ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

CIVIL ENGINEERING

For

B. TECH. FOUR YEARS DEGREE PROGRAMME

(Applicable for the batches admitted from 2016-17)

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

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)
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Permanently Affiliated to JNTUK, Kakinada.
K.Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh

Academic Regulations 2016 for B. Tech.
(Effective for the students admitted into I year from the **Academic Year 2016-2017** 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.

Sl. 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**	**03**
2	**Complementary Course**	**02**
3	**Laboratory Course**	**02**
4	**Advanced Laboratory Course**	**03**
5	**Self Study course/Internship**	**01**
6	**Employability skills**	**02**
7	**Project**	**06**

5. **Complementary Courses:**

There is two complementary courses in each semester from 2-1 Semester to 4-1 semester. The student can choose two complementary courses of respective semester. The pattern of Midterm examinations and end examinations of these courses is similar to regular theory courses and the valuation is purely internal.

6. **MOOCs:**
Explore all possibilities to run at least one subject in every semester from 2-1 semester onwards as a Moocs.

7. **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.

7.1 **Theory course:**
For theory courses the distribution shall be **30** marks for internal midterm evaluation and **70** marks for the External End - Examinations.
Out of 30 internal midterm marks – **25** marks are assigned for descriptive exam and 5 marks for continuous assessment tests.
Process of conducting assessment test: The assessment test will be conducted for 5 marks. Teacher should give 5 questions after completion of 11/2 units to the students from which the student has to answer any one of the questions suggested by the teacher in the classroom itself. Similarly there will be another two assessment tests after completion of 3 units and 41/2 units from prescribed syllabus.The average marks of these 3 tests will be considered for 5 marks for the continuous assessment tests finally.

(i) **Pattern for Internal Midterm Examinations (25 marks):**
For theory courses of each semester, there shall be **2** Midterm descriptive/short answer exams. Each descriptive/short answer exam consists of **120 minutes** duration for **25** marks.
First MID exam will be conducted after completion of 2 1/2 units (50%) of syllabus and the second MID will be conducted after completion of the total syllabus.

For final calculation of internal marks, weightage of 80% will be given to the student who performed well either in first Mid or second Mid and 20% weightage will be given to other Mid term examinations.

Mid paper consists of 2 parts.(Part-A &B)
(a) Part-A contains 10 marks, which is compulsory. It has **5** short questions with **2** marks each (5x2=10M).
(b) Part-B of the paper contains descriptive type questions for thirty marks. This part shall contain four questions. The student should answer 3 out of 4 questions. Each question carries 10 marks (3@10=30M).
The first Midterm examination to be conducted usually after 8 weeks of instruction or after completion of 50 percent syllabus, the second Midterm examination to be conducted usually at the end of instruction after completion of remaining 50 percent syllabus.

(ii) Pattern for External End Examinations (70 marks):

    (c) 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.

    (d) Part-A shall contain 14 marks, which is compulsory. It has **7** short questions with **2** marks each (7x2=14M). At least **1** question will be given from each unit.

    (c) Part-B of the question paper shall have descriptive type questions for 56 marks. This Part shall contain **6** questions. The student should answer **4** out of **6** questions. Each Question carries **14** marks. At least **1** question will be given from each unit. Each course shall consist of **5** units of syllabus.

.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** marks 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.

7.3 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.

7.4 Self Study course:

    Three 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.

7.5 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

7.6 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.

Three Periods per week are allotted for this course from 2-1 semester to 4-1 semester and evaluated in 4-1 semester.

7.7 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.

8. 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.

9. Minimum Academic Requirements:

9.1 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.

9.2 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

Course	Grade Points	Letter Grade
95-100%	10	0
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

9.3. 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:

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

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.

9.4,Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme.

The CGPA is calculated as below:

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

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

Table: Award of Divisions

CGPA	DIVISION
≥ 7.5	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and <6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

9.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.6 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.

10. 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.

11. Minimum Instruction Days:

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

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

13. 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 2017 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 fulfills 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

Course	Grade Points	Letter Grade
95-100%	10	0
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B$^+$
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 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:

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

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	DIVISION
≥ 7.5	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and < 6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	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)
<u>**Course Structure (AR16)**</u>

I YEAR - I Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks Int	Marks Ext	Credits
1	16HS1001	English	3	0	-	30	70	3.0
2	16BS1001	Engineering Mathematics –I	3	1	-	30	70	3.5
3	16CE1001	Building Materials and Construction	3	1	-	30	70	3.5
4	16BS1004	Engineering Chemistry	3	1	-	30	70	3.5
5	16ME1001	Engineering Drawing	3	0	-	30	70	3.0
6	16CS1001	Computer Programming	3	1	-	30	70	3.5
7	16BS1102	Engineering Chemistry Lab	-		3	25	50	1.5
8	16HS1101	Basic English Communication Skills Lab	-		3	25	50	1.5
9	16CS1101	Computer Programming Lab	-		3	25	50	1.5
		Total Credits	**18**	**04**	**9**	**255**	**570**	**24.5**

I YEAR - II Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks Int	Marks Ext	Credits
1	16HS1002	English communication Practice	3	0	-	30	70	3.0
2	16BS1002	Engineering Mathematics – II	3	1	-	30	70	3.5
3	16HS1003	Environmental Studies	3	0	-	30	70	3.0
4	16BS1003	Engineering Physics	3	1	-	30	70	3.5
5	16ME1002	Engineering Mechanics	3	1	-	30	70	3.5
6	16EE1004	Basic Electrical &Electronics Engineering	3	1	-	30	70	3.5
7	16BS1101	Engineering Physics Lab	-		3	25	50	1.5
8	16ME1101	Engineering Workshop Lab	-	-	3	25	50	1.5
9	16EE1102	Electrical &Electronics Engg. Lab	-		3	25	50	1.5
		Total Credits	**18**	**4**	**9**	**255**	**570**	**24.5**

II YEAR- I Semester

S. No.	Subject code	Theory / Labs	L	T	P	Int	Ext	Credits
						Marks		
1	16CE2002	Strength of Materials-I	3	1	-	30	70	3.5
2	16CE2003	Fluid mechanics	3	1	-	30	70	3.5
3	16CE2004	Surveying	3	1	-	30	70	3.5
4	16CE2005	Environmental Engineering-I	3	-	-	30	70	3.0
5	16CE2006	Engineering Geology	2	-	-	30	70	2.0
6	********	**Open Elective – I**	2	-	-	30	70	2.0
7	16CE2101	Strength of Material Lab	-	-	3	25	50	1.5
8	16CE2102	Surveying Lab – I	-	-	3	25	50	1.5
9	16CE2103	Engineering Geology Lab	-	-	3	25	50	1.5
10	16HS2201	Professional Ethics & Morals	2	-	-			-
		Total	**18**	**3**	**9**	255	570	**22.0**

II B. Tech. (1st Sem): (Open Elective – I)

Code	Subject	Branch Offering
16OE2011	Matrices and applications	BS&H
16OE2013	Introduction to MATLAB	EEE
16OE2014	Fundamentals of Material Science	MECH
16OE2015	Introduction of Electronic measurements	ECE
16OE2016	UNIX Utilities	CSE
16OE2017	IT Systems Management	IT

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16BS2006	Complex Variables and Statistical Methods	3	1	-	30	70	3.5
2	16CE2007	Hydraulics and Hydraulic Machinery	3	0	-	30	70	3.0
3	16CE2008	Structural Analysis-I	3	1	-	30	70	3.5
4	16CE2009	Strength of Materials-II	3	1	-	30	70	3.5
5	16CE2010	Building Planning and Drawing	2	-	-	30	70	2.0
6	********	**Open Elective – II**	2	-	-	30	70	2.0
7	16HS2102	Advanced English Communication Skills Lab	-		3	25	50	1.5
8	16CE2104	Fluid Mechanics Lab	-	-	3	25	50	1.5
9	16CE2105	Surveying Lab –II	-	-	3	25	50	1.5
10	16CE2201	Self Study course-I*	-	2	-	75		1.0
		Total Credits	**16**	**5**	**09**	**340**	**570**	**23.0**

2 Periods which include library. E-learning, internet and Presentation.

II B. Tech. (2ⁿᵈ Sem): (Open Elective – II)

Code	Subject	Branch Offering
16OE2021	Transform Theory	BS&H
16OE2023	Renewable Energy sources	EEE
16OE2024	Principles of Mechanical Measurements	MECH
16OE2025	Principles of Communications	ECE
16OE2026	Introduction to Java	CSE
16OE2027	Introduction to Python	IT

S. No.	Subject code	Theory / Labs	L	T	P	Marks Int	Marks Ext	Credits
1	16CE3011	Geotechnical Engineering –I	3	1	-	30	70	3.5
2	16CE3012	Structural Analysis-II	3	1	-	30	70	3.5
3	16CE3013	Design of Concrete Structures	3	1	-	30	70	3.5
4	16CE3014	Transportation Engineering-I	3	-	-	30	70	3.0
5	16CE3015	Concrete Technology	2	-	-	30	70	2.0
6	********	**Open Elective - III**	2	-	-	30	70	2.0
7	16CE3106	Drawing of Concrete Structures Lab	-	-	3	25	50	1.5
8	16CE3107	Transportation Engineering Lab	-	-	3	25	50	1.5
9	16CE3108	Concrete Technology Lab	-	-	3	25	50	1.5
10	16CE3202	Self Study course-II*	-	2	-	75		1.0
Total Credits			**16**	**5**	**9**	**340**	**570**	**23.0**

2 Periods which include library. E-learning, internet and presentation.

III B. Tech. (I Sem): (Open Elective – III)

Code	Subject	Branch Offering
16OE3031	Fundamentals of Fuzzy Logic	BS&H
16OE3033	Energy Audit Conservation and Management	EEE
16OE3034	Elements of workshop technology	MECH
16OE3035	Introduction to Signal Processing	ECE
16OE3036	Social Networks	CSE
16OE3037	Fundamentals of Computer Graphics	IT

S. No.	Subject code	Theory / Labs	L	T	P	Marks Int	Marks Ext	Credits
1	16CE3016	Design and Drawing of Steel Structures	4	1		30	70	4.5
2	16CE3017	Water Resources Engineering	3	1	-	30	70	3.5
3	16CE3018	Environmental Engineering –II	3	0	-	30	70	3.0
4	16CE3019	Pre-Stressed Concrete	2	-	-	30	70	2.0
5	********	**Elective I**	3	-	-	30	70	3.0
6	********	**Open Elective – IV**	2	-	-	30	70	2.0
7	16CE3109	Hydraulic Machinery Lab	-	-	3	25	50	1.5
8	16CE3110	Computer Aided Engineering Drawing Practice Lab	-	-	3	25	50	1.5
9	16CE3111	Software tools for Structural Engineering Lab	-	-	4	25	50	2.0
10	16HS3202	Intellectual Property Rights and Patents	2	-	-			-
		Total Credits	**19**	**2**	**10**	**255**	**570**	**23.0**

Subject Code	Elective I
16CE3020	Advanced Design of Concrete Structures
16CE3021	Industrial Waste and Waste Water management
16CE3022	Advanced Structural Analysis
16CE3023	Ground Improvement Techniques
16CE3024	Advanced Water shed Management

III B. Tech. (II Sem): (Open Elective – IV)

Code	Subject	Branch Offering
16OE3041	Management Information Systems (MIS)	MBA
16OE3043	Special Machines	EEE
16OE3044	Introduction to Automobile Engineering	MECH
16OE3045	Basics of VLSI	ECE
16OE3046	Simulation and Modeling	CSE
16OE3047	Soft Computing	IT

S. No.	Subject code	Theory / Labs	L	T	P	Marks Int	Marks Ext	Credits
1	16CE4025	Remote Sensing and GIS	3	1	-	30	70	3.5
2	16CE4026	Geotechnical Engineering –II	4	0	-	30	70	4.0
3	16HS4004	Managerial Economics &Financial Analysis	2	1	-	30	70	2.5
4	16CE4027	Estimation and Quantity Surveying	2	1	-	30	70	2.5
5	********	**Elective II**	3	-	-	30	70	3.0
6	********	**Open Elective - V**	2	-	-	30	70	2.0
7	16CE3112	Environmental Engineering Lab	-	-	3	25	50	1.5
8	16CE3113	Geotechnical Engineering Lab	-	-	3	25	50	1.5
9	16CE3114	GIS Lab (Advanced Lab)	-	-	4	25	50	2.0
10	16HS4203	Employability Skills	-	3	-	75	-	1.5
Total Credits			**17**	**6**	**10**	**340**	**570**	**24.0**

Subject Code	Elective II
16CE4028	Advanced Surveying
16CE4029	Traffic Engineering
16CE4030	Water Resources System Planning and management
16CE4031	Advanced Water Resource Engineering
16CE4032	Environmental Impact Assessment and Management

IV B. Tech. (1st Sem): (Open Elective – V)

Code	Subject	Branch Offering
16OE4051	Project Management	MBA
16OE4053	Power Quality Management	EEE
16OE4054	Fundamentals of Robotics	MECH
16OE4055	Basics of Mobile Communications	ECE
16OE4056	Introduction to Cloud Computing	CSE
16OE4057	Introduction to DBMS	IT
16OE4058	Entrepreneurial Development	MBA

S. No.	Subject code	Theory / Labs	L	T	P	Marks Int	Marks Ext	Credits
1	16CE4033	Transportation Engineering –II	3	-	-	30	70	3.0
2	16CE4034	Air Quality Management	3	0	-	30	70	3.0
3	********	**Elective III**	3	-	-	30	70	3.0
4	16CE4203	Internship	-	-	-	25	50	1.0
5	16CE4204	Project	-	-	-	60	140	6.0
Total Credits			**9**	**0**	**-**	**175**	**400**	**16.0**

Subject Code	Elective III
16CE4035	Advanced Structural Design
16CE4036	Ground Water Development and Management
16CE4037	Soil Dynamics and Machine Foundations
16CE4038	Earthquake Resistant Design
16CE4039	Pavement Analysis and Design

L   -   LECTURE HOURS/WEEK

T   -   TUTORIAL HOURS/WEEK

P   -   PRACTICAL HOURS/WEEK

Course Structure (AR16)

I YEAR - I Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16HS1001	English	3	0	-	30	70	3.0
2	16BS1001	Engineering Mathematics –I	3	1	-	30	70	3.5
3	16CE1001	Building Materials and Construction	3	1	-	30	70	3.5
4	16BS1004	Engineering Chemistry	3	1	-	30	70	3.5
5	16ME1001	Engineering Drawing	3	0	-	30	70	3.0
6	16CS1001	Computer Programming	3	1	-	30	70	3.5
7	16BS1102	Engineering Chemistry Lab	-		3	25	50	1.5
8	16HS1101	Basic English Communication Skills Lab	-		3	25	50	1.5
9	16CS1101	Computer Programming Lab	-		3	25	50	1.5
	Total Credits		18	04	9	255	570	24.5

English
(Common to all branches)

Subject Code: 16HS1001   **External Marks: 70**
Credits   : 3.0   **Internal Marks : 30**

Course Objectives

- To improve comprehension levels of the students while reading texts in English
- To enable students interpret data and present their perspective on it
- To help students learn the techniques of expanding their vocabulary
- To assist students use grammar effectively in both speech and writing
- To enable students to write formal letters and short essays

Course Outcome
- Students will be able to read and comprehend seen and unseen passages and answer questions based on them.
- Students will be able to interpret the content of a passage and state their perspective.
- Students will be able to understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
- Students will be able to use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
- Students will be able to write sentences, paragraphs, formal letters, emails, short essays on any given topic.

