student can learn the usage of water in both economically and ecologically.
- They can develop the various alternative management strategies.

UNIT I
Introduction: concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

UNIT II
Linear programming: Formulation linear programming models, graphical method, simplex method, application of Linear programming in water resources. Revised simplex method, duality in linear programming, sensitivity and past optimality analysis.
Dynamics programming: Belman's of principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application of dynamic for resource allocation.

UNIT III
Non-linear optimatization techniques: Clerical of method optimization, Kuch-Tucleer, gradential based research techniques for simple unconstrained optimization.

UNIT VI
Simulation: application of simulation techniques in water resources.

UNIT V
Water –resources economics: Principles of Economics analysis, benefit cost analysis socio economic intuitional and pricing of water resources.
Water resources management: Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

TEXT BOOKS:

1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd. 2005.
2. Water Resources Economics - James & Lee. Oxford Publishers 2005.

REFERENCES:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.

Air Pollution and Control
(Elective –2)

Subject Code: 13CE4028   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To identity different pollutants which are causing air pollution.
- To understand the thermodynamics and kinetics of air pollution.
- To apply the professional knowledge of air pollution to design pollution control systems.
- To aim for employment in pollution control organizations.
- To apply the professional, ethics, attitude, team work skills, multi disciplinary approach to contribute the needs of society in the field of environmental protection.

COURSE OUTCOMES:
- Able to solve air pollution problems of industries.
- Able to create awareness among the public on the effects of air pollution at local level as well as global level.
- Able to manage the ambient air quality by maintaining emission   standards.
- Able to get successful employment in organizations working for the protection of environmental.
- Able to design air pollution control equipments for industries and other polluting sources.

UNIT – I
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution-stationary and mobile sources.
Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT-II
Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

UNIT – III
Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

UNIT-IV
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control.Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT – V
General Methods of Control of NOx and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling. Air Quality Management – Monitoring of SPM, SO; NO and CO Emission Standards.

TEXT BOOKS:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution by Wark and Warner.- Harper & Row, New York.

REFERENCE:

1 An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.

Ground Improvement Techniques
(Elective –2)

Subject Code: 13CE4029   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- Increase of strength of soil
- Reduce distortion under stress (Increases stress-strain modulus)
- Reduce compressibility (volume decreases due to a reduction in air voids or water content under loads)
- Prevent detrimental physical or chemical changes due to environmental
- conditions (freezing / thawing, wetting / drying)

COURSE OUTCOMES:
- From this study can learn about the how to improve the soil properties
- Student can learn these poor soils where considered as economically unjustifiable or technically not feasible and are often replaced with an engineered fill or location of the project is changed.
- They can develop the Ground improvement techniques are used increasingly for new projects to allow utilization of site with poor subsurface conditions.

UNIT – I
Dewatering: methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points-Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis .
Grouting: Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage grouting-hydraulic fracturing in soils and rocks- post grout test.

UNIT – II
In – situ densification methods in granular Soils: Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.
In – situ densification methods in Cohesive soils: Preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

UNIT – III
Stabilization: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride,sodium silicate and gypsum
Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

UNIT –IV
Geosynthetics : Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and applications.

UNIT - V
Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

TEXT BOOKS:

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi

REFERENCES:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA

Hydraulic Structures and Irrigation Design & Drawing
(Elective –2)

Subject Code: 13CE4030   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To study the design and drawing of weir
- To improve the knowledge on design and drawing of tank sluice with a tower head
- To study the design and drawing of a canal regulator
- To study the design and drawing of under tunnel

COURSE OUTCOMES:
- To get the knowledge on design and drawing of weir
- To acquire knowledge on tank sluice with a tower head
- To get the knowledge on design of canal drop
- To know the design and drawing of canal regulator.
- To get the knowledge on design and drawing under tunnel

Hydraulic Structures
Unit- I
Reservoir Planning: Introduction, classification of Reservoirs, Storage zones of a reservoir, Mass curve, fixing capacity of a reservoir, safe yield,problems, density currents, Trap efficiency, Reservoir sedimentation, life of a reservoir, economic height of a dam, problems. environmentaleffects of reservoirs

Unit - II
Gravity Dams: Introduction, forces on a gravity dam, stress analysis in gravity dam, Problems, combination of forces for design. Elementary & practical profiles of a gravity dam, stability analysis (without earth quake forces), problems, galleries in gravity dams,
Earth Dams: Introduction, types of Earth dams, construction methods,Design criteria for Earth dams, causes of failure of earth dams, section of dam, preliminary design criteria, problems, control ofseepage through earth dams, Safety measures.

Unit-III
Spillways:Introduction, essentials of a spillway, spillway components, factors affecting type & design of spillways. Ogee spillway (simple design problems). Energy dissipation below spillways (hydraulic jump- No design)

Irrigation Design & Drawing
Unit-IV
Design and Drawing with all the three views of :
1. Surplus weir with stepped apron
2. Tank Plug sluice without tower head
3. Canal gate sluice without tower head

UNIT V
Design and Drawing with all the three views of :
4. Notch type Canal Drop
5. Canal Cross regulator.
6. Aqueduct (Hydraulic Design only)

RECOMMENDED TEXT BOOKS:
1. Irrigation Engineering – S. K. Garg – Khanna Publishers, Delhi.
2. Irrigation, Water Resources and Water power Engineering – Dr P.N. Modi
3. Irrigation and Water power Engineering – Dr Punmia and Dr. Pande – Laxmi
   Publications, Delhi
4. 'Engineering Hydrology' - Subramany K., -Tata McGraw Hill, New Delhi.
5. 'Engineering Hydrology' - Raghunath H.M. - New Age International Publishers
6. Watershed Management in India – J.V.S.Murthy – Wiley Eastern Publications,Delhi

REFERANCE BOOKS:
1. R.K.Sharma, 'Hydrology and water resources', Dhanpatrai and sons, New Delhi.
2. Varshney, Gupta and Gupta, 'Theory and design of irrigation structures vol. I
and II and III', Newchand and Brothers.
3. Michael, 'Irrigation Theory and practice', Vikas Publications House
4. Jaspal Sing, M.S.Acharya, Arun Sharma, 'Water management', Himanshu Publications.
5. Design of M.I. and Canal Structure – Satyanarayan and R. Murthy
6. Water and Soil Conservation – Ghanshyam Das

Air Quality Management
(Open Elective)

Subject Code : 13OE4001   **External Marks:70**
Credits   : 03   **Internal Marks :30**

COURSE OBJECTIVES:
- To identity different pollutants which are causing air pollution.
- To understand the thermodynamics and kinetics of air pollution.
- To apply the professional knowledge of air pollution to design pollution control systems.
- To aim for employment in pollution control organizations.
- To apply the professional, ethics, attitude, team work skills, multi disciplinary approach to contribute the needs of society in the field of environmental protection.