Unit–I: Read and Proceed: Reading—Vocabulary—Grammar—Writing Sentences

Unit–II: Health: Reading—Vocabulary—Grammar—Types of Writing

Unit–III: Travel: Reading—Vocabulary—Grammar—Paragraph Writing

Unit–IV: Disaster Management: Reading—Vocabulary—Grammar—Writing Letters & Emails

Unit–V: Gender: Reading—Vocabulary—Grammar—Writing an Essay

Textbook

Rani, K. Nirupa et al. *Step by Step*. Pearson: New Delhi, 2013.

Reference Books

1. Maison, Margaret M. *Examine Your English*. Orient Longman: Hyderabad, 2003.
2. Taylor, Grant. *English Conversation Practice*. Tata McGraw-Hill: New Delhi, 2008.
3. Wood, Frederick T. *A Remedial English Grammar for Foreign Students*. Macmillan, 1966.

3. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2005.

ENGINEERING MATHEMATICS – I
(Common to all branches)

Subject Code: 16BS1001   **External Marks: 70**
Credits: 3.5   **Internal Marks: 30**

COURSE OBJECTIVES
- To identify & solve the 1st order differential equations and apply in Engineering.
- To understand the process of solving a 2nd and higher order differential equation and solve it. Identify a 2nd and higher order differential equation & solve it in engineering topics.
- To understand the generalized mean value theorems & their use to find the series expansions of functions and in turn their application in finding the maxima and minima of two variable functions.
- To solve the multiple integrals and to develop the capacity of a student to understand the applications of multiple integrals.
- To Understand the mathematical and physical interpretation of Vector differential operator operating on a vector or scalar point function, the line, surface and volume integrals, vector integral theorems and their applications to find work done, area, and volume.

COURSE OUTCOMES

- Solve the 1st order differential equations by identifying the suitable method.
- Identify and solve a 2nd and higher order differential equations and perform simple applications in Engineering.
- Estimate the maxima and minima of two variable functions under different constraints.
- Solve a multiple integral and apply to estimate the volume and surface area of the solids.
- Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.

Unit – I   Linear Differential Equations of first order
Linear differential equations of first order and first degree – exact, linear and Bernoulli. 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, Cauchy's and Euler's equations.

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

Unit-IV   Multiple Integrals
Multiple integrals - double and triple integrals – change of variables in Double & Triple Integrals – Change of order of integration-Cartesian and Polar coordinates.

Unit-V   Vector Calculus

Vector Differentiation: Gradient- Divergence- Curl - Laplacian and second order operators- Vector identities (without proof).

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- Work done, Force.

Text Books:
1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics, Volume-I, II 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.

Building Materials and Construction

Subject Code: 16CE1001   **External Marks:70**
Credits: 3.5   **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, 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, Paints and Varnishes, on wood product washing, distempering on Plastic products washing, distempering, Termite proofing, Scaffolding, Shoring, under pinning and Form work

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

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

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

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

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, Paints and Varnishes, 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

ENGINEERING CHEMISTRY
(Common to all branches)

Subject Code: 16BS1004   **External Marks: 70**
Credits: 3.5   **Internal Marks: 30**

COURSE OBJECTIVES:

- **1.** 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 lubrication techniques.
- To understand about constructing the PV cell.

COURSE OUTCOMES:

On completion of this course, students should be able to:
- Different moulding techniques of plastic material.
- Determine total hardness of water by EDTA method.
- Design the metallic materials to prevent corrosion.
- Apply suitable lubrication mechanisms for various machinery parts.
- Demonstrate the working of Photovoltaic cell.

UNIT-I: POLYMER SCIENCE & INORGANIC ENGINEERING MATERIALS

Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of polymerization (addition and condensation polymerizations). Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of plastics into Articles (Compression, injection, transfer and extrusion moulding methods).

Cement: Classification of cements – Manufacture of Portland cement – Raw Materials - Chemical composition of Portland cement - Setting and Hardening of Portland Cement.

UNIT-II: WATER TECHNOLOGY

Hardness of Water – Temporary and Permanent Hardness - Units and Inter Conversions of Units - Estimation of Hardness by EDTA Methods - Treatment of Water for Domestic Purposes - Sedimentation – Coagulation – Filtration - Disinfection – Sterilization – Chlorination - Break Point chlorination – Ozonisation - Industrial Water Treatments: Desalination – Electro Dialysis - Reverse Osmosis - Lime-Soda Process - Zeolite Process - Ion-Exchange Process.

UNIT-III: CORROSION AND ITS CONTROL

Definition, Causes and Effects of Corrosion - Theories of Corrosion (Chemical and Electrochemical Corrosion) - Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Types of Corrosion (Galvanic Corrosion, Differential Aeration Corrosion, Water Line Corrosion, Pitting Corrosion and Stress corrosion) - Galvanic Series - Factors affecting Rate of Corrosion (Nature of Metal and Nature of Environment). Controlling of Corrosion: Proper Designing - Modifying the Environment - Cathodic Protection (Sacrificial Anodic and Impressed Current).

UNIT-IV. FUEL TECHNOLOGY & LUBRICANTS
Classification of Crude Oil-Fractional Distillation of Petroleum- Manufacturing Of Synthetic Petrol (Fischer-Tropsch & Bergius Process) - Knocking –Anti Knocking Agents-Octane & Cetane Number.

Lubricants: Definition and functions of lubricants – classification of lubricants - mechanism of lubrication – Thick film, Thin film and Extreme pressure lubrication - properties of lubricants - Viscosity, flash and fire points, cloud and pour points, aniline point, neutralization number and mechanical strength.

UNIT-V: ENERGY SOURCES

Chemical sources of energy: Single electrode potential - Faraday Laws – electro chemical series - Nernst Equation – reference electrodes – calomel electrode – NHE (or) SHE - **Renewable energy Source (Solar Energy):** Green house concept – harnessing of solar energy – Photovoltaic cells – concentrated power plants – parabolic trough – solar dish - solar tower.

TEXT BOOKS:

1)   "Engineering Chemistry", P.C.Jain and Monica Jain, DhanpatRai Publications, Co.,
         New Delhi (Latest Edition)

2)   "A Text Book of Engineering Chemistry", S.S. Dara, S.S.Umare, S.Chand& Co.,
         Ltd., (Latest Edition).

REFERENCES:

1)   "A Text Book of Engineering Chemistry", Sunita Rattan, S.K. Kataria& Sons (2012).

2)   "A Text Book of Engineering Chemistry", S. Nagarajan, R. Gopalan,
          D.Venkatappayya, Vikas Publishing House (Latest Edition).

3)   "Engineering Chemistry", Wiley India Editorial Team, Wiley Publishers (2011).

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ENGINEERING DRAWING
(Common for all Branches – at Sem-I / Sem -II)

Subject Code:16ME1001   **External Marks: 70**
Credits: 3.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- Able to develop drawing skills and representation of I angle and III angle projection, isometric Projection, Isometric drawing.

COURSE OUTCOMES:
- Construct polygons, ellipse and scales (plain, diagonal, vernier).
- Draw orthographic projection of points and straight lines in any quadrant, and determine its true length and true inclination.
- Draw projections of plane surfaces inclined to either one or both reference planes.
- Draw projections of simple solids inclined to one reference plane.
- Convert orthographic views into isometric projections and vice-versa.

UNIT-I
Lines, Lettering and Dimensioning: Introduction to Drawing instruments and their uses, Types of lines, Lettering ,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 and concentric circles methods. Construction of cycloid & involute.

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

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, & Cone inclined to one reference plane only.

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, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

REFERENCE BOOKS:
1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

Computer Programming
(Common for All Branches)

Credits : 3.5   **Exetrnal Marks : 70**
Subject Code: 16CS1001   **Internal Marks : 30**

COURSE OBJECTIVES:
- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basis of C language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in the file organization and the usage of file systems.
- To impart the knowledge about pointers this is the backbone of effective memory handling.
- To study the advantages of user defined data type this provides flexibility for application development.

COURSE OUTCOMES:
At the end of this course the student will be able to
- 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:
Computer Languages: Machine, Assembly and High-level, algorithm, flowchart, Program Development Steps.
Introduction to C: Character set, **Tokens:** Identifiers, keywords, data types, constants, variables, **Operators:** Arithmetic, relational, logical, assignment, bitwise, conditional and special (increment, decrement, comma)
Basic I/O statements, structure of a program, simple programs

UNIT-II:
Control Structures: Decision Making: if, if-else, nested if, switch **Iteration:** while, for, do-while, nested loops **Branching:** Break, continue, goto

UNIT-III:
Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations
Functions: Definition, user defined function declaration, types of user defined functions, parameter passing, recursion, library functions, storage classes, passing arrays to function, string manipulations, preprocessor

UNIT-IV:
Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation
Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions

UNIT-V:
File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

Text Books:

1. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.
2. Yashwant Kantikar. 2012. Let Us C, 8th Ed.. PBP Publications.

Reference Books:
1. Dr. N.B Venkateswarlu. 2009. C and Data Structures: A snap shot Oriented Treatise Using Live Engineering Examples. S. Chand & Co., New Delhi.
2. B. W Kernighan, Dennis M. Ritchie . The C – Programming Language. PHI.

ENGINEERING CHEMISTRY LABORATORY
(Common to All Branches)

Code: 16BS1102   **Externals Marks: 50**
Credits: 1.5   **Internals Marks: 25**

COURSE OBJECTIVES:
- To understand the determination of Dissolved Oxygen and Turbidity of water samples.
- To become familiar with the determination of viscosity, flash point and acid value of oil.
- To learn concepts of pH and conductometric titrations.
- To understand the determination of hardness of water by EDTA method.
- To become familiar about all the instruments in the chemistry laboratories.

COURSE OUTCOMES:
On completion of this course, students should be able to
- Determine Dissolved Oxygen. and Turbidity of water samples.
- Explain the importance of viscosity, Flash point and Acid value of a lubricant.
- Determine the amount of acid or base by pH metric and conductometric titrations.
- Determine the hardness of various water samples.
- Operate all the instruments in the chemistry laboratory analysis.

LIST OF EXPERIMENTS: (Any Twelve experiments have to be completed)

1. Determination of acid number of given lubricating oil.
2. Determination of Flash and Fire points of given Oil Samples.
3. Determination of Kinematic Viscosity of a given oil sample by using Viscometer.
4. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
5. Determination of Total Hardness of water sample by using EDTA Method.
6. Nephelometric determination of Turbidity present in the given water sample.
7. Estimation of Viscosity of an Organic Solvent by using Ostwald Viscometer.
8. Preparation and calculation of the yield of Phenol-Formaldehyde Resin (Bakelite).
9. Determination of Strength of a strong acid by pH metric Method.
10. Conductometric determination of Strength of an Acid using strong base.
11. Conductometric determination of mixture of acids using strong base.
12. Colorimetric determination of Iron (III).
13. Potentiometric determination of Mohr's salt using $K_2Cr_2O_7$.
14. Potentiometric determination of strong acid using strong base.
15. Determination of manganese dioxide in manganese ore (pyrolusite).

TEXT BOOKS:

1) "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2) "Lab Manual on Engineering Chemistry" by Sudharani, Dhanpat Rai Publications, Co., New Delhi. (Latest Edition).

REFERENCE BOOKS:

1)   "Engineering Chemistry Lab Manual" by Shuchi Tiwari (2010), SCITECH Publications.
2)   "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G.J.Jeffery, J.Bassett, J.Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3)   "A Text Book of Engineering Chemistry" by R.N.Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4)   "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand & Company Ltd. (2003).
5)   "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

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Basic English Communication Skills Lab
(Common to all Branches)

Subject Code: 16HS1101   **External Marks: 50**
Credits   : 1.5   **Internal Marks :25**

Course Objectives

- To get students pronounce words correctly and speak with proper intonation
- To help students understand people speaking with different accents
- To enable students to describe objects and events effectively
- To help students approach a book with effective reading techniques
- To help students comprehend and interpret data provided in graphs, tables etc.

Course Outcome

- Students will be able to pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.
- Students will be able to comprehend audio and video clips of different accents.
- Students will be able to describe / discuss / explain a given situation / context well.
- Students will be able to read and recall what they have read.
- Students will be able to understand and interpret information provided in graphs, tables etc.

Course Syllabus

Unit I: Received Pronunciation—Speech sounds of English—Intonation

Unit II: Comprehension of Audio and Video Clips of different Accents

Unit III: Greetings—Self-introduction—Introducing others—Story telling—Narrating an incident / event / person / picture

Unit–IV: Reading: SQ3R Technique (Survey-Question-Read-Recite/Recall-Review)

Unit V: Interpreting data of graphs, tables etc. orally and in writing

Text books
Rani, K. Nirupa et al. *Speak Well*. Orient Blackswan: Hyderabad, 2012.