COURSE OUTCOMES:
- Able to solve air pollution problems of industries.
- Able to create awareness among the public on the effects of air pollution at local level as well as global level.
- Able to manage the ambient air quality by maintaining emission   standards.
- Able to get successful employment in organizations working for the protection of environmental.
- Able to design air pollution control equipments for industries and other polluting sources.

UNIT-I
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Measurement of Pollution Classifications – Natural and Artificial –Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

UNIT- II
Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, and Ozone Holes-Effects of art treasures.

UNIT-III
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, Reverse Flow Cyclones, Fabric filters – Bag House, Dry and Wet scrubbers, Electrostatic precipitators.

UNIT- IV
General Methods of Control of NO_2 and SO_2 emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

UNIT- V
Ambient Air Quality Management – Monitoring of SPM, SO; NO and CO Stack Monitoring for the Flue gases –Micro meterological monitoring Emission Standards.

Text Books:
1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution and control by KVSG Murali Krishna.

Reference Books:
1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner – Harper & Row, New York.

CYBER LAWS
(OPEN ELECTIVE)

Subject Code : 13OE4002   **External Marks:70**
Credits   : 03   **Internal Marks :30**

COURSE OBJECTIVES:
- To identify the emerging Cyber law trends
- To create more awareness about the newly emerging kinds of cybercrimes
- To identify the areas in cyber crimes where Cyber law needs to be further evolved
- To identify the impact of Cyber Law on Real World
- To identify the importance of cyber law and its professionals.

COURSE OUTCOMES:
- Have comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources.
- Understand, analyze and work on activities of fraud prevention, monitoring, investigation, reporting.
- Differentiate among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
- Have knowledge of cyber law and ethics.
- Evaluate the interaction and relative impact of human factors, processes and technology in cyber law infrastructures.

UNIT- I
The IT Act, 2000: A Critique: Crimes in this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce?, Forgetting the Line between Cognizable and Non- Cognizable Officers, Arrest for "About to Commit" an Offence Under the IT Act, A Tribute to Darco, Arrest, But No Punishment.

UNIT- II
Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E-mail Abuse

UNIT- III
DE-Commerce Taxation - Real Problems in the Virtual World: A Tug of War on the Concept of Permanent Establishment, Finding the PE in Cross Border E-Commerce, Source versus residence and classification between Business Income and Royalty, The impact of the internet on Customs duties, Taxation policies in India.

UNIT- IV
Digital Signatures, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature compromise, E-Governance in the India. A Warming to Babudom

UNIT-V
Protection of Cyber Consumers in India : Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices

Text Books:
1. Cyber Law Simplified, Vivek Sood, Tata McGraw-Hill
2. Cyber Law. Texts & Cases, South-Western's Special Topics Collections

Reference Books:
1. Law Relating to Computers Internet & E-Commerce By Nandan Kamath , 2nd Edition, Universal Law Publishing Co.Pvt.Ltd.
2. Cyber Law in India by Farooq Ahmad – Pioneer Books.
3. Information Technology Law and Practice by Vakul Sharma – Universal Law Publishing Co. Pvt. Ltd. The Indian Cyber Law by Suresh T Vishwanathan – Bharat Law house New Delhi.
4. Hand book of Cyber & E-commerce Laws by P.M. Bakshi & R.K.Suri – Bharat Law house, New Delhi.
Guide to Cyber Laws by Rodney D. Ryder – Wadhwa and Company Nagpur.The Information Technology Act,2000 – Bare Act – Professional Book Publishers – New Delhi

ENTREPRENEURIAL DEVELOPMENT
(OPEN ELECTIVE)

Subject Code : 13OE4003   **External Marks:70**
Credits   : 03   **Internal Marks :30**

COURSE OBJECTIVES:
- The objective of this course is to expose the students to the subject of entrepreneurial development, so as to prepare them to establish a new enterprise and effectively manage the enterprise.

COURSE OUTCOME:
- Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
- Understanding Entrepreneurship Development programmes in INDIA and contents for training for Entrepreneurial competencies.
- Create appropriate business model and develop well presented business plan that is feasible for the student.
- Understanding how to manage effectively the selected business.

UNIT-I
Entrepreneur and Entrepreneurship: Meaning of Business and components of Business. Concept of Entrepreneur, characteristics of an Entrepreneur, distinguish between an Entrepreneur and manager, functions of an Entrepreneur, types of Entrepreneurs, Intrapreneur. Concept of Entrepreneurship, women entrepreneurship and Rural entrepreneurship. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

UNIT-I
Entrepreneurship Development in India: Nature and development of Entrepreneurship in India - emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs , course contents, phases and evaluation of EDPs for existing and new entrepreneurs . Institutions for EDP - NIESBUD, EDII, NAYE,TCOs, MSMEDI,DICs, commercial Banks, Universities and Engineering colleges..

UNIT-III
Creating and starting the venture: Types of start ups. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, opportunity recognition. Project selection - meaning of project report(business plan), Formulation of a project report, project appraisal by economic analysis, financial Analysis, market analysis, technical Feasibility, managerial competence. Project implementation. preparation of sample project report of any one product and service. Steps to start an MSME.

UNIT-IV
Government and Institutional support to Entrepreneurs: MSME Development Act-2006. AP Industrial policy (2015-20), incentives and subsides, industrial estates, Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, AP Skill Development Corporation. Institutional finance – sources of long term and short term capital, Venture capital. Role of IDBI, SIDBI, APIIC, NSIC, APSFC, APITCO, EXIM Bank and commercial Banks.

UNIT-V
Managing the venture: Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of entrepreneurs.

Text Books:
1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

References Books:
1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd.
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi.
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

INDUSTRIAL SAFETY AND ENIVRONMENT
(OPEN ELECTIVE)

Subject Code : 13OE4004   **External Marks:70**
Credits   : 03   **Internal Marks:30**

COURSE OBJECTIVES:
- To familiarize the student with fundamentals principals of safety management
- To impart knowledge on different type of industrial hazards
- To enable the student to know the various industrial safety acts
- To understand the environmental safety

COURSE OUTCOMES:
- Attain the basic fundamentals safety management
- Understand the safety various industrial safety acts
- Acquire basic knowledge of different type of industrial hazards
- Understand the concepts of environmental safety

UNIT-I
Principles of Safety Management: Concepts and techniques, safety audit- introduction, accident investigation and reporting, safety performance monitoring, safety education and training

UNIT-II
Environmental Safety: Air pollution, water pollution, hazardous waste management, environmental measurement and control, pollution control in process industries

UNIT-III
Occupational health and industrial hygiene; physical hazards, chemical hazards, biological and ergonomical hazards, occupational physiology

UNIT–IV
Industrial safety, health and environment acts; factories act– 1948, environment act– 1986, manufacture, storage and import of hazardous chemical rules 1989

UNIT-V
International acts and standards, other acts and rules (indian boiler act 1923, static and mobile pressure vessel rules (smpv), motor vehicle rules)

Text books:
1. Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997.
2. Rao, CS, "Environmental pollution engineering:, Wiley Eastern Limited, New Delhi, 1992

Reference Books:
1. S. P. Mahajan, "Pollution control in process industries", Tata McGraw Hill Publishing Company, New Delhi, 1993.
2. Hand book of "Occupational Safety and Health", National Safety Council, Chicago, 1982
3. The Factories Act 1948, Madras Book Agency, Chennai, 2000
4. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt.Ltd. New Delhi.
5. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt.Ltd. New Delhi.

MICRO ELECTRO MECHANICAL SYSTEMS   (MEMS)
(OPEN ELECTIVE)

Subject Code : 13OE4005   **External Marks:70**
Credits   : 03   **Internal Marks:30**

COURSE OBJECTIVES:
- To understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.
- To understand workings of MEMS mechanical and thermal sensors and actuators
- To understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices
- To understand mechanisms of MEMS optical and RF devices.
- To be exposed to MEMS simulation softwares, Multiscale simulations, CNT and NEMS.

COURSE OUTCOMES:
On completion of this course, students should be able
- To understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.
- To understand workings of MEMS mechanical and thermal sensors and actuators
- To understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices
- To understand mechanisms of MEMS optical and RF devices.
- To be exposed to MEMS simulation softwares, Multiscale simulations, CNT and NEMS.

UNIT-I
Micro-Machining Processes: Additive Processes – Spin coating, Evaporation, Sputtering, PVD, CVD, PECVD, Thermal oxidation.
Subtractive Processes – Plasma etching, Reactive ion etching, DRIE etching, Wet chemical etching
Pattering Processes – Photolithography, X-ray Lithography, LIGA
Material Modification Processes – Ion implantation doping, Diffusion doping, Thermal annealing
Mechanical Steps – Polishing, Wafer bonding, Wafer dicing, Wire bonding, Chip packaging

UNIT-II
Mechanical Sensors and Actuators: Principles of mechanical sensing and actuation – beam, plate, capacitive, piezo-electric. Strain measurement, Pressure measurement, Flow measurement, Gyroscopes. Specialized Actuators – Shear-mode piezo, Gripping piezo, Inchworm technology.

Thermal Sensors and Actuators: Thermal transduction phenomena - Thermo-electric, Thermo-resistive, Pryo-electric effects. Micro-machined thermo-couple probe, Peltier effect heat pump. Thermal flow sensors, Micro-hot plate gas sensors, Thermo-vessels. Pyro-electricity, Shape memory alloys, Electro-thermal actuator, Thermally activated MEMS relay, Micro-spring thermal actuator, Data storage cantilever.

UNIT-III
Magnetic Sensors and Actuators: Magnetic properties of materials, Presence and detection of large objects, Magneto-restrictive sensor, Hall effect sensor, Magneto-diode, Magneto-transistor, MEMS magnetic sensor, Pressure sensor utilizing MOKE, MagMEMS actuators, Optical switches, Bi-directional micro-actuator, Feedback circuit integrated magnetic actuator, Large force reluctance actuator, Magnetic probe based storage device.

Micro-Fluidics: Introduction, Properties of fluids, Micro-fluidic design considerations. Fluid actuation methods – Di-electro-phoresis, Electro-wetting, Electro-thermal, Thermo-capillary, Electro-osmosis, Opto-electro-wetting. Tuning of fiber optic cables using micro-fluidics, Micro-fluidic channel, Dispenser, Needle, Molecular gate, Micro-pump,

UNIT-IV

Optical Sensors and Actuators: Properties of light, Light modulators, Beam splitter, Micro-lens, Micro-mirror, Optical switch. Digital Micro Device (DMD) using Digital Light Processing (DLP) technology. Diffraction grating, Grating light valve, Waveguide and tuning.

RF MEMS: Introduction to RF Communication and RF MEMS, MEMS inductors, Varactors, Tuner/filter, Resonator, MEMS switches, Phase shifter.

UNIT-V

MEMS Simulations: Atomistic to Continuum theory, Multiscale concept, Multiscale methods.
Softwares - Ansoft Designer, HFSS, DS/MEMS and CA/MEMS, FEMPRO, ANSYS Multiphysics, SUGAR.

NEMS

Introduction to NEMS , properties, applications, fabrication methods, future development.

Text Books:

1. MEMS, Nitaigour Premchand Mahalik, Tata McGraw Hill Pub.

Reference Books:

1. Foundations of MEMS, Chang Liu, Pearson Pub.
2. MEMS & Microsystems – Design and Manufacture, Tai-Ran Hsu, McGraw Hill Pub.