Reference Books
1. Prasad, M. Hari et al. *Strengthen Your Steps*. Maruthi: Hyderabad, 2010.
2. Prasad, M. Hari et al. *Strengthen Your Communication Skills*. Maruthi: Hyd, 2014.
3. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2005.

Computer Programming Lab
(Common for All Branches)

Subject Code: 16CS1101   **External Marks : 70**
Credits : 1.5   **Internal Marks : 30**

COURSE OBJECTIVES:
- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

COURSE OUTCOMES:
At the end of the course students will be able to
- Solve the given problem using the syntactical structures of C language
- Develop , execute and document computerized solution for various problems using the features of C language
- Design programs involving decision structures and loops.
- Implement modularity and code reusability concepts using functions.3
- To read and write C program that uses pointers, structures and files

LIST OF EXPERIMENTS

Ex 1: Write the C programs calculate the following
  a) Area of triangle when sides are given.
  b) Sum of first n numbers.
  c) Interchanging values of two variables.

Ex 2: Write the C programs to perform the following
  a) Read lower case character and convert into upper case.
  b) Find maximum of 3 values using conditional operator.
  c) Calculate area and perimeter of circle.

Ex 3: Write C programs for the following using decision making statements
  a) Check the given number is even / odd.
  b) Find the Largest among 3 values.
  c) Calculate the grades of a student.

Ex 4:
  a) Arithmetical operations using switch-case.
  b) Read a number and display in reverse.
  c) Check for Armstrong number property

Ex 5:
  a) Check for strong number property
  b) Generate Fibonacci series.
  c) Generate Prime numbers between two numbers.

Ex 6: Implement the following using arrays
  a) Largest and smallest from a list of elements.
  b) Find the position of given element from a list.
  c) Arrange the elements in order.

Ex 7: Implement the following using arrays
     a) Matrix addition.
     b) Matrix Multiplication.
     c) Transpose of given matrix

Ex 8: Calculate ^nC_r value using functions.
     Write functions to perform
     a) String copy
     b) String concatenation
     c) String comparison

Ex 9:
     a) Factorial using recursion and non recursion.
     b) GCD using recursion and non recursion.

Ex 10:
     a) Find the sum and average of list of elements using DMA Functions
     b) Implementation of call by reference

Ex 11:
     a) Implementation of array of structure.
     b) Demonstration of Union.

Ex 12:
     a) Copy the contents of one file into another.
     b) Count the number of characters, words and lines in a file.

Text Books:

1. E. Balaguruswamy, "C Programming", Tata Mc Graw Hills
2. Yashwant Kantikar "Let Us C",

Reference Books:
1. Dr. N.B Venkateswarlu, "C and Data Structures: A snap shot Oriented Treatise Using Live Engineering Examples", S. Chand & Co, New Delhi.
2. B. W Kernighan, Dennis M. Ritchie, "The C – Programming Language", PHI

I YEAR - II Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16HS1002	English communication Practice	3	0	-	30	70	3.0
2	16BS1002	Engineering Mathematics – II	3	1	-	30	70	3.5
3	16HS1003	Environmental Studies	3	0	-	30	70	3.0
4	16BS1003	Engineering Physics	3	1	-	30	70	3.5
5	16ME1002	Engineering Mechanics	3	1	-	30	70	3.5
6	16EE1004	Basic Electrical &Electronics Engineering	3	1	-	30	70	3.5
7	16BS1101	Engineering Physics Lab	-		3	25	50	1.5
8	16ME1101	Engineering Workshop Lab	-	-	3	25	50	1.5
9	16EE1102	Electrical &Electronics Engg. Lab	-		3	25	50	1.5
		Total Credits	**18**	**4**	**9**	255	570	**24.5**

English communication Practice
(Common to all branches)

Subject Code: 16HS1002   **External Marks: 70**
Credits : 03   **Internal Marks: 30**

Course Objectives
- To assist students use grammar effectively in both speech and writing
- To improve communication skills of students by making them participate in different language activities
- To help students acquire the study skills of 'Note taking' and 'Note making'
- To assist students to use reading techniques learnt in English for other subjects
- To enable students to summarize, paraphrase and review a piece of writing

Course Outcome
- Students will be able to use grammar appropriately in speech and writing.
- Students will be able to describe, discuss, explain and interpret a given situation / context effectively.
- Students will be able to read texts and listen to lectures and make notes on them.
- Students will be able to apply reading techniques in their other subjects.
- Students will be able to summarize, paraphrase and review a piece of writing efficiently.

Unit–I: Grammar: Regular & Irregular Verbs—Tenses—Voice—Reported Speech—Auxiliaries and Modals—*If* Conditionals— Degrees of Comparison— Simple, Compound, Complex Sentences— Question Tag—Correction of Sentences

Unit –II: Situational Dialogues—Acceptance and Rejection of Invitation—Debate—JAM—Public Speaking

Unit–III: Study Skills: Note taking and Note making

Unit-IV: Intensive and Extensive reading—Skimming and Scanning

Unit–V: Summarising / Paraphrasing / Reviewing an article orally and in writing

Textbook

Rani, K. Nirupa et al. *Speak Well*. Orient Blackswan: Hyderabad, 2012.

Reference Books

1. Wood, Frederick T. *A Remedial English Grammar for Foreign Students*. Macmillan, 1966.
2. Heaton, John Brian et al. *Longman Dictionary of Common Errors*. Longman, 1977.
3. Taylor, Grant. *English Conversation Practice*. Tata McGraw-Hill: New Delhi, 2008.
4. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2005.

ENGINEERING MATHEMATICS – II
(Common to all branches)

Subject Code: 16BS1002   **External Marks: 70**
Credits: 3.5   **Internal Marks: 30**

COURSE OBJECTIVES

- To solve the algebraic and transcendental equations, using different numerical method. Estimate the best curve for a given data.
- To estimate the value of derivatives, evaluate the definite integrals using different numerical methods and calculate the numerical solution of an ordinary differential equation i.e IVP .
- To explain Laplace transform of continuous functions using Laplace transform formulae & properties, apply Laplace transform to solve an I.V.P &B.V.P
- Perform the Fourier series and half range series expansion of different functions in different intervals.
- Interpret the methods of solving a linear and non-linear 1st order partial differential equation and evaluate wave equations & heat equations using method of separation of variables.

COURSE OUTCOMES
On completion of this course, students should be able

- Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, 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 and evaluate an IVP.
- Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
- Deduce the Fourier series and half range series expansions of different functions for different intervals.
- Solve a linear and non-linear 1st order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation

Unit – I   Numerical solutions of Equations and Interpolation
Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.
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.

Unit-II
Numerical Differentiation, Integration and solution of Ordinary Differential equations
Numerical Differentiation and Integration: Numerical Differentiation using finite differences – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.
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-III   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. Solution of ordinary differential equations using Laplace transforms.

Unit-IV   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.

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- 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.

ENVIRONMENTAL STUDIES
(Common to all branches)

Subject Code: 16HS1003   **External Marks: 70**
Credits: 3.0   **Internal Marks: 30**

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 of Environment – Scope, Importance and multidisciplinary nature of the course - Need for Public Awareness
Natural Resources:
Forest Resources - Use and over exploitation - deforestation – consequences – solutions - case studies
Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment

Mineral Resources - Use and exploitation - Tribal and environmental effects of extracting and using mineral resources - case studies
Food Resources – Food security concept - 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 - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources - case studies
Land resources – Reasons for land degradation - Human induced landslides - soil erosion and desertification

UNIT – II
Ecosystems:
Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow - Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession, Types - characteristic features of the following ecosystems: Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (lakes and oceans)

Biodiversity and its conservation:
Definition of Biodiversity – genetic, species and ecosystem diversities - Values of biodiversity - Bio-geographical classification of India - India as a mega-diversity nation – Hotspots of biodiversity (India) - Endangered and endemic species of India – Threats to biodiversity - Conservation of biodiversity

UNIT – III
Environmental Pollution:
Definition – causes - effects - control measures of Air pollution - Water pollution - Marine pollution - Noise pollution - Nuclear hazards

Solid waste Management: Causes - effects - disposal methods of urban waste - biomedical wastes - case studies

Disaster management: floods – earthquakes - cyclones

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 - case studies. Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion - World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – EIA - definition – significance - scope – stages of EIA – Concept of Bioremediation – Concept of Carbon Sequestration – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act - Forest (Conservation) Act

UNIT – V
Human Population and the Environment:
Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

Field work:
Visit to local area to document environmental assets - River/ forest/ grassland/ hill/ mountain
Visit to local polluted sites Urban/ Rural/ industrial/ Agricultural
Study of common plants/ insects/ birds - Study of simple ecosystems ponds/ rivers/ hill slopes

Text Books:
1. Shashi Chawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, *Environmental Studies*, Revised edition, TMH, New Delhi

Reference:
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, New Delhi
4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill International edition
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications

ENGINEERING PHYSICS
(Common to all Branches)

Subject code : **16BS1003**   External Marks :70
Credits   : **3.5**   Internal Marks :30

COURSE DESCRIPTION:

This course encompass Fundamental Concepts of Physics that include Wave Optics
- Lasers & Fiber Optics
- Preliminary Quantum Mechanics
- Magnetic Materials
- Dielectric Materials

that are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

SCOPE

This course is offered for all First Year B.Tech. students either in SEM-I or SEM-II.
- Student is exposed to Wave Optics such as Interference and Diffraction that will enable him to appreciate Electromagnetic Wave Propagation in Communications and also in Stress Analysis.
- Lasers and Fiber Optics will help the students to understand the Fabrication of Engineering Materials apart from Optical Communication Technology
- Further, the students will be elucidated with significance of Quantum Theory that will give an Insight on Physical Properties and Theories of Solids
- In addition, the familiarity with Magnetic Materials and Dielectric Materials will through light on Engineering Applications.

COURSE OBJECTIVES

- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers and Fiber Optics
- To define the shortcoming of classical physics and describe the need for modifications to classical theory
- To possess an insight on Magnetic Properties pertaining to Material Fabrication
- To estimate the response of E-Field on Dielectric Materials to control the device performance

COURSE OUTCOME

Will be able to
- CO1   Apply the principles of optics in designing optical devices
- CO2   outline the Principles of Lasers and Fiber Optics
- CO3   resolve the discrepancies in classical estimates through quantum principles
- CO4   Interpret the knowledge of Magnetic Properties in Material Fabrication
- CO5   explain the response of E-Field on Dielectric Materials to control the device
         Performance

UNIT- I   : WAVE OPTICS
Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light, Applications of Interference-Testing of Flatness of Surfaces, Anti Reflecting Coatings
Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution

UNIT-II   : LASERS & FIBER OPTICS

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser [Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Appications of Optical Fibers in Communication

UNIT-III   : PRELIMINARY QUANTUM MECHANICS

Introduction, Waves and Particles, Wave Particle Duality and De-Broglie Hypothesis, Heisenberg's Uncertainity Principle – Applications (a) Non Existence of Electrons in Nucleus (b) Existence of Protons and Neutrons in Nucleus (c) Radiation of Light from an excited atom, Time independent Schrödinger wave equation, Physical Significance of Wave Function, Particle in One Dimensional Potential Box, Comparison of Maxwell Boltzmann, Bose Einstein and Fermi Dirac Statistics (Qualitative Treatment only)

UNIT-IV   : Magnetic Properties

Introduction, Basic Terms, Relation between B, H & I, Origin of Magnetic Moment – Bohr Magnetron, Classification of Magnetic Materials – Dia, Para and Ferro, Domain Theory of Ferromagnetism – Hysteresis, , Soft and Hard Magnetic Materials, Applications- Ferrites and Eddy Current Losses Transformer Cores, Concept of Magnetostriction

UNIT-V   : DIELECTRIC MATERIALS

Introduction, Basic Terms – Relation between D, E & P, Electronic Polarizability, Ionic Polarizability, Orienational Polarizability (both Qualitative and Quantitative), Total Polarizability, Frequency Dependence of Polarizability, Dielectric Loss and Dielectric Breakdown, Applications of Dielectrics – Solid Insulating Materials, Liquid Insulating Materials, Dielectric Heating, Concept of Ferro Electricity - Spontaneous Polarization in Barium Titanate Crystal, Concept of Piezoelectricity.

Texts Book
1.   A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers

References
1.   University Physics by Young and Freedman
2.   Fundamentals of Physics by Resnick, Halliday and Walker
3.   Concepts of Modern Physics by Arthur Beiser, McGraw-Hill Pubishers
4.   Solid State Physics by S. O. Pillai, New Age International Pubishers
5.   Engineering Physics, Volume-I&II, P.K.Palani Swamy, Scitech Publications Hyderabad
6.   Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
7.   Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

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

Subject Code: 16ME1002   **External Marks : 70**
Credits : 3.5   **Internal Marks : 30**

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

 Course Outcomes:
- Know the system of forces and calculate the resultant of different force system.
- Draw the free body diagram and understand the concept of moment and couple.
- Know the friction between two mating surfaces and calculate cetroid of plane areas.
- Determine area and mass moment of inertia for different sections.
- Determine the kinematic relations of particles & rigid bodies.

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 CENTRE 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.

REFERENCES 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. Engg. Mechanics / S.S. Bhavikati & J.G. Rajasekharappa

Basic Electrical &Electronics Engineering
(Common to CSE, IT, EEE, ECE & Civil branches)

Subject Code:16EE1004   **External Marks : 70**
Credits : 3.5   **Internal Marks : 30**

Course Objectives:

- To introduce electric circuits and its analysis
- To have knowledge on DC Machines.
- To understand the performance of transformers and induction motors.
- To understand the operation of alternators and measuring instruments.
- To educate about the different types of semiconductor devices.

Course outcomes:

1 On completion of this course, students should be able to
- 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
BASIC ELECTRICAL COMPONENTS
Basic definitions, Types of elements, Ohm's Law, symbols, R, Land C and their V-I relationships, Resistive networks, Inductive networks, Capacitive networks, Series & Parallel circuits, Kirchhoff"s Laws, Star-delta and delta-star transformations, simple problems.

UNIT-II

DC Machines:
Generator-Principle of Operation, construction, EMF equation, Classification; O.C.C, internal and external characteristics of shunt generator. Motor-principle of operation, Torque equation, Speed Control Methods, Testing of DC motors, Operation of 3 point starter.

UNIT-III
Transformers:
 Operation of a Single Phase Transformer, EMF equation, Equivalent Circuit, losses, Regulation and Efficiency of a single phase transformer, O.C and S.C Tests.

Three Phase induction Motor:
 Principle of Operation of 3-Φ induction motor, power and torque equations, Torque-Speed Characteristics of 3- Φ induction Motor.

UNIT-IV
Alternators
Principle of operation of alternator, emf equation, regulation by synchronous impedance method

Measuring Instruments:
Types of instruments, principle operation of permanent magnet Moving Coil and Moving Iron instruments advantages, disadvantages

UNIT-V
Semiconductor devices:
P-N junction diode- V-I characteristics, applications, rectifiers-half wave, full wave (simple problems) P-N-P,N-P-N transistor, common base, common emitter configuration.

TEXT BOOKS
1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

REFERENCE BOOKS
1. Electronic components Dr. K. Padmanabhan, Laxmi publications, New Delhi.
2. Basic Electrical Engineering - Dr.K.B.Madhu Sahu.
3. Electronic Devices and circuits S.Salivhanan, N.Suresh Kumar, A.Vallavaraj Tata McGraw-Hill
   Education Private Limited, New Delhi second edition

ENGINEEING PHYSICS LAB
(Common for all Branches)

Subject Code : 16BS1101   **External Marks:50**
Credits   : 1.5   **Internal marks:25**

COURSE DESCRIPTION

This Laboratory course is intended to apply the Scientific Method to expedite experiments that include Mechanics

- Wave Fundamentals
- Physical/Wave Optics
- Modern Physics
- Solid State Devices
- Electromagnetic Induction

So that student can verify theoretical ideas and concepts covered in lecture through host of Analytical Techniques, Statistical Analysis and Graphical Analysis

SCOPE

This course is offered for all First Year B.Tech students either in SEM-I or SEM-II.

- Student will get acquainted with Determination of Rigidity Modulus and Acceleration due to Gravity using Torsional Pendulum and Compound Pendulum respectively.
- The learner is expected to understand Wave Phenomena such as Laws of Stretched Strings apart from Electromagnetic Phenomena such as Variation of Magnetic Field along the Axis of Circular Coil.
- Student will be familiar with Optical Equipment such as Traveling Microscope and Spectrometer to understand the phenomena of Interference and Diffraction that will enable him to appreciate the Precision Measurements.
- The Modern Physics Experiments include introduction to Cutting Edge Technology such as Lasers and Fiber Optics in addition to the Solid State Devices such as Thermistor and Energy Band Gap of a typical Diode

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 with precision measurements to estimate error for targeted accuracy
- 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 OUTCOME
    Will be able to
- **CO1**   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
- **CO2**   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
- **CO3**   demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy
- **CO4**   illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- **CO5**   evaluate characteristics of magnetic, dielectric and semiconducting material devices

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

  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)

ENGINEEING WORKSHOP LAB
(Common for all Branches – at Sem-I / Sem -II)

Subject Code:16ME1101   **External Marks: 50**
Credits: 1.5   **Internal Marks: 25**

COURSE OBJECTIVES:
• The Engineering Workshop Practice for engineers is a training lab course spread over entire semester. 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.**

Electrical &Electronics Engg. Lab
(Common to Civil, Mech Branches)

Subject Code: 16EE1102 **External Marks: 50**
Credits   : 1.5 **Internal Marks: 25**

Course Objectives
- To verify the basic laws related to electrical engineering, 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.

The following experiments are required to be conducted as compulsory experiments:

1. To verify ohm"s law
2. To verify (a) Kirchoff"s current law
          (b) Kirchoff"s voltage law

3. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C.
Shunt machine working as motor and generator).
4. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at
given power factors)
5. Brake test on 3-phase Induction motor (Determination of performance characteristics)
6. Regulation of alternator by Synchronous impedance method.
7. Speed control of D.C. Shunt motor by
a) Armature Voltage control b) Field flux control method
8. Brake test on D.C Shunt Motor
9. Magnetization characteristics of D.C shunt generator
10. Transistor CE Characteristics (Input and Output)
11. Full wave Rectifier with and without filters.
12. CE Amplifiers.

Additional Experiments:
11. Class a Power Amplifier
12. RC Phase Shift Oscillator

II YEAR- I Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16CE2002	Strength of Materials-I	3	1	-	30	70	3.5
2	16CE2003	Fluid mechanics	3	1	-	30	70	3.5
3	16CE2004	Surveying	3	1	-	30	70	3.5
4	16CE2005	Environmental Engineering-I	3	-	-	30	70	3.0
5	16CE2006	Engineering Geology	2	-	-	30	70	2.0
6	********	**Open Elective – I**	2	-	-	30	70	2.0
7	16CE2101	Strength of Material Lab	-	-	3	25	50	1.5
8	16CE2102	Surveying Lab – I	-	-	3	25	50	1.5
9	16CE2103	Engineering Geology Lab	-	-	3	25	50	1.5
10	16HS2201	Professional Ethics & Morals	2	-	-			-
		Total	**18**	**3**	**9**	255	570	**22.0**

II B. Tech. (1st Sem): (Open Elective – I)

Code	Subject	Branch Offering
16OE2011	Matrices and applications	BS&H
16OE2013	Introduction to MATLAB	EEE
16OE2014	Fundamentals of Material Science	MECH
16OE2015	Introduction of Electronic measurements	ECE
16OE2016	UNIX Utilities	CSE
16OE2017	IT Systems Management	IT

Strength of Materials-I (AR-16)

Subject Code: 16CE2002   **External Marks: 70**
Credits: 3.5   **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 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

COURSE OUTCOMES:
Students will get ability
- to acquire the knowledge about simple stresses & strains and stress-strain diagram of mild steel..
- to solve the sheer force and bending moments of the Simply supported, cantilever and over hanging beams for the loads of point load , UDL and UVL.
- to acquire   the   knowledge the flexural stresses which include bending equation ,section modulus of rectangle, circular and I sections, composite sections.
- to solve the derivation of shear stress formula and shear stress distribution across various sections include rectangle, circular and I sections.
- to solve 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

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 moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy, proof resilience

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
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
Springs
Introduction- Types of springs-Deflection of close and open coiled helical springs under axial pull and axial couple- Springs in series and parallel-Carriage of leaf springs

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**.**

Fluid Mechanics (AR16)

Subject Code: 16CE2003   **External Marks: 70**
Credits: 3.5   **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 Meta center, Meta centric height.
- 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 acquire the knowledge the physical properties of fluids, Pascal's law, Hydrostatic law, measurement pressure and manometers
- to solve the Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces , Center of Pressure and Derivations Meta center, Meta centric height
- to acquire the knowledge fundamentals of kinematics , classification of flows, equation of continuity and flow net analysis.
- to solve the Euler's, Bernoulli's equations, Navier, Stokes equations and Reynolds's experiment
- to solve the laws of fluid friction, Darcy's equation, Major and Minor losses, pipes in series, pipes in parallel and pipe network problems.
- to solve 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 Buoyancy & Flotation, Meta Center, Meta centric hight.

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
4. Fluid Mechanics by A.K Jain.
5. Fluid Mechanics by D.S Kumar

Surveying

Subject Code: 16CE2004   **External Marks:70**
Credits: 3.5   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to read the surveying definition, primary divisions of survey, classification, principles of surveying, plans and maps, scales, measurement conventions and methods; use of chain and tape, electronic distance measurements, meridians, azimuths and bearings, declination, computation of angle.
- to read the definitions, methods of levelling, levelling instruments, temporary adjustments of a level, terms and abbreviations, differential levelling, profile levelling, height of instrument method, rise and fall method.
- to read the introduction, the essentials of transit theodolite, definitions and terms, temporary adjustments, measurement of horizontal angles, measurement of vertical angles, sources of errors in theodolite work, Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position-fundamentals of total station and GPS
- to read the introduction, chain traversing, chain and compass traversing, traversing by direct observation of angles, locating details with transit and tape, checks in closed traverse, plotting a traverse survey, consecutive coordinates: Latitude and departure, closing error, balancing the traverse, degree of accuracy in traversing
- to read the introduction, base of the object accessible, base of the object inaccessible: instrument stations in the same vertical plane as the elevated object, base of the object inaccessible: instrument stations not in the same vertical plane as the elevated object, determination of height of an elevated object above the ground when its base and top are visible but not accessible, determination of elevation of object from angles of elevation from three instrument stations in one line, types of curves, design and setting out – simple and compound curves.

COURSE OUTCOMES:
Students will get ability
- to recognized the surveying definition, primary divisions of survey, classification, principles of surveying, plans and maps, scales, measurement conventions and methods; use of chain and tape, electronic distance measurements, meridians, azimuths and bearings, declination, computation of angle.
- to to acquire the knowledge of definitions, methods of levelling, levelling instruments, temporary adjustments of a level, terms and abbreviations, differential levelling, profile levelling, height of instrument method, rise and fall method.
- to identify the introduction, the essentials of transit theodolite, definitions and terms, temporary adjustments, measurement of horizontal angles, measurement of vertical angles, sources of errors in theodolite work, Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position-fundamentals of total station and GPS
- to identify the introduction, chain traversing, chain and compass traversing, traversing by direct observation of angles, locating details with transit and tape, checks in closed traverse, plotting a traverse survey, consecutive coordinates: Latitude and departure, closing error, balancing the traverse, degree of accuracy in traversing
- to identify the introduction, base of the object accessible, base of the object inaccessible: instrument stations in the same vertical plane as the elevated object, base of the object inaccessible: instrument stations not in the same vertical plane as the elevated object, determination of height of an elevated object above the ground when its base and top are visible but not accessible, determination of elevation of object from angles of elevation from three instrument stations in one line, types of curves, design and setting out – simple and compound curves.

UNIT – I
Introduction
Surveying Definition, Primary divisions of survey, classification, principles of surveying, plans and maps, scales

Distances and direction: Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle.

Unit II
Levelling: Definitions, methods of levelling, levelling instruments, temporary adjustments of a level, terms and abbreviations, differential levelling, profile levelling, height of instrument method, rise and fall method.

UNIT – III
Theodolite: Introduction, The essentials of transit theodolite, definitions and terms, temporary adjustments, measurement of horizontal angles, measurement of vertical angles, sources of errors in theodolite work.

Tacheometric Surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position-fundamentals of total station and GPS

UNIT – IV
Traverse surveying: Introduction, chain traversing, chain and compass traversing, traversing by direct observation of angles, locating details with transit and tape, checks in closed traverse, plotting a traverse survey, consecutive coordinates: Latitude and departure, closing error, balancing the traverse, degree of accuracy in traversing

UNIT – V
Trigonometric levelling: Introduction, base of the object accessible, base of the object inaccessible: instrument stations in the same vertical plane as the elevated object, base of the object inaccessible: instrument stations not in the same vertical plane as the elevated object, determination of height of an elevated object above the ground when its base and top are visible but not accessible, determination of elevation of object from angles of elevation from three instrument stations in one line.
Curves: Types of curves, design and setting out – 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.
REFERENCES:
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.

Environmental Engineering-I (AR16)

Subject Code: 16CE2005   **External Marks: 70**
Credits: 3.0   **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
- To validate   water distribution of problems of cities/towns.
- To reproduce awareness among the public on the need of protected water supply.
- Put into action the stream water quality by maintaining effluent standards.
- To estimate et successful employment in organizations working for the protection of environment.
- To evolutes water/sewage treatment units for town & industries.

UNIT-1
INTRODUCTION: Waterborne diseases-protected water supply-population forecast, design period water demand-factors affecting-fluctionations-fire demand-storage capacity-water quality and testing-drinking water standards : IS 10500

UNIT-II
SOURCES OF WATER : Comparison from quality and quanity and other considerations-intakes-infiltration galleries.
DISTRIBUTION SYSTEMS : Requirements- methods and layouts- Design procedures- Hardy Cross and quiivalent pipe methods-Service reservioirs-Capicity by Mass Curve Method. Joints, valves such as sluice valves, air vailves. Scour valves and check valves, water meters.-Laying and testing of pipe lines – pump house.

UNIT-III
WATER TREATMENT SEDIMENTATION : Layout and general outline of water treatment units – sedimentation –principles – design factors coagulation-flocculation clarifier design- coagulants-feeding arrangements.

UNIT-IV
FILTRATION AND DISINFECTION : Filtration –theory-working of slow and rapid gravity filters-multimedia filters-Pressure filters design of filters-troubles in operation comparison of filters –disinfection theory of chlorination chlorine demand. Other disinfection practices Miscellaneous tratment methods.

UNIT-V
MUNICIPAL SOLID WASTES: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

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

Engineering Geology

Subject Code: 16CE2006   **External Marks: 70**
Credits: 2.0   **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 acquire the knowledge about 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 identify the different methods of study of minerals, physical properties of common rock forming minerals and economic minerals.
- to recognized 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 identify the common geological structures associating with the rocks such as folds, faults, unconformities and joints and their important types.
- to acquire the knowledge 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.
Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Physical properties of Minerals.

UNIT - II
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.

UNIT – III
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 – IV
Geology Of Dams, Reservoirs And Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

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.

MATRICES AND APPLICATIONS
Open Elective - I

Subject Code: 16OE2011   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To calculate the rank of a matrix and solve linear system of equations by different methods.
- Understand the concept of eigen values, eigen vectors of real and complex matrices, Cayley's Hamilton theorem and its applications.
- To solve Linear system of equations by Numerical Methods.
- To acquire the knowledge of reduction of quadratic to canonical form and study its nature.
- To acquire the knowledge of matrix computations using mat lab.