OPTIMIZATION TECHNIQUES
(OPEN ELECTIVE)

Subject Code : 13OE4006   **External Marks:70**
Credits   : 03   **Internal Marks :30**

COURSE OBJECTIVES:
- To be able to formulate linear or nonlinear optimization problems as a solution for industrial problems.
- To be able to solve various kinds linear and nonlinear, single and multiple variable, unconstrained and constrained optimization problems using standard optimization algorithms.

COURSE OUTCOMES:
- Should be able to solve linear multivariable optimization using linear programming and perform sensitivity analysis.
- Should be able to solve single-variable, non-linear, unconstrained optimization problems
- Should be able to solve geometric programming optimization problems using standard techniques for each case.

UNIT-I
Introduction to Classical Optimization Techniques:
Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions

UNIT-II
Linear programming: Two-phase simplex method, Big-M method, duality, interpretation, applications

UNIT-III
Assignment problem: Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT-IV
One dimensional Optimization methods:
Elimination Methods: - Fibonacci, Golden Section.
Interpolation Methods: - Quadratic, Cubic.
Direct Root Methods: - Newton, Quasi-Newton, Secant Methods. Gradient of a function, steepest descent method.

UNIT-V
Geometric Programming: Polynomials – arithmetic - geometric inequality – unconstrained G.P- constrained G.P

Text Books:
1. Engineering Optimization, Theory and Applications, S.S. Rao, New Age International.
2. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers

Reference Books:
1. Optimization Techniques, Theory and Practice, M.C.Joshi, K.M.Moudgalya, Narosa Pub.
2. Engineering Optimization, A Ravindran, K M Ragsdell, G V Reklaitis

RENEWABLE ENERGY
(OPEN ELECTIVE)

Subject Code : 13OE4007   **External Marks:70**
Credits   : 03   **Internal Marks:30**

COURSE OBJECTIVES:
- It introduces solar energy its radiation, collection, storage and application. It also introduces the Wind energy, Biomass energy, Geothermal energy and ocean energy as alternative energy sources.

COURSE OUTCOMES:
- After completion of this course, the student will able to understand in detail the uses and production of electrical energy from solar, wind,biomass and ocean energys.

UNIT-I
Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data

UNIT-II
Solar Energy Collection, Storage and Applications: Flat plate and concentrating collectors, classification of concentrating collectors, orientation , advanced collectors. Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III
Wind and Biomass Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria. Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-IV
Geothermal and Ocean Energy: Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V
Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion. Fuel cells, principles, faraday's law's, selection of fuels and operating conditions.

Text Books:
1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

Reference Books:
1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

ADVANCED MATERIALS
(OPEN ELECTIVE)

Subject Code : 13OE4008   **External Marks:70**
Credits   : 03   **Internal Marks:30**

COURSE OBJECTIVES:
- To know different types of composite materials.
- To learn different manufacturing methods of the composite materials.
- Distinguish between the properties and uses of different reinforcement fibres.
- Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
- To know about the nanomaterials and nanotechnology.

COURSE OUTCOMES:
At the end of the course students are able to:
- Understand the need and explain different types of composite materials.
- Summarize the various methods for manufacturing of the composite materials.
- Distinguish between the properties and uses of different reinforcement fibres.
- Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
- Outline the evolution, history, applications and impact of nanotechnology.

UNIT-I
Introduction to Composite Materials and Manufacturing processes: Introduction, Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon-Carbon Composites, Fiber- Reinforced Composites.
Manufacturing Methods: Autoclave, tape production, moulding methods, filament winding, manual layup, pultrusion.

UNIT-II
Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres.
Metal Matrix and Ceramic Matrix Composites: Manufacturing of ceramic matrix & metal matrix composites and their applications, stress strain relations for MMC and CMC.

UNIT-III
Smart materials: Shape memory alloys, Piezoelectric materials, Electro-rheological fluid, Magneto-rheological fluid

UNIT-IV
Biomaterials: Property requirement, Concept of biocompatibility, Cell-material interaction and body response to foreign materials.1

UNIT-V
Nano materials & technology: Definition, Types of nanomaterials including carbon nanotubes and nanocomposits, Methods for creating nano structures, Processes for producing ultrafine powders - physical synthesis and chemical synthesis, Physical and mechanical properties and their applications.

Text Books:
1. Nano material by A.K. Bandyopadyay, New age 'publishers
2. Material science and Technology- Cahan
3. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press
4. The Science and Engineering of Materials-D. R. Askeland and P. P. Phule - Thomson Publication
5. Advances in Material Science-R. K. Dogra and A. K. Sharma
6. Engineering Materials and Applications-R. A. Flinn and P. K. Trojan
7. An Introduction to Biomaterials, Jeffrey O. Hollinger, 2011 by CRC Press.

Reference Books:
1. R. M. Jones, Mechanics of Composite Materials, Me Graw Hill Company, New York, 1975.
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980

TOTAL QUALITY MANAGEMENT
(OPEN ELECTIVE)

Subject Code : 13OE4009   **External Marks:70**
Credits   : 03   **Internal Marks :30**

COURSE OBJECTIVES:
- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

COURSE OUTCOMES:
- Develop an understanding on quality management philosophies and frameworks.
- Understand the fundamental principles of total quality management.
- Choose approximate statistical techniques for improving processes.
- Develop in-depth knowledge on various tools and techniques of quality management.
- Know what cultural transformation is necessary for successful implementation of total quality practices with his/her organization.

UNIT-I
Introduction: Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT-II
TQM Principles: Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, 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.

UNIT-III
Statistical Process Control and Process Capability: Meaning and significance of statistical process control (SPC) – construction of   control charts for variables and attributes.
Process capability – meaning, significance and measurement – Six sigma concepts of process capability.
Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve.Total productive maintenance (TMP)–relevance to TQM, Terotechnology. Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

UNIT-IV
Tools and Techniques for Quality Management: Quality functions deployment (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools. Bench marking and POKA YOKE.

UNIT-V
Quality Systems: 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.

Text Books:
1. Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education (First Indian Reprints 2004).
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

Reference Books:
1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
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.

Environmental Engineering Lab

Subject Code: 13CE4111   **External Marks:50**
Credits: 03   **Internal Marks: 25**

COURSE OBJECTIVES:
- Determine pH and Electrical Conductivity
- Estimate total Hardness
- Determine of Alkalinity, Acidity of given water sample
- Determine chlorides, Iron, total solids, dissolved solids in water
- Determine D.O,B.O.D/COD.

COURSE OUTCOMES:
- Get ability to perform relevant tests in the laboratory to determine the major characteristics of water and wastewater
- Get hands on experience in operating the various equipment/methods available for examining water and wastewater
- Understand the practical significance of the characteristics, the relevant codes of practice for
- Examination and permissible limits for the characteristics of water and wastewater

LIST OF EXPERIMENTS
1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coli form test.

    NOTE : At least 8 of the above experiments are to be conducted.

LIST OF EQUIPMENT
1. pH meter,
2. Tabidity meter,
3. Conductivity meter,
4. Hot air oven,
5. Muffle furnace,
6. Dissolved Oxygen meter,
7. U – V visible spectrophotometer,
8. Reflux Apparatus,
9. Jar Test Apparatus,
10. BOD incubator.

TEXT BOOKS:
1. Chemistry for Environmental Engineering by Sawyer and Mc. Carty
2. Standard Methods for Analysis of water and Waste Water – APHA

REFERENCE
1. Relevant IS Codes.

Geotechnical Engineering Lab

Subject Code: 13CE4112   **External Marks:50**
Credits: 03   **Internal Marks: 25**

COURSE OBJECTIVES:
- To know how to find Atterberg's Limits, Field Density , Relative density of sand
- To know how to do Grain size analysis, compaction test, CBR Test
- To know how to do Unconfined Compression test, Triaxial Compression test
- To know how to do Direct Shear test, Vane Shear test etc.,

COURSE OUTCOMES:
- Get ability to find Atterberg's Limits, Field Density , Relative density of sand
- Get ability to do Grain size analysis, compaction test, CBR Test
- Get ability to to do Unconfined Compression test, Triaxial Compression test
- Get ability to do Direct Shear test, Vane Shear test etc.,

GEOTECHNICAL ENGINEERING LAB
LIST OF EXPERIMENTS
1. Atterberg's Limits.
2. Field density-Core cutter and Sand replacement methods
3. Relative Density of Sand
4. Grain size analysis - Sieve Analysis Hydrometer analysis
5. Permeability of soil - Constant and Variable head tests
6. Compaction test
7. CBR test
8. Consolidation test
9. Unconfined Compression test
10. Triaxial Compression test
11. Direct Shear test.
12. Vane Shear test.
13. Differential free swell (DFS)
14. Measurement of Swell Pressure.
    At least **Eight** experiments shall be conducted.

LIST OF EQUIPMENT:
1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
   a) Core cutter method
   b) Sand replacement method
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for
   a) Constant head test
   b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.

8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature 50_0 - 150_0C

REFERENCE BOOK:
     1. IS 2720 – relevant parts.

GIS Lab

Subject Code: 13CE4113   **External Marks:50**
Credits: 03   **Internal Marks: 25**

COURSE OBJECTIVES:
- To know how to georeference, project, digitization of Toposheet
- To know how to create thematic maps and Layout preparation
- To know how to estimate features like length, area etc.,
- To Know how to generate DEM
- To know road network applications and water resources applications

COURSE OUTCOMES:
- Get ability to georeference, project, digitization of Toposheet
- Get ability to create thematic maps and Layout preparation
- Get ability to estimate features like length, area etc.,
- Get ability to generate DEM
- Get ability in doing road network applications and water resources applications

EXCERCISES:
1. Georeferencing and Projection of a Toposheet
2. Digitization of Features in a Toposheet
3. Topology of digitized of features
4. Study of features estimation
5. Creation of Thematic maps.
6. Layout Preparation
7. Digital Elevation model
8. Calculation of volumes for Hills and Tanks
9. Road Network application in GIS
10. Simple applications of GIS in water Resources Engineering

GIS SOFTWARE
1. Arc GIS 9.0
2. ERDAS 8.7
3. Mapinfo 6.5

Any one or Equivalent.

TEXT BOOK:
1. Concept and Techniques of GIS by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

S. No.	Codes	Theory / Labs	L	T	P	C	Marks		Total
		II Semester							
							INT	EXT	
1	13CE4031	Finite Element Methods	3	1		3	30	70	100
2		**Elective 3**	3	1		3	30	70	100
	13CE4032	I. Advanced Structural Design							
	13CE4033	II. Ground Water Development and Management							
	13CE4034	III. Environmental Impact Assessment and Management							
	13CE4035	IV. Soil Dynamics and Machine Foundations							
3		**Elective 4**	3	1		3	30	70	100
	13CE4036	I. Water Shed Management							
	13CE4037	II. Pavement Analysis and Design							
	13CE4038	III. Advanced Structural Analysis							
	13CE4039	IV. Bridge Engineering							
4	13CE4203	Internship				1	25	50	75
5	13CE4204	Project work				6	60	140	200
		Total Credits	9	3		**16**	175	400	575

Finite Element Methods

Subject Code: 13CE4031   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To study the concept FEM which includes merits and demerits, energy principles, Rayleigh-Ritz method of functional approximation and principles of elasticity, equilibrium equations, strain displacement relationships, consecutive relationships for plane stress and plane strain and axi-symmetric bodies.
- To study one dimensional element which includes stiffness matrix for bar elements, shape function for one dimensional elements, and problems.
- Two dimensional elements which includes different types of elements for plane stress and plane strain analysis, displacement formulation, shape functions, natural coordinate system, area and volume coordinates, nodular load vector for 3 node triangular element and four node rectangular element.
- To study finite element formulation for beams which includes stiffness matrix, load vector, comparison of FE solution to exact solution and isometric formulation which includes concept of isometric elements for 2D analysis, formulation of CST element, 4 noded and 8 nodediso-parametric quadrilateral elements and lagrangian serendipity elements.
- To study Axi-symmetric analysis, basic principles, formulation of 4noded iso-parametric axi-symmetric element, planning of watershed management activities, people's participation, preparation of action plan, and administrative requirements.