COURSE OUTCOMES:
On completion of this course, students should be able
- Calculate the rank of a matrix and solve linear system of equations by different methods.
- Calculate eigen values, eigen vectors of real and complex matrices, apply Cayley's Hamilton theorem to calculate the powers and inverse of matrices.
- Solve Linear system of equations by LU –Factorization, Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.
- Deduce quadratic to canonical form by different methods.
- Compute matrix operations using mat lab.

UNIT-I
Matrices and Linear System of Equations: Matrices-Rank of Matrix-By Definition-Echelon form, Normal form- PAQ form-Solution of homogeneous and non homogeneous Linear System of equations – condition of consistency - Direct methods- Gauss elimination, Gauss Jordan .

UNIT-II
Eigen Values and Eigen Vectors: Eigen values - Eigen vectors – Properties – Cayley -Hamilton Theorem (without proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem.
Complex matrix-conjugate matrix – Hermitian and skew Hermitian matrix- eigen values and eigen vectors- properties.

UNIT-III
Numerical Methods in Linear Algebra: Linear System : LU –Factorization , Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.

UNIT-IV
Quadratic forms: Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.

UNIT-V
Computation by using MATLAB: Solving a linear system, Gaussian elimination, Finding Eigenvalues and Eigenvectors.

TEXT BOOKS:
o Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi
o Engineering Mathematics Volume - II, 6th editions respt., 2012, T.K.V Iyengar, & others, S. Chand Co. New Delhi.
o Getting Started with Mat Lab, Rudra Pratap, Oxford University press, 2014 print.
o Advanced Engineering Mathematics, Erwin Kreyszig,8th Edition.

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.

INTURDUCTION TO MATLAB
Open Elective - I

Subject Code: 16OE2013   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVE:
- By the end of this half-semester minicourse, students in this class will understand the basic principles of programming and of implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations.

COURSE OUTCOMES: By the end of this course, the student will be able to
- Translate mathematical methods to MATLAB code
- Generalize results and represent data visually
- Student should be able to apply computer methods for solving a wide range of engineering problems.
- Students should be able to utilize computer skills to enhance learning and performance in other engineering and science courses.
- And finally, students should be able to demonstrate professionalism in interactions with industry.

UNIT-I
Introduction to MATLAB: Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

UNIT-II
Data and Data Flow in MATLAB: Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

UNIT-III
MATLAB Programming: Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

UNIT-IV
MATLAB Advanced: Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface). MATLAB- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

UNIT-V
SIMULINK: Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

TEXT BOOKS:
1. Getting Started With Matlab: A Quick Introduction For Scientists And Engineers (English) by Rudra Pratap, OXFORD University Press.
2. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

REFERENCE BOOKS:
1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang , Wenwu Cao, Tae-Sang Chung, John Morris.

FUNDAMENTALS OF MATERIAL SCIENCE
(Open Elective - I)

Subject Code: 16OE2014   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVE:
- To understand different engineering materials and their structures.

COURSE OUTCOME:
  At the end of the course the student will be able to:
- Gain thorough knowledge in engineering materials and their structures.

UNIT-I: Introduction
Introduction, classification of materials, crystal defects.

UNIT-II: Plastic deformation of single crystals
Plastic deformation of single crystals. Deformation by slip,. Deformation of single crystal. Deformation by twinning.

UNIT-III:
Hot working, cold working. Recovery, recrystallization and grain growth. Solidification mechanism.

UNIT-IV Mechanical properties
Mechanical properties. Tensile stress-strain diagrams, proof stress, yield stress diagrams, modules of elasticity. Hardness Testing: -Rockwell, Brinell and Vickers.

UNIT-V Impact toughness, Charpy V-Notch, fracture, ductile, brittle, Griffith criteria for brittle failure, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

TEXT BOOKS:
        1. An introduction to material Science – V Raghavan.
2. Mechanical Metallurgy – GE Dieter.
3. Material Science – Callister.

REFERENCE BOOKS:
        1. Material Science for Engineers – Vanvlack.
        2. Material Science for Engineers – Schakleford.

INTRODUCTION OF ELECTRONIC MEASUREMENTS
Open Elective - I

Subject Code: 16OE2015   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- Study of performance characteristics of different electronic measuring instruments.
- Subject introduces Signal Generator and Wave Analyzers for analysis of EM spectrum.
- Deals about Oscilloscopes and internal circuitry for measurement of electronic parameters.
- Brief discussion about all AC bridges, design methods and its applications.
- This subject includes transducers for the measurement of non electrical parameters and its signal conditioning techniques using electronic circuitry.

COURSE OUTCOMES:
- Identify electronic instruments, their Characteristics and use.
- Describe various signal generators, wave analyzers for distortion measurements.
- Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
- Design the AC bridges for measurement of resistance, inductance, capacitance for frequency changes.
- Explain various types of transducers and their applications for measuring non- electrical parameters.

UNIT-I
Performance characteristics of instruments: Static characteristics, accuracy, resolution, precision, expected value, error and sensitivity. Errors in measurement and dynamic characteristics: speed of response, fidelity, lag and dynamic error.
Voltmeters: Multirange, range extension.
Ammeters: Shunt and thermocouple type ammeter.
Ohmmeters: Series type and shunt type.

UNIT-II
Signal Generators - standard and AF sine and square wave signal generators, function Generators, Wave Analyzers, Harmonic distortion analyzers.

UNIT-III
Cathode Ray Oscilloscopes: CRT features, Block Diagram of CRO, Dual beam CRO, measurement of amplitude and frequency, Dual trace oscilloscope, Digital storage oscilloscope.

UNIT-IV
AC Bridges: Measurement of inductance: Maxwell's bridge, Anderson bridge.
Measurement of capacitance: Schearing bridge. Wheatstone bridge and Wien Bridge

UNIT-V
Transducers: Classification of Transducers**,** Linear Variable Differential Transformer, Thermocouples, thermistors, Data acquisition systems.

TEXT BOOKS:
1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

REFERENCE BOOKS:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

UNIX UTILITIES
Open Elective – I

Subject Code: 16OE2016   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVE:
- State the major components and describe the architecture of the UNIX operating system
- Organize and manipulate files and directories
- Use UNIX utilities to create simple tools for the information processing
- Use I/O redirection, pipes, quoting, and filename expansion mechanisms.
- Develop the user interface menu system using shell scripting constructs.

COURSE OUTCOMES:
On completion of this course the student should be able to:
- Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security.
- Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks.
- Monitor system performance and network activities.
- Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
- Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.
- Develop shell scripts to perform more complex tasks.

UNIT-I
UNIX Overview: What Is UNIX? History of UNIX, UNIX Philosophy, Why UNIX? , UNIX Components, System V vs. BSD, Comparing UNIX and Windows.
Getting Started: Logging on to the System, Your Home Directory, Using UNIX Commands, Special Characters, Terminal Control Keys, Changing Your Password, Getting Information, Logging off the System

UNIT-II
UNIX File systems: Hierarchical File Structure, File Types, File Names Pathnames, File and Directory Commands, Access Permissions, Standard UNIX File System
Editors: UNIX Editors, The Standard Display Editor - vi, vi Commands, Setting vi Options, pico: One Alternative to vi

UNIT-III
The Shell: What is the Shell? ,Processes ,Redirection ,Pipes ,Filters ,Features (csh) ,Variables (csh), Initialization Files ,Logout Files
Electronic Mail: Electronic Mail Overview, Standard UNIX Mail, Sending Mail, Send Mode Commands, Reading Mail, Command Mode Commands, Saving Mail and Using Folders, Customizing Mail, pine: One Alternative to UNIX Mail

UNIT-IV
Common UNIX Utilities: Alphabetical List, Functional List Shell Scripts: What is a Shell Script? , Expressions, Control Structures, Miscellaneous.

UNIT-V
Network Related Utilities: talk, finger, ping, traceroute, ftp, telnet, rlogin, rsh, rcp
X Windows Environment: What is X Windows? , Getting Started Using X Windows, Using the Window
Manager, Customizing Your X Clients, Some Common X Clients

TEXT BOOKS:
1. Sumitabha Das, 3rd Edition, UNIX the Ultimate Guide, TMH
2. Behrouz A. ForouZan, Richard F Gilberg, UNIX and Shell Programming, CENGAGE

REFERENCE BOOKS:
1. Dr. N B Venkateswarlu, Advanced Unix Programming, BS Publications

Reference Link: http://parallel.vub.ac.be/documentation/linux/unixdoc_download/UnixIntro.html#Utilities.

IT SYSTEMS MANAGEMENT
Open Elective – I

Subject Code: 16OE2017   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- Provides extensive theoretical knowledge of IT infrastructure
- Enhances the student's Computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for an increasingly international business environment.
- Builds upon the essential core network and storage management with greater emphasis .

COURSE OUTCOMES:
- be able to describe the business value and processes of ICT services in an organisation and apply that knowledge and skill with initiative to a workplace scenario
- be able to analyze and evaluate the impact of new and current ICT services to an organisation;
- be able to describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organisation;
- Characteristics of the network that affect user satisfaction.
- be able to define, track, and maintain data and data resources.

UNIT 1: IT Infrastructure: Overview
Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit 2: IT Infrastructure Management
Factors to consider in designing IT organizations and IT infrastructure, Determining customer's Requirements, Identifying System Components to manage, Data, applications, Tools and their integration, Patterns for IT systems management, Information Technology Infrastructure Library (ITIL).

UNIT 3 Current computing environment
Complexity of current computing, multiple technologies, multiple vendors, multiple users, e- Waste disposal.
IT system Management: Common tasks in IT system management, approaches for organization Managemnt, Models in IT system design, IT management systems context diagram, patterns for IT system Management

Unit 4 Data communications and Network Management Overview
Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions.

Unit 5 Storage Management
Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery.Space management, Hierarchical storage management, Network attached storage.

Textbooks:
1. IT Infrastructure & Its Management,By Phalguni Gupta, Tata McGraw-Hill Education.
   (Unit 1,2,3,5)
2. Network Management, Principles and Practice, Mani Subrahmanian, Pearson Education. (Unit 4)

REFERENCES :

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.
2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

Strength of Materials Lab

Subject Code: 16CE2101   **External Marks: 50**
Credits: 1.5   **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 acquire the knowledge about tension test, bending test on cantilever beam
- to acquire the knowledge about bending test on simple support beam,
- to acquire the knowledge about torsion test, hardness test, spring test
- to acquire the knowledge about compression test on wood/steel/brick, impact test, shear test, bending on UTM
- to verify Maxwell's Reciprocal theorem on beams
- to acquire the knowledge about 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

Surveying Lab-I

Subject Code: 16CE2102   **External Marks: 50**
Credits: 1.5   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
- to measure survey of an area by chain survey and plotting
- to do 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 area by prismatic compass.
- to practice radiation method, intersection methods, setting out simple curve
- to practice Fly leveling, check leveling, contouring

COURSE OUTCOMES:
Students will get ability
- to recognized how to measure survey of an area by chain survey and plotting
- to recognized how to do chaining across obstacles,
- to draw residential building by perpendicular offset, introduction of tie lines
- recognized how to do temporary adjustments of prismatic compass
- to acquire the knowledge about how to find distance between two inaccessible points with compass, a given are by prismatic compass.
- to acquire the knowledge about how to do radiation method, intersection methods, setting out simple curve
- to acquire the knowledge about 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. settingout of simple curve.
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**.**

Engineering Geology Lab

Subject Code: 16CE2103   **External Marks: 50**
Credits: 1.5   **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
  • to learn the method of Electrical Resistivity Meter Survey & Site visit observations & Dip Strike

COURSE OUTCOMES:
Students will get ability
  • to identify the physical properties and identification of minerals referred under theory.
  • to analyze megascopic description and identification of rocks referred under theory.
  • to interpret and draw the sections geological maps showing tilted beds, faults, unconformities etc.,
  • to analyze structural geological problems
  • to analyze the method of Electrical Resistivity Meter Survey & Site visit observations & Dip Strike

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.
5. Electrical Resistivity Meter Survey
6. Site visit (Strike & Dip observations)

LAB EXAMINATION PATTERN:
1. Description and identification of 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.
2. Description and identification of Six Rocks (including 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.
3. Interpretation of a Geological map along with a geological section, tilted beds, faults,
   unconformities etc..
4. Simple strike and Dip problems.

PROFESSIONAL ETHICS AND MORALS

Subject Code: 16HS2201
Credits: 0

. **COURSE OBJECTIVES:**
  - To help students regulate their behaviour in a professional environment as employees.
  - To make students aware of the impact of taking non-ethical engineering decisions.
  - To understand that mind and desire control is needed for being ethical.
  - To understand organizational culture and to adapt to varying cultures without compromising ethical values.

COURSE OUTCOMES:
 On completion of this course, students should be able
  - Realize the importance of human values.
  - Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress.
  - Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices.
  - Assess the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.
  - Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, Kingfisher Airlines financial misappropriation.

UNIT I
INTRODUCTION TO TERMINOLOGY IN ETHICS:
Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others – Work culture, Social responsibility, Responsibilities as a citizen, Cooperation and commitment – Religion vs. Spirituality, Philosophy, Customs and practices – Self-interest, Fear, Deception, Ignorance, Ego, Uncritical acceptance of authority.

UNIT II
MIND AND ITS MYSTERIES:
What is Mind? Mind and body, Mind and food – Mental faculties – Theory of perception, Memory, Imagination, Thought-Culture, Desires – Cultivation of Virtues, Control of Senses and Mind – Concentration, Meditation and Enlightenment.

UNIT III
RISK AND SAFETY IN ENGINEERING:
Estimating risk – What is acceptable risk? – Engineer's liability, Changing legal rights of the employees by non-participation, by protest – Environmental laws and judicial intervention in related matters.

UNIT IV
NON-ETHICAL PRACTICES IN VOGUE:
Conflict of Interest, Occupational crime – How multinational corporations influence government decisions, 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, Fukushima reactor meltdown, Challenger blowup, Ford Pinto design,
Highway safety, Kingfisher Airlines financial misappropriation.