COURSE OUTCOMES:
- To understand the concept FEM which includes merits and demerits, energy principles, Rayleigh-Ritz method of functional approximation and principles of elasticity, equilibrium equations, strain displacement relationships, consecutive relationships for plane stress and plane strain and axi-symmetric bodies.
- To learn one dimensional element which includes stiffness matrix for bar elements, shape function for one dimensional elements, and problems.
- To learn Two dimensional elements which includes different types of elements for plane stress and plane strain analysis, displacement formulation, shape functions, natural coordinate system, area and volume coordinates, nodular load vector for 3 node triangular element and four node rectangular element.
- To understand finite element formulation for beams which includes stiffness matrix, load vector, comparison of FE solution to exact solution and isometric formulation which includes concept of isometric elements for 2D analysis, formulation of CST element, 4 noded and 8 nodediso-parametric quadrilateral elements and lagrangian serendipity elements.
- To understand Axi-symmetric analysis, basic principles, formulation of 4noded iso-parametric axi-symmetric element, planning of watershed management activities, people's participation, preparation of action plan, and administrative requirements.

UNIT -I
Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.

Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT -II
One dimensional fem : Stiffness matrix for bar element - shape functions for one dimensional elements – one dimensional problems.
Two Dimensional FEM : Different types of elements for plane stress and plane strain analysis – Displacement models –generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

UNIT –III
Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements.

UNIT –IV
Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis -formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

UNIT-V
Axi-symmetric analysis- Basic principles-Formulation of 4-node iso-parametric axi-symmetric element
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:
1. Finite Elements Methods in Engineering by Tirupati.R. Chandrepatla and Ashok
D. Belegundu - Pearson Education Publications.
2. Finite element analysis by S.S. Bhavakatti-New age international publishers
3. .Finite element analysis by David V Hutton, Tata Mcgraw Hill, New Delhi

REFERENCES:
1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David
S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

Advanced Structural Design
(Elective-3)

Subject Code: 13CE4032   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- The student will read, study, understand and analyze (the design of retaining walls, cantilever and counter fort
- The student will read, study, understand and analyze (design of circular and rectangular types of RCC water tanks
- The student will read, study, understand and analyze (design of steel water tanks
- The student will read, study, understand and analyze (introduction to bunkers, silos and chimneys, concepts of loading and design
- The student will read, study, understand and analyze (introduction to concrete bridges, IRC loading, slab bridges and T-beam bridges design concept)

COURSE OUTCOMES:
- The student will have learnt, will have an understanding of, will be able to formulate, and will be able to solve problems on (the design of retaining walls, cantilever and counter fort).
- The student will have learnt, will have an understanding of, will be able to formulate, and will be able to solve problems on (design of circular and rectangular types of RCC water tanks)
- The student will have learnt, will have an understanding of, will be able to formulate, and will be able to solve problems on (design of steel water tanks)
- The student will have learnt, will have an understanding of, will be able to formulate, and will be able to solve problems on (introduction to bunkers, silos and chimneys, concepts of loading and design)
- The student will have learnt, will have an understanding of, will be able to formulate, and will be able to solve problems on (introduction to concrete bridges, IRC loading, slab bridges and T-beam bridges design concept)

UNIT - I
Design of Retaining walls, cantilever and counter fort

UNIT - II
Design of RCC water tanks, Circular and rectangular types- Design of steel water tanks

UNIT - III
Introduction to bunkers, silos and Chimney, concepts of loading and Design-Introduction to concrete bridges, IRC loading, slab bridges and T - beam bridges design concepts.

UNIT - IV
Design of plate girder railway bridges and gantry girders-Design of steel truss bridges for railway loading

UNIT – V
Multistory building system – detailing for Ductility, Design for earthquake and wind forces.

TEXT BOOKS:
1. Advanced Reinforced concrete structures by Vargheesh, Pranties Hall of India Pvt. Ltd.
2. Design drawing of concrete and steel structures by N.Krishna Raju University Press 2005.
3. Reinforced concrete structures Vol-2 by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

REFERENCES:
1. Essentials of Bridge Engineering by D.John son Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. Reinforced concrete design by S.U,Pillai and D.Menon, Tata Mc.Ghrawhill Publishing company
3. Advanced Reinforced Concrete Design by P.C. Varghese, Prentice Hall India.
Codes: Relevant IS: codes.

Ground Water Development and Management
(Elective-3)

Subject Code: 13CE4033   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- Explain in detail how groundwater systems function
- Describe the interactions between groundwater systems, climate, surface waters and land use
- Use modeling tools for climate and groundwater systems
- Identify the consequences of global and climate change impacts for groundwater management under uncertainty
- Plan groundwater-related adaptation solutions for global change.

COURSE OUTCOMES:
- To know that how ground water systems function
- Students learn that how the interactions between groundwater systems, climate, surface waters and land use
- Students know that Use modeling tools for climate and groundwater systems
- capacity to use a wide range of modelling tools for climate, groundwater and water resource management, to simulate these systems, existing feedbacks and induced stresses from human activities, calibrating and validating such models based on historical data and using them for scenario analysis

UNIT I
Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.
Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT II
Analysis of Pumping Test Data : Steady flow groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests.Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jocob and Chow's simplifications, Leak aquifers.

UNIT – III
Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

UNIT – IV
Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

UNIT – V
Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion.Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:
1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCES :
1. Groundwater by Bawvwr, John Wiley & sons.
2. Groundwater Syatem Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers

Environmental Impact Assessment and Management
(Elective-3)

Subject Code: 13CE4034   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
* To identity different methodologies for Environmental Impact Assessment (EIA).
* To understand the basic concept of EIA.
* To apply the professional knowledge of EIA to prepare Environmental audit report.
* To aim for employment in premier consultancy organization which are preparing EIA report to industries.
* To apply the professional, ethics, attitude, team work skills, multi disciplinary approach to contribute the needs of society in the field of environmental protection

COURSE OUTCOMES:
* Able to Prepare EIA reports to industries.
* Able to create awareness among the public on the effects of pollution at local level as well as global level.
* Able to manage quality of soil, water & air by adopting environmental legislation
* Able to get successful employment in organizations working for the protection of environment.
* Able to prepare environmental audit report.

UNIT - I
Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.
E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT - II
Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT - III
Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT – IV
Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report. Post Audit activities, The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Mota Act, Wild life Act.

UNIT-V
Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:
1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, KAKINADA.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCES:
1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

Soil Dynamics and Machine Foundations
(Elective-3)

Subject Code: 13CE4035   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To create an ability to apply knowledge of geotechnical engineering.
- To design and conduct experiments, as well as to analyze and interpret data related to the geotechnical engineering.
- To introduce traditional curriculum consisting mostly of practical courses in numerous special aspects of soil engineering.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

COURSE OUTCOMES:
- Understanding of the basic principles and exposes the student to the latest developments, with a strong research orientation.
- An ability to identify, formulate and solve foundation related problems.
- A complete awareness of the latest trends, modern standards and state-of-the-art techniques for geotechnical engineering.
- Develop an ability to apply knowledge of foundation engineering to solve problems related to geotechnical engineering.
- An ability to design a foundation system for economic and safe aspects for the society

UNIT 1
Theory of vibrations: Basic definitions- free and forced vibrations with and without damping for single degree freedom system- Resonance and its effect – magnification – Logarithmic decrement – Transmissibility-Natural frequency of foundation – Soil system: Barkan's and IS methods – pressure bulb concept – Pauw's Analogy.

UNIT II
Wave propagation: Elastic waves in Rods – Waves in elastic Half space.
Dynamic Soil Properties: Field and Laboratory methods of determination – Uphole, Down hole and cross hole methods – Cyclic plate load test – Block vibration test – Determination of Damping factor.

UNIT III
Machine Foundations: Types, Design criteria, permissible amplitudes and bearing pressure.
Block foundation: Degrees of freedom - analysis under different modes of vibration

UNIT IV
Analysis of Two Degree freedom systems under free and forced vibrations -Principles of Design of Foundations for reciprocating and impact machines as per IS code.

Unit – V
Vibration Isolation: Types and methods – Isolating materials and their properties

TEXT BOOKS:
1) Handbook of Machine Foundations by P.Srinivasulu and G.V.Vaidyanathan, Tata McGraw Hill
2) Soil Dynamics by Shamsher Prakash

REFERENCES:
1) Dynamics of Bases and Foundations by Barken, McGraw Hill Publishing Co.,New York
2) Vibration of Soils and Foundations by Richart, Hall and Woods, Prentice Hall, eaglewood Cliffs, New Jersy, USA.

Watershed Management
(Elective-4)

Subject Code: 13CE4036   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- to study the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- to study the principles of erosion which include Types ,factors affecting, Effects, estimation of soil loss of erosion etc., and measures to control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.
- to study the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- to study the Land management which include Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.
- to study the Ecosystem management which include Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

COURSE OUTCOMES:
- to understand the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- to learn the principles of erosion which include Types ,factors affecting, Effects, estimation of soil loss of erosion etc., and measures to control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion
- to understand the Land management which include Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.
- to learn the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- to understand the Ecosystem management which include Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

UNIT-I
Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.
Characteristics of watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II
Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.
Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-III
Water harvesting: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT-IV
Land management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT-V
Ecosystem management: Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping,cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

TEXT BOOKS:
1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers.

REFERENCE:
1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India.

Pavement Analysis and Design
(Elective-4)

Subject Code: 13CE4037   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- The objective of this course is to enable students to understand and differentiate between road pavement structures or layers, to differentiate between the different types of materials used and to design road pavements.
- The student will learn the importance of evaluation and strengthening of pavements
- This explains the stress and strains for various types of pavements and its evaluation procedures
- This explain the structural and functional requirements of pavements along with its failures
- This explains how overlay designs are carried with BBD and FWD

COURSE OUTCOMES:
- Selecting the appropriate materials for use in different road layers
- Evaluate the quality and performance of unbound and bound road materials
- Perform road pavement design and analysis
- Design flexible and rigid pavements
- Explains the different types of pavement failures

UNIT I
Types of pavement – Factors affecting design of pavements – wheel loads –ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors.

UNIT II
Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design. Stresses in rigid pavements – relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction.

UNIT III
Pavement design: CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.- AASHO Method of Flexible Pavement design. IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars.

UNIT –IV
Highway Materials – Soil, Aggregate and Bitumen- Tests on aggregates – Aggregate Properties and their Importance- Tests on Bitumen – Bituminous Concrete- Requirements of Design Mix- Marshall's Method of Bituminous Mix design. Highway construction – Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads- Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives-Soil-cement Stabilization and Soil-lime Stabilization.

UNIT – V
Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes- Rigid Pavement Failures- Types and causes- Pavement Evaluation- Benkleman Beam method- Strengthening of Existing Pavements- Overlays.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna & C.J.Justo, Nemchand & Bros., 7th Edition (2000).
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003).

REFERENCES:

1. Principles of pavement design – Yoder & wit zorac – Jhonwilley & Sons.
CODES:
1. IRC Code for flexible pavement – IRC – 37 -2001.
2. IRC Code for Rigid pavement – IRC – 58 – 2002.

Advanced Structural Analysis
(Elective-4)

Subject Code: 13CE4038   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- The student will read, study, understand and analyze (the notations for forces and stresses, components of stresses, components of strains, Hooke's Law).
- The student will read, study, understand and analyze (Definitions, Differential Equations Of Equilibrium, Boundary Conditions, and Compatibility Conditions)
- The student will read, study, understand and analyze (Airy's Stress Function, Solution by polynomials, Saint Venant Principle, Solution of bi-harmonic equation using Fourier series)
- The student will read, study, understand and analyze (general equations in polar co-ordinates, solution of bi-harmonic equation for axial symmetry, general solution of bi-harmonic equation, bending of a curved bar, analysis of thick cylinder)
- The student will read, study, understand and analyze (Dynamic Loadings, formulation of equation of motion, Newton's second law of motion, D'Alembert's principle, solution of undamped single degree of freedom systems)