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

II YEAR- II Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16BS2006	Complex Variables and Statistical Methods	3	1	-	30	70	3.5
2	16CE2007	Hydraulics and Hydraulic Machinery	3	0	-	30	70	3.0
3	16CE2008	Structural Analysis-I	3	1	-	30	70	3.5
4	16CE2009	Strength of Materials-II	3	1	-	30	70	3.5
5	16CE2010	Building Planning and Drawing	2	-	-	30	70	2.0
6	********	**Open Elective – II**	2	-	-	30	70	2.0
7	16HS2102	Advanced English Communication Skills Lab	-		3	25	50	1.5
8	16CE2104	Fluid Mechanics Lab	-	-	3	25	50	1.5
9	16CE2105	Surveying Lab –II	-	-	3	25	50	1.5
10	16CE2201	Self Study course-I*	-	2	-	75		1.0
		Total Credits	**16**	**5**	**09**	**340**	**570**	**23.0**

2 Periods which include library. E-learning, internet and Presentation.

II B. Tech. (2nd Sem): (Open Elective – II)

Code	Subject	Branch Offering
16OE2021	Transform Theory	BS&H
16OE2023	Renewable Energy sources	EEE
16OE2024	Principles of Mechanical Measurements	MECH
16OE2025	Principles of Communications	ECE
16OE2026	Introduction to Java	CSE
16OE2027	Introduction to Python	IT

COMPLEX VARIABLES AND STATISTICAL METHODS
(Common for CIVIL & MECH Branches)

Subject Code: 16BS2006   **External Marks: 70**
IInd Year II Semester Credits: 2.5   **Internal Marks: 30**

COURSE OBJECTIVES
- Test if a function is analytic, harmonic and then find a harmonic conjugate via the Cauchy-Riemann equations.
- Identify and classify zeros and singular points of functions, calculate the residues by Residue theorem. Evaluate integrals using the Cauchy Integral.
- Find Laurent series expansion of complex functions understanding region of convergence, the residues by Laurent Series.
- Understand the proof of Baye's theorem, understand the properties of Discrete and Continuous distributions and the characteristics of probability distribution under different conditions using Binomial, Poisson and Normal.
- Use tabular and graphical formats for displaying univariate (bivariate) data sets and calculate correlation, regression coefficients.

COURSE OUTCOMES

On completion of this course, students should be able

- Can identify an analytic function, harmonic function; find harmonic conjugate function via Cauchy-Riemann equations.
- Can identify and classify zeros and singular points of a function, calculate the residues by residue theorem and evaluate integrals using the Cauchy Integral formulae.
- Can find Laurent series expansion of complex functions for different region of convergence and calculate the residues by Laurent Series.
- Can apply Baye's theorem to solve industry related problems, recognize where the use of certain standard probability distributions would be appropriate.
- Can use appropriate tabular and graphical formats for displaying univariate (bivariate) data sets and carry out correlation, regression analysis.

UNIT-I
Complex Functions
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.

UNIT-II
Complex Integration and Residues
Cauchy's integral theorem-Cauchy's integral formula-Generalized Cauchy's integral formula(without proofs). Singular point-isolated singular point-pole of order m- essential singularity. Residue- Evaluation of residue by formula -Residue theorem (without proof).

UNIT-III
Laurent's Series
Power series-radius of convergence of power series- Laurent's Theorem - Laurent's Series-calculation of Residue by Laurent's series.

UNIT-IV
Probability and Distributions
Conditional Probability-Baye's theorem, Random variables – Discrete and continuous, Mathematical Expectations. Binomial, Poisson, Normal distributions and related properties.

UNIT-V
Correlation and Regression
Concept of correlation–types of correlation-scatter diagram-Karl-Pearson correlation coefficient method and its properties-Regression-Linear regression and its properties-non-linear regression-curve fitting-Straight line, 2nd degree parabola, power curve ($y=ax^b$), exponential curves($y= ab^x$, $y = ae^{bx}$)

Text Books:

1. Complex Analysis And Statistical Methods, 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.
2. Probability and Statistics , Athanasios-Papoulis-Pearson education.

Hydraulics and Hydraulic Machinery

Subject Code: 16CE2007   **External Marks:70**
Credits:3.5   **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:

Students will get ability

- to acquire the knowledge about 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 recall 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 identify 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 define 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 acquire the knowledge about 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's method, Buckingham's 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: 16CE2008   **External Marks: 70**
Credits: 4.0   **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 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 continuous beams which include Slope deflection Method, 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 concepts of strain energy methods for Structural analysis.

COURSE OUTCOMES:

Students will get ability
- to acquire the knowledge 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 recall 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 identify 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 identify 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 assess 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 analyzed about the continuous beams which include Slope deflection Method, 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 assess about the application of concepts

UNIT – I

Introduction to Static and Kinematic indeterminacy
Analysis 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
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 – III
Analysis Continuous Beams (Clapeyron's theorem of three moments)
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 – IV
Analysis of continuous beams: (Slope deflection method)
Slope deflection method- Derivation of slope deflection equations- Application to continuous beams with and without settlement of supports

UNIT – V
Strain energy due to axial load- Strain energy due to shear force- Strain energy due to bending, Castiglianos theorem-I, Castigliano's theorem –II

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

Strength of Materials-II

Subject Code: 16CE2009   **External Marks: 70**
Credits: 3.5   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to learn the deflection of simply supported and cantilever beams which are solved by double integration method, Macaulay's method and moment area method.
- 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 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 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.
- to study direct and bending stress, and determination of stress in chimneys. And various checks for stability of retaining walls and dams.

COURSE OUTCOMES:

Students will get ability
- to acquire the knowledge about the deflection of simply supported and cantilever beams which are solved by double integration method, Macaulay's method and moment area method.
- to identify 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 acquire   the   knowledge about 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 determine   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 acquire the knowledge about the 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.
- to identify direct and bending stress, and determination of stress in chimneys. And various checks for stability of retaining walls and dams.

UNIT I
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

UNIT II
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 III
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.

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 IV
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 – Prof. Perry's formula- Laterally loaded struts – subjected to uniformly distributed and concentrated loads- Maximum bending moment and stresses due to tranverse lateral loading

UNIT V
Direct and bending stresses

Stresses under combined action of direct loading and B.M, Core of a section- Determination of stresses incase of chimneys, Retaining walls and dams- Conditions for stability-stresses due direct loading and B.M about both axis

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.

Building Planning and Drawing

Subject Code: 16CE2010   **External Marks:70**
Credits:02   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
* to read about objectives of building byelaws, FAR, FSI, principles underlying building byelaws, classification of bye buildings, open space requirements, lighting and ventilation requirement
* to read about minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings
* to read about effect of Sun, factors, effecting the orientation, to find out the facing of a house, the earth's orbital motion round the sun-the sessions, drawing sun path, use of sun path diagram.
* to draw English & Flemish bond of odd & even courses for one, one and half and two, two and half brick walls, paneled door, paneled and glazed door, paneled & glazed windows
* to draw flat roof buildings, given line diagram with specifications to draw, plan, sections section and elevation

COURSE OUTCOMES:
Students will get ability
* to acquire the knowledge about objectives of building byelaws, FAR, FSI, principles underlying building byelaws, classification of bye buildings, open space requirements, lighting and ventilation requirement
* to acquire the knowledge about minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings
* to acquire the knowledge about effect of Sun, factors, effecting the orientation, to find out the facing of a house, the earth's orbital motion round the sun-the sessions, drawing sun path, use of sun path diagram.
* to acquire the knowledge about how to draw English & Flemish bond of odd & even courses for one, one and half and two, two and half brick walls, paneled door, paneled and glazed door, paneled & glazed windows
* to acquire the knowledge about how to draw to know how to draw flat roof buildings, given line diagram with specifications to draw, plan, sections section and elevation

PART A

UNIT – I
Building Byelaws and Regulations: Introduction – Objectives of building byelaws – Floor area ratio (FAR) – Floor space Index (FSI) – Principles underlying building byelaws – classification of bye buildings – Open space requirements – 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.

UNIT – III
Orientation, Sun and the Building: Effect of Sun, factors, effecting the orientation, to find out the facing of a house, the earth's orbital motion round the sun-the sessions, drawing sun path, use of sun path diagram . .

UNIT – IV

Bonds: English & Flemish bond of odd & even courses for one, one and half and two, two and half brick walls.

Doors, windows: Paneled Door, paneled and glazed door, paneled & glazed windows

UNIT – V

Flat roof buildings, given line diagram with specifications 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 is 60% and Part B is 40%

TEXT BOOKS:

1. Planning and Design of buildings by Y.S. Sane
2. Planning, designing and scheduling by Gurucharan Singh and Jagadish Singh
3. Building planning and drawing by M. Chakravarthi.

REFERENCES:

1.Building drawing by Shah and Kale

2. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

TRANSFORM THEORY
Open Elective - II

Subject Code: 16OE2021   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To deduce Z- transform of discrete functions using Z- transform.
- To deduce inverse Z- transform of discrete functions and understand their properties, and solve their related problems.
- To calculate the Fourier transforms for different functions, understand their properties, and solve their related problems.
- To acquire the knowledge of Inverse Fourier transforms and Finite Fourier Transforms, their properties.
- To Solve of difference equations, Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines).

COURSE OUTCOMES:
On completion of this course, students should be able
- Deduce Z- transform of discrete functions and solve their related problems.
- Find the inverse z-transforms of discrete functions using the properties and solve their related problems.
- Derive the Fourier transforms of different functions using different properties, and solve related problems.
- Deduce the Inverse Fourier transforms and Finite Fourier Transforms different functions using different properties.
- Apply Z-transform to solve difference equations and Fourier Transforms to solve Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines).

UNIT-I
Z- Transforms: Z-transform – Linear property – Damping rule – Shifting rule – Initial and final value theorems- Z transforms of functions multiplied by n and divided by n- unit step function.

UNIT-II
Inverse Z- Transforms: Inverse Z-Transforms- by Basic formulae, Partial fractions, Convolution theorem, Solution of Difference equations by Z-transforms

UNIT-III
Fourier Transforms: Fourier Integral Theorem (only statement)- Fourier sine and cosine integrals – complex form of Fourier Integral- Fourier transform – Fourier sine and cosine transforms – properties

UNIT-IV
Inverse Fourier transforms: Inverse Fourier transforms-Inverse Fourier sine and cosine transforms - properties – Finite Fourier Sine and cosine transforms. Convolution Theorem for Fourier transforms.

UNIT-V
Applications: Solution of difference equations by Z-transform. Solutions of Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines)

TEXT BOOKS:
1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics Volume - II, III, 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.

RENEWABLE ENERGY SOURCES
Open Elective - II

Subject Code: 16OE2023   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To Outline the concept regarding the physics of the sun
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To Outline the concept regarding different types of wind mills and different types of biogas digester
- To Outline the concept regarding geothermal energy conversion
- To Outline the concept regarding direct energy conversion

COURSE OUTCOMES: After completion of this course, the student will able to
- Define different kind of solar radiation
- Utilize different methods of collection of solar energy and storage of solar energy
- Classify different types of wind mills and biogas digesters
- Classify different types of geothermal energy sources and utilize different types of extracting techniques
- Distinguish different kinds of direct energy conversion techniques

UNIT-I
Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

UNIT-II
Solar Energy Collection, Storage and Applications: Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat . Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

UNIT-III
Wind and Biomass Energy: Sources and potentials, horizontal and vertical axis windmills. Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield, I.C. Engine operation and economic aspects.

UNIT-IV
Geothermal and Ocean Energy: Resources, types of wells, methods of harnessing the energy. OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques,

UNIT-V
Direct Energy Conversion: Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems. Fuel cells, principles, faraday's law's.

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

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PRINCIPLES OF MECHANICAL MEASUREMENTS
(Open Elective - II)

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Subject Code: 16OE2024   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

Course Objectives:
- To provide knowledge on static, dynamic behavior of measuring instruments and get the concepts of physical quantity measurement like pressure.
- To provide knowledge on measuring techniques for physical Quantity like pressure and flow.
- To provide knowledge on measuring techniques for temperature.
- To provide knowledge on measuring techniques for displacement.
- To provide knowledge on measuring techniques for mechanical quantities.

Course Outcomes:

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

- Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error.
- Measure pressure and flow using appropriate instruments
- Measure temperature using different transducers.
- Measure Displacement and Acceleration using appropriate devices.
- Measure force, torque speed and power using suitable instruments

UNIT- I
INTRODUCTION TO MEASUREMENTS: Basic functional descriptions of measuring instrument with examples, static and dynamic characteristics of measuring instrument.

UNIT- II
PRESSURE: classification of mechanical pressure gauges, working principles.
FLOW: Rota meter, magnetic flow meter, hot-wire anemometer, ultrasonic flow meter.

UNIT- III
TEMPERATURE: classification of temperature measuring methods according to their range of operation, working principles low temperature measurement and high temperature measurement techniques.

UNIT- IV
DISPLACEMENT: principle and operation of resistive, inductive, capacitive displacement transducers.

UNIT- V
FORCE, TORQUE, POWER, SPEED: Elastic force meter, load cells, Torsion meter, dynamo meter, stroboscope

TEXT BOOKS:
1. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI / PE

REFERENCE BOOKS:
1. Measurement systems: Application and design, Doblin Earnest. O. Adaptation by Manik and Dhanesh/ TMH
2. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.

PRINCIPLES OF COMMUNICATIONS
Open Elective - II

Subject Code: 16OE2025   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- Describe various types of signals and their properties
- Explain the fundamental concepts of modulation and demodulation of analog modulation schemes.
- Understand various pulse modulation schemes and multiplexing techniques.
- Compare the different types of Digital communication systems
- Explain the basic concepts of information theory

COURSE OUTCOMES:
- Analyze various types of signals and their properties
- Summarize the fundamental concepts like modulation, demodulation of analog modulation schemes.
- Discriminate the various pulse modulation schemes and multiplexing techniques.
- Summarize the different types of Digital communication systems
- Explain the basic concepts of information theory

UNIT-I
Introduction: Block diagram of communication systems, Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, correlation, convolution.