COURSE OUTCOMES:
- The student will have learnt, will have an understanding of, will be able to use, will be able to formulate, and will be able to solve problems on (the notations for forces and stresses, components of stresses, components of strains, Hooke's Law).
- The student will have learnt, will have an understanding of, will be able to use, will be able to formulate, and will be able to solve problems on (Definitions, Differential Equations Of Equilibrium, Boundary Conditions, and Compatibility Conditions)
- The student will have learnt, will have an understanding of, will be able to use, will be able to formulate, and will be able to solve problems on (Airy's Stress Function, Solution by polynomials, Saint Venant Principle, Solution of bi-harmonic equation using Fourier series)
- The student will have learnt, will have an understanding of, will be able to use, will be able to formulate, and will be able to solve problems on (general equations in polar co-ordinates, solution of bi-harmonic equation for axial symmetry, general solution of bi-harmonic equation, bending of a curved bar, analysis of thick cylinder)
- The student will have learnt, will have an understanding of, will be able to use, will be able to formulate, and will be able to solve problems on (Dynamic Loadings, formulation of equation of motion, Newton's second law of motion, D'Alembert's principle, solution of undamped single degree of freedom systems)

UNIT - I
Moment Distribution method: Application to the analysis of portal frames with inclined legs, gable frames Strain energy method: Application to the analysis of continuous beams and simple portal frames.

UNIT - II
Influence lines: Influence line diagrams for Reaction, Shearing force and Bending moment in case of determinate beams and Influence line diagrams for member forces in determinate trusses – application of influence line diagrams. Analysis Two hinged and Three hinged arches using influence lines.

UNIT - III
Flexibility Method: Introduction to the structural analysis by flexibility concept using Matrix approach and application to continuous beams and plane trusses.
Stiffness method: Introduction to the structural analysis by stiffness concept using Matrix approach and application to continuous beams and plane trusses.

UNIT - IV
Analysis of portal fames by flexibility and stiffness methods. Drawing of bending moment diagram.

UNIT - V
Plastic Analysis: Introduction – Idealized stress – Strain diagram – shape factors for various sections – Moment curvature relationship – ultimate moment – Plastic hinge – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

TEXT BOOKS:
1. Matrix methods of Structural Analysis by Pandit and Gupta – Tata Mc.Graw Hill
2. Analysis of structures Vol. I & II by Vazrani and Ratwani. Khanna publications.
3. Comprehensive Structural Analysis Vol.1 & 2 by Dr. Vaidyanathan and Dr. P.Perumal - by Laxmi, publications Pvt. Ltd., New Delhi

REFERENCES:
1. Structural Analysis by D.S.Prakash Rao - Sagar books
2. Structural Analysis Vol. I & II by Bhavi Katti Vikas Publications.
3. Matrix structural analysis by T.N.Gayl; Tata Mc.Graw Hill company

Bridge Engineering
(Elective-4)

Subject Code: 13CE4039   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To study Standard Specifications for Road Bridges
- To study General Design Consideration
- To study culverts
- To Study Reinforced Concrete Bridges
- To study substructure

COURSE OUTCOMES:
- Able to understand Standard Specifications for Road Bridges
- Able to understand General Design Consideration
- Able to learn culverts
- Able to learn Reinforced Concrete Bridges
- Able to understand substructure

UNIT-I
Introduction-Indian Roads Congress Bridge Code-Width of carriageway-Clearances-Loads to be considered-Dead load-I.R.C. standard live loads-Impact effect-Review of I.R.C. loadings-Application of live loads on deck slabs-Wind load-Longitudinal forces-Centrifugal forces-Horizontal forces due to water currents-Buoyancy effect-Earth pressure-Temperature effects-Deformation stresses-Secondary stresses-Erection stresses-seismic force.

UNIT-II
Introduction-Reinforced concrete; Elastic design constants; Reinforcing bars; Concrete grades; Permissible stresses under different load conditions; Cover to reinforcement; Effective flange width of T-beams and L-beams; Curtailment of bars; Detailing of reinforcement-Concrete mix design-Notation for detailing R.C. bridges-Steel construction; Materials; Permissible stresses; General details-Prestressed concrete; Materials; Design considerations; Traffic aspects of highway bridges-Aesthetics of bridge design.

UNIT-III
Introduction-Reinforced concrete slab and Box culver-Example for R.C. Slab culver-Author's charts for design of deck slab of slab bridges-Skew slab culvert-pipe culvert-Reinforced concrete box culvert-Sub-mesible bridges; Analysis & Design Box culvert bridges.

UNIT-IV
Introduction – T-beam bridges-Illustrative example of T-beam bridge-Hollow girder bridges-Balanced cantilever bridges; Continuous girder bridges- Rigid frame bridges-Arch bridges- Bow string girder bridge-Example of bow string Girder Bridge.

UNIT-V
Definition-Bed block-Materials for piers and abutments-Piers-Forces due to wave action and collision-Example of design of pier-Abutments-Example of design of abutment-Backfill behind abutment-Approach slab. Construction and Maintenance:
Construction method-short span bridges-Long span bridges-Formwork and false work for concrete bridges-Construction management-Numbering of Bridges-Maintenance-Bridge failures

TEXT BOOKS
1. Bridge Engineering by D.Johnson Victor.
2. Bridge Analysis and Design by V.K. Raina

Reference books:
1. Bridge Engineering by N. Krishna Raju
2. Bridge Engineering by Aswani, Vatvani & Ratvani.

Internship

Subject Code: 13CE4203   **External Marks: 25**
Credits: 01   **Internal Marks: 50**

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Project

Subject Code: 13CE4204   **External Marks: 60**
Credits: 06   **Internal Marks: 140**

COURSE OBJECTIVES:
Students will have
- to identify the problem of a project which is going to be done.
- to analyze the problem in many possible ways and choose the best one
- to do the literature review on the same problem and they have to compare the problem with the literature
- to know how to write methodology of the project
- to know how to document the project with conclusions

COURSE OUTCOMES:
Students will get ability
- to understand the problem of a project which is going to be done.
- to learn how to analyze the problem in many possible ways and choose the best one
- to understand how to do the literature review on the same problem and they understand how to compare the problem with the literature
- to learn how to write methodology of the project
- to learn how to document the project with conclusions