UNIT-II
Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation and Demodulation of AM.
Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT-III
Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM
Multiplexing: Time Divison Multiplexing, Frequency Divison Multiplexing.

UNIT-IV
Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.
Digital Modulation: ASK, FSK, PSK, DPSK, M -ary PSK.

UNIT-V:
Information Theory: Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding.

TEXTBOOKS:
1. Principle of Communications, Taub & Schilling, TMH, 2003.
2. Communication Systems Analog and Digital – R.P. Singh, SD Sapre, TMH, 20th reprint, 2004.

REFERENCE BOOKS:
1. Communication Systems Engineering–John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson.
2. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition, 2004.

INTRODUCTION TO JAVA
Open Elective - II

Subject Code: 16OE2026   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- Be able to explain the difference between object oriented programming and   procedural programming
- Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Cover issues related to the definition, creation and usage of classes, objects and methods.
- Discuss the principles of inheritance and polymorphism and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces.

COURSE OUTCOMES:
Upon completion of this course, students should be able to:
- Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- Identify classes, objects, members of a class and the relationships among them needed for a specific problem
- To demonstrate the ability to understand and use Exception handling and file handling mechanism
- Arrange the concrete and abstract classes in an appropriate hierarchy.
- Develop efficient Java applets and applications using OOP concept

UNIT-I:
Introduction: OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, scope and life time of variables, arrays, operators, control statements, type conversion and casting.

UNIT-II:
Classes and Objects: Concepts of classes and objects, class fundamentals Declaring objects, introducing methods, constructors, usage of static with data and methods, this key word, garbage collection, overloading methods and constructors, parameter passing – call by value, recursion..

UNIT-III:
Inheritance: Basic concepts, member access rules, usage of super key word, types of inheritance, method overriding, abstract classes, dynamic method dispatch, final keyword.
Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, defining an interface, implementing interface, applying interfaces.

UNIT-IV
Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions.

UNIT-V
Multithreading: Concepts of Multithreading, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities.

TEXT BOOKS:
1. Herbert Schildt, the Complete Reference Java J2SE 5th Edition TMH Publishing Company Ltd, New Delhi.
2. Dr. N.B. Venkateswarlu, Dr. E.V. Prasad, Learn Object Oriented Programming Using Java: An UML Treatment using Live Examples from Science and Engineering, S. Chand, New Delhi.

REFERENCE BOOKS:
1. H.M. Dietel and P.J. Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI
2. Cay. S. Horstmann and Gary Cornell, Core Java 2, Vol 2, Advanced Features, Seventh Edition, Pearson Education.
3. Iver Horton, Beginning in Java 2, Wrox Publications.
4. Somasundaram, Java, Jaico.

INTRODUCTION TO PYTHON
Open Elective - II

Subject Code: 16OE2027   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:.
- Help students (who may /may not intend for CS&IT) to feel justifiably confident of their ability to write small programs.
- To provide the basic features of python programming language.
- To make students so that they can compete for jobs by providing competence & confidence in computational problem solving.
- Prepare students from other streams to make profitable use of computational methods in their chosen field.
- Prepare students who have prior programming experience or knowledge of computer science for an easier entry into computer science major.

COURSE OUTCOMES

On successful completion of the course Students will be able to:

- Be fluent in the use of procedural statements — assignments, conditional statements, loops, method calls — and arrays.
- Identify or characterize or define a problem.
- design, code, and test small Python programs that meet requirements expressed in English. This includes a basic understanding of top-down design.
- Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.

UNIT I:
Client /Server environment , Introduction to Python, History, features, python environment setup, Basic syntax, using command interpreter, Variable and Data Types, Basic data types in Python, script structure.

UNIT II:
Conditional statements , Boolean expressions , Looping Control Structures , Control Statements: Break, Continue, Pass.

UNIT III:
Python sequences: strings, Lists, Tuples, dictionaries, sets., string manipulation, functions, modules & import.

UNIT IV:
Errors and Exceptions, Handling exceptions, Files, File input/output, Text processing, file functions.

UNIT V:
Object Oriented programming: Class, object, Object Oriented Programming concepts.

Text Books:
1. Wesley J. Chun "Core Python Programming", Second Edition, Prentice Hall
2. Allen Downey, "Think Python", Second Edition , Green Tea Press

Reference Books:
1. Introduction to Computation and Programming Using Python, Spring 2013 Edition, By [John V. Guttag](#).
2. Programming in Python 3: A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2nd Edition.

Advanced English Communication Skills Laboratory
(Common to all Branches)

Subject Code: 16HS2102	**External Marks: 50**
Credits : 1.5	**Internal Marks: 25**

Course Objectives

- To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
- To prepare students for making presentations
- To enable students to participate in group discussions
- To prepare students for facing interviews confidently

Course Outcome

- Students will be able to state meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
- Students will be able to present and interpret data on select topics using pre-existing slides.
- Students will be able to contribute proactively and extrapolate in group discussions.
- Students will be able to prepare Résumé / CV and face interview.
- Students will be able to develop communication skills by playing different roles.

Unit I: Vocabulary Extension for facing competitive examinations

Unit II: Paper, PowerPoint and Video Presentations

Unit III: Group Discussion

Unit IV: Job Application and Résumé / CV Writing—Interview Preparation

Unit V: Speaking: Role-play

Textbook
Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.

Reference Books
1. Rani, K. Nirupa et al. *Speak Well*. Orient Blackswan: Hyderabad, 2012.
2. Prasad, M. Hari et al. *Strengthen Your Steps*. Maruthi: Hyderabad, 2010.
3. Prasad, M. Hari et al. *Strengthen Your Communication Skills*. Maruthi: Hyd, 2014.
4. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2005.

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FLUID MECHANICS LABORATORY

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Subject Code: 16CE2104   **External Marks: 50**
Credits: 1.5   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have

- to study how to calculate the time emptying of a tank through a small orifice.
- to study how to calculate the time emptying of a tank through a Cylindrical mouthpiece.
- to study how to calculate the time emptying of a tank through a Convergent mouthpiece.
- to study how to calibrate Borda's mouthpiece by constant head method
- to study how to calibrate of venturimeter & orifice meter.
- to study how to calibrate of contracted Rectangular Notch and /or Triangular Notch
- to study how to calibrate of Flow nozzle meter.
- to study how to calibrate V-notch and Trapezoidal notch

COURSE OUTCOMES:
Students will get ability
- to acquire the knowledge how to calculate the time emptying of a tank through a small orifice.
- to acquire the knowledge about how to calculate the time emptying of a tank through a Cylindrical mouthpiece.
- to identify how to calculate the time emptying of a tank through a Convergent mouthpiece.
- to acquire the knowledge how to calibrate Borda's mouthpiece by constant head method
- to acquire the knowledge how to calibrate of venturimeter & orifice meter.
- to acquire the knowledge how to calibrate of contracted Rectangular Notch and /or Triangular Notch
- to acquire the knowledge how to calibrate of Flow nozzle meter.
- to acquire the knowledge how to calibrate V-notch and Trapezoidal notch
  List of exercises:
1. Calibration of Small orifice, by constant head method and Time of emptying a tank   through a small orifice.
2. Calibration of Cylindrical mouthpiece by constant head method. and Time of emptying a tank through a Cylindrical mouthpiece.
3. Calibration of Convergent mouthpiece by constant head method.
4. Calibration of Borda's mouthpiece by constant head method.
5. Calibration of Venturi meter.
6. Calibration of Orifice meter.
7. Calibration of Flow nozzle meter.
8. Calibration of V-notch and Trapezoidal notch

Surveying Lab -II

Subject Code: 16CE2105   **External Marks: 50**
Credits: 1.5   **Internal Marks: 25**

. 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 determine horizontal angles by repetition and reiteration methods
- to determine distance between two inaccessible points by making use of theodolite
- to solve trigonometric Leveling, heights and distance problem
- to solve the measurements of heights and distances using principles of tachometric surveying
- to draw 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 discuss 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. Measurement of Latitutude and Longitude of any location using GPS.
12. Creation of way points and route and Tracing of the route using GPS

LIST OF EQUIPMENT:
1. Chain, Tape, Compass, Theodolite
2. Tacheometer.
3. Total Station
4. GPS

Self Study Course-I

Subject Code: 16CE2201   **External Marks: 0**
Credits: 1.0   **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

III YEAR- I Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16CE3011	Geotechnical Engineering –I	3	1	-	30	70	3.5
2	16CE3012	Structural Analysis-II	3	1	-	30	70	3.5
3	16CE3013	Design of Concrete Structures	3	1	-	30	70	3.5
4	16CE3014	Transportation Engineering-I	3	-	-	30	70	3.0
5	16CE3015	Concrete Technology	2	-	-	30	70	2.0
6	********	**Open Elective - III**	2	-	-	30	70	2.0
7	16CE3106	Drawing of Concrete Structures Lab	-	-	3	25	50	1.5
8	16CE3107	Transportation Engineering Lab	-	-	3	25	50	1.5
9	16CE3108	Concrete Technology Lab	-	-	3	25	50	1.5
10	16CE3202	Self Study course-II*	-	2	-	75		1.0
Total Credits			**16**	**5**	**9**	**340**	**570**	**23.0**

2 Periods which include library. E-learning, internet and presentation.

III B. Tech. (I Sem): (Open Elective – III)

Code	Subject	Branch Offering
16OE3031	Fundamentals of Fuzzy Logic	BS&H
16OE3033	Energy Audit Conservation and Management	EEE
16OE3034	Elements of workshop technology	MECH
16OE3035	Introduction to Signal Processing	ECE
16OE3036	Social Networks	CSE
16OE3037	Fundamentals of Computer Graphics	IT

Geotechnical Engineering –I

Subject Code: 16CE3011   **External Marks:70**
Credits: 3.5   **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, 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.seepage through soils which include 1-D,2-D, flownets, characteristics, Uses, quick sand condition and seepage through soils.
- 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 consolidation which include stress history of clay; e-p and e-log p curves, magnitude and rate of consolidation ,Terzaghi's theory and Theory determination of coefficient of consolidation from laboratory tests
- 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
- to understand introduction which include soil formation, soil structure and clay mineralogy, adsorbed water, mass, volume relationship, relative density, 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.seepage through soils which include 1-D,2-D, flownets, characteristics, Uses, quick sand condition and seepage through soils.
- 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, 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 consolidation ,Terzaghi's theory and Theory determination of coefficient of consolidation from laboratory tests
- 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: 1-D & 2-D, Flownets: Characteristics and Uses, Quick sand condition and Seepage through soils.

UNIT III
Stress distribution in soils: Total, neutral and effective stresses, 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 - laboratory compaction tests (Heavy and Light) – 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 determination of coefficient of consolidation from laboratory tests.

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
4. Principles of Geo technical Engineering by B.N.Das

References:
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. Fundamentals of soil mechanics by D.W.Taylor
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New
   Delhi.

Structural Analysis – II

Subject Code: 16CE3012   **External Marks:70**
Credits: 3.5   **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.
- To study about slope deflection method which include Derivation of slope deflection equations, application to continuous beams,beam with and without settlement of supports
- 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, single bay portal frame including side sway and also single bay portal frame including side sway by slope defection method.
- To study about analysis of continuous beams which include settlement of supports and single bay portal frames with side sway by Kani's method.
- To study about analysis of continuous beams by stiffness method, settlement of supports (Maximum two unknowns)

COURSE OUTCOMES:
Students will get ability
- todotwo 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.
- to do about slope deflection method which include Derivation of slope deflection equations, application to continuous beams,beam with and without settlement of supports.
- 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 and also single bay portal frame including side sway by slope defection method..
- to do analysis of continuous beams which include settlement of supports and single bay portal frames with side sway by Kani's method.
- to do analysis of continuous beams by stiffness method, settlement of supports (Maximum two unknowns)

UNIT I
Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear for (uniform support) parabolic arches with point load and UDL where support hinges at the same level .

Two hinged arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear for parabolic arches with point load and uniformly distributed load.

UNIT – II
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 , influence line the 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 – III
Moment Distribution method – Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – story portal frames – including Sway.
Slope deflection method: single bay portal frame including side sway.

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

UNIT – V
Analysis of continuous beams – Analysis of continues beams by stiffness methods-settlement of supports. (Maximum of two unknowns)

TEXT BOOKS:
1. Analysis of Structures – Vol. I & 2 by Bhavakatti, 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
5. Statistical indeterminate structures by C.K.Wang

REFERENCES :
1. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata Mc.Graw Hill publishers.
2. Theory of structures by Ramamutham
3. Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi
4. Structural analysis by T.S Thandava Moorthy.
5. Structural analysis by R.C.Hibbler
6. Basic structural analysis by Muttu & Janarthan

Design of Concrete Structures

Subject Code: 16CE3013   **External Marks: 70**
Credits: 3.5   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- 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. 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 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
- to study about slabs which include classification of slabs, design of one - way slabs, two way slabs, and continuous slabs using IS coefficients (conventional).
- 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.

COURSE OUTCOMES:
Students will get ability
- 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. 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 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.
- 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 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.

UNIT-I
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. Based on IS Code :456-2000. Assumptions in limit state design – stress – block parameters – limiting moment of Resistance, limit state analysis and design of singly reinforced, comparison of Limit stage method with working stress and ultimate load method.

UNIT-II
Design for Flexure, Shear, Torsion and Bond: Design of 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 – III
Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

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– I S Code provisions.

UNIT-V
Footings: types of footings. Distribution of base pressure. General Design considerations   for footings. Design of Isolated rectangular, square footing.

NOTE: All the designs to be taught in Limit State Method (IS456-2000 and SP 16)

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

References:
1. Reinforced Concrete Structures by Park and Pauley, John Wiley and Sons.
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 – I.C. Syal & A.K.Goel, S.Chand Publishers
5. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, New Delhi.
6. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.

Transportation Engineering-I

Subject Code: 16CE3014   **External Marks:70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:

Students will have
- 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 highway materials, tests on aggregates and bitumen, requirement of design mix, marshall's method of bituminous mix design
- 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 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.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:

Students will get ability

- 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 highway materials, tests on aggregates and bitumen, requirement of design mix, marshall's method of bituminous mix design
- 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 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. 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
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.

UNIT – IV
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 – 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

Concrete Technology

Subject Code: 16CE3015   **External Marks: 70**
Credits: 02   **Internal Marks: 30**

COURSE OBJECTIVES:
Students will have
- to study about cements, admixtures and aggregate which include portland cement, chemical composition, hydration, setting of cement, structure of hydrate cement, test on physical properties, different grades of cements , admixtures, mineral and chemical admixtures and different types of aggregate and its properties.
- to study about fresh concrete which includeworkability, 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,different types of hardned concrete tests and its elasticity and plasticity and other properties.
- to studyabout the mix designfactors 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.
- To study the special concrete like Light weight concrete-Lightweight aggregate concrete etc.

COURSE OUTCOMES:

Students will get ability
- to understand about cements, admixtures and aggregate which include portland cement, chemical composition, hydration, setting of cement, structure of hydrate cement, test on physical properties, different grades of cements , admixtures, mineral and chemical admixtures and different types of aggregate and its properties.
- to learn about fresh concrete which includeworkability, 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 understand hardened concrete ,different types of hardned concrete tests and its elasticity and plasticity and other properties.
- to learn about the mix designfactors 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.
- to understand the special concrete like Light weight concrete-Lightweight aggregate concrete etc.

UNIT - I
Cements & admixtures: Portland cement- chemical composition- Hydration of cement- Structure of hydrate cement- Test on physical properties- Different grades of cement.

Admixtures: Types of admixtures- mineral and chemical admixtures- properties.

Aggregates: Classification of aggregates-particle shape, size 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.

UNIT - II
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.

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

UNIT - IV

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

UNIT - V

Special Concretes: Light weight concrete-Lightweight aggregate concrete- Cellular concrete- No-fines concrete- Fibre reinforced concrete- Polymer concrete- Types of Polymer concrete- Self compacting concrete.

Text Books:
1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
Reference Books:
1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Micro structure of concrete by P.K.Mehata

Fundamentals of Fuzzy Logic
(Open Elective – III)

Subject Code: 16OE3031   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES
The student will be able to
- Understand the concepts of fuzzy sets, membership functions and their operations.
- Frame linguistic variables and analyze the fuzzy quantifiers.
- Frame simple fuzzy sets.
- Fuzzify any desired area of classical Mathematics using Fuzzy controllers.
- Apply the concepts of Defuzzification.

COURSE OUTCOMES
Student is able to
- Perform different fuzzy operations on fuzzy sets or membership functions.
- Construct linguistic variables and estimate the fuzzy quantifiers as per the requirement.
- Construct a simple Fuzzy set.
- Develop simple Fuzzy expert system to Fuzzify any desired area with suitable controllers using different inference rules.
- Apply defuzzification process to convert a Fuzzy set to a crisp value.

UNIT-I
Fuzzy set Theory
Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions-Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations- union, intersection, complement. Properties of Fuzzy Sets, Fuzzy relations – Cartesian product, operations on fuzzy relations.

UNIT-II
Fuzzy Logic
Classical Logic – an overview, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference.

UNIT-III
Construction of Fuzzy sets
Methods of construction –an overview, Direct methods with one expert, Direct methods with multiple experts, constructions from Sample data –examples.

UNIT-IV
Fuzzy Expert System - Fuzzification
Fuzzy Controllers, Fuzzy Expert System- Fuzzification- Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules.

UNIT-V
Fuzzy Expert System- Defuzzification
Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method-examples.

Text books:
1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.Vijayalakshmi Pai, PHI.

References
1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3rd edition, John wiley & sons Ltd.

ENERGY AUDIT CONSERVATION AND MANAGEMENT
(Open Elective – III)

Subject Code: 16OE3033   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

Course Objective:
> To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, lighting and energy instruments. Finally economic aspects are analyzed.

Course Outcomes:
Students will be able to:
CO1: Apply principles of energy auditing and propose energy conservation schemes.
CO2: Demonstrate principle and organizing energy management program.
CO3: Demonstrate the operating principle of energy efficient motors.
CO4: Analyze power factor improvement methods, illumination methods and demonstrate the operation of various energy instruments.
CO5: Analyze and compute the economic aspects of energy consumption.

UNIT-I: BASIC PRINCIPLES OF ENERGY AUDIT
Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

UNIT-II: ENERGY MANAGEMENT
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT-III: ENERGY EFFICIENT MOTORS
Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT-IV: POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS
Power factor – methods of improvement, location of capacitors. Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-V: ECONOMIC ASPECTS AND ANALYSIS
Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis.

Text Books:
1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
    3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing Company Ltd, New Delhi.

Reference Books:
1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Civil Engineering)

ELEMENTS OF WORKSHOP TECHNOLOGY
(Open Elective - III)

Subject Code: 16OE3034   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To provide knowledge about the different manufacturing processes
- To impart knowledge on carpentry tools, operations and joints
- To understand the fitting tools, operations and joints
- To provide knowledge on forging tools, operations and joints
- To impart knowledge on sheet metal work tools, operations and joints

COURSE OUTCOMES:
On completion of this course, students should be able to
- Comprehend different manufacturing processes.
- Explain the carpentry tools and applications of carpentry joints.
- Explain the fitting tools and operations.
- Explain the forging tools and operations.
- Explain the sheet metal tools and operations and applications.

UNIT – I
Methods of manufacturing processes, casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop process, carpentry fitting, hand forging, sheet metal work, cold and hot working of metals.

UNIT – II
CARPENTRY:
Marking & measuring tools, Cutting Tools: Saws, Chisels, Planes, Boring Tools, Striking tools, Holding devices, Carpentry joints: Half lap joint, Mortise and tenon joint, bridle joint, dovetail joint.

UNIT –III
FITTING:
Marking & measuring tools, Holding Devices, Cutting tools: Hacksaw, Files, Chisels, Drill bits, Reamer, Taps, Dies & sockets, striking tools, Holding devices and Fitting Operations: chipping, filing, sawing, marking, drilling, reaming, tapping, dieing.

UNIT – IV
FORGING:
 Hand forging - Hand tools**:** Anvil, swage block, Tongs, hammers, Chisels, Swages, Fullers, flatters, set hammer, punches and drift, Forging operations: Upsetting, drawing down, setting down, punching and drifting, bending, welding, cutting, swaging, fullering and flattering.

UNIT – V
SHEET METAL WORK:

Metals used for sheet metal work, Sheet metal hand tools: snips, stakes, hand hammers, mallets and Sheet Metal Operations: Shearing, bending, drawing, squeezing, Sheet metal joints-Hem joint, seam joint.

TEXT BOOKS:
1. Elements of Workshop Technology S. K. Hajra Choudhury, A. K. Hajra Choudhury.
2. Workshop Technology B. S. Raghuwanshi Dhanpat Rai & Co.,

References:
1. Workshop Technology by Virender Narula Pub: S.K.Kataria & Sons

INTERDICTION TO SIGNAL PROCESSING
(Open Elective – III)

Subject Code: 16OE3035   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To study the different types of discrete time signals and systems and their properties.
- To test the different systems based on their properties and calculate the frequency response
- To define the Discrete Fourier transform properties.
- To calculate the Fourier transform for the different discrete time signals and also calculate the Fourier Transform of a given sequence based on FFT algorithms
- To design a FIR and IIR filters using different techniques

COURSE OUTCOMES:
At the end of the course the student will be able to:
- Discriminate the discrete systems based on their basic properties
- Determine the frequency response of different signals in Fourier domain.
- Translate the discrete time systems into hardware realization.
- Design IIR filters using different techniques
- Design FIR filters using different techniques

Unit I
Signals and Systems Introduction: Basic elements of DSP , concepts of frequency in Analog and Digital signals- Sampling theorem, Impulse sampling, Natural and Flat top Sampling. Discrete time signals and sequences, – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation, Frequency domain representation of discrete time signals and systems.

Unit II
Discrete Fourier Transform: Computation of DFT, Properties of DFT, linear convolution of sequences using DFT. Relation between Fourier transform and Z-transform

Unit III
Realization of digital filters- Fundamental of FIR and IIR filters Direct, Canonic, Cascade and Parallel forms.

Fast Fourier Transform: Radix-2 decimation in time and decimation in frequency algorithms, inverse FFT.

Unit IV
Introduction to Butterworth and Chebyshev filters, Design of infinite impulse response filters (IIR) from analog filters-Bilinear transformation. Practical design method of IIR Low Pass Filter.

Unit V
Design of FIR filters: Design of FIR LPF filters using window techniques- Hamming, Hanning. Comparison of IIR and FIR filters.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications – John G. Proakis, Dimitris G.Manolakis, Pearson Education/PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI.

Reference Books:

1. Digital Signal Processing – Andreas Antoniou, Tata McGraw Hill , 2006.
2. Digital Signal Processing – MH Hayes, Schaum's Outlines, Tata Mc-Graw Hill, 2007.

SOCIAL NETWORKS
(Open Elective – III)

Subject Code: 16OE3036   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:

The student should be made to

- Introduce students to an academic understanding of social networks.
- Learn visualization of social networks.
- Define social networks and related terms.
- Understand the role of ontology in social networks.
- To be able to build web applications with social network features.
- Understand human behaviour in social web and related communities,
- Understand the link between qualitative and quantitative methods of social network analysis.

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

1. Predict human behavior in social web and related communities.
2. Visualize social networks.
3. Able to discover the capabilities and limitations of Semantics for social networks
4. Understand how these Social technologies impact society and vice versa.
5. Develop skills, recognize, understand, and more effectively manage new social practices online.

Unit-I: Introduction To Social Networks And Semantic Web
Introduction to Social Networks – Emergence of the Social Web, Limitations of the Current Web, Development of the Semantic Web, the Semantic Solution.

Unit-II Social Network Analysis
Social Network analysis: What is Network analysis, Development of Social Network analysis, Key Concepts and Measures in Network analysis.

Unit-III: Web Intelligence
Web data and Semantics in Social Network applications – Electronic Sources for Network analysis: Electronic Discussion Networks, Blogs and Online Communities, Web based Networks.

Unit-IV: Knowledge Representation:
Knowledge Representation on the semantic web: Ontologies and their role in the Semantic web, Ontology languages for the semantic web.

Unit- V: Social Networks Analysis In The Sciences
History of Social Networks – Context, Methodology- Data acquisition, Representation, Storage and Reasoning, Visualization and analysis.

Text Books:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1 st Edition, Springer, 2010.
3. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.

Reference Books:

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.

Reference Link:

1. Burt, R. S. (1984). Network items and the General Social Survey. Social Networks 6, 293-340.

FUNDAMENTALS OF COMPUTER GRAPHICS
(Open Elective – III)

Subject Code: 16OE3037   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To enlighten the working principles of display devices, and concepts of resolution.
- To understand the fundamental data-structures and algorithms used for output primitives.
- To design graphics programmes using mathematical and theoretical foundations.
- To hypothesize 3D models of objects.
- To organize steps and plan for generation of animations.

COURSE OUTCOMES:
- Understand the working principles of display devices, and concepts of pixel, resolution.
- Apply mathematics and logic to develop algorithms for various output primitives like lines, circles, polygons.
- Learn to manipulate 2D pictures by designing various transformations.
- Generate 3D computer graphics using interpolation and approximation functions. And derive Projection Transformations.
- Detect visible surfaces using various routines, thus hiding back faces in 3D graphics, and generate Computer Animation.

UNIT-I

Introduction**:** Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, input devices, Pixels and frame buffers.

UNIT-II

Output Primitives**:** Points and lines, line drawing algorithms, mid-point circle algorithm,

Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

UNIT -III

2-D Geometrical Transformations**:** Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.

UNIT- IV

2-D Viewing**:** The viewing pipe-line, window, view-port, viewing transformation, Cohen-Sutherland, Sutherland-Hodgeman polygon clipping algorithm.
3D Graphics**:** 3D basic Transformations, Projections, Curve generation**,** Hermite curve, Bezier curve and B-spline curve, B-spline surfaces.

UNIT- V

Visible surface detection algorithms: Back-face, Z-buffer, Scan-line algorithm, Painter's algorithm, Animation.

TEXT BOOKS:
1. " Computer Graphics C version" Donald Hearn and M. Pauline Baker, Pearson/PHI

REFERENCES:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Computer Graphics, Steven Harrington, TMH.
3. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

DRAWING OF CONCRETE STRUCTURES LAB

Subject Code: 16CE3106   **External Marks:50**
Credits: 1.5   **Internal Marks: 25**

COURSE OBJECTIVES:
. Students will have
- to practice Reinforcement detailing of One way Slab.
- to practice Reinforcement detailing of two way Slab.
- to practice Reinforcement detailing of flat Slab.
- to practice Reinforcement detailing of square and circular columns with stirrups.
- to practice Reinforcement detailing of helical circular column.
- to practice Reinforcement detailing of a beam.
- to practice Reinforcement detailing of a stepped and sloped footing.
- to practice Reinforcement detailing of a combined footing.
- to practice Reinforcement detailing of a raft foundation.
- to practice Reinforcement detailing of a staircase.

COURSE OUTCOMES:
Students will get ability
- to do Reinforcement detailing of One way Slab.
- to do Reinforcement detailing of two way Slab.
- to do Reinforcement detailing of flat Slab.
- to do Reinforcement detailing of square and circular columns with stirrups.
- to do Reinforcement detailing of helical circular column.
- to doReinforcement detailing of a beam.
- to do Reinforcement detailing of a stepped and sloped footing.
- to do Reinforcement detailing of a combined footing.
- to do Reinforcement detailing of a raft foundation.
- to doReinforcement detailing of a staircase.

LIST OF DRAWINGS
Reinforcement detailing of following for different types of loading
1) Reinforcement detailing of One way Slab.
2) Reinforcement detailing of two way Slab.
3) Reinforcement detailing of flat Slab.
4) Reinforcement detailing of square and circular columns.
5) Reinforcement detailing of helical circular column.
6) Reinforcement detailing of a beam.
7) Reinforcement detailing of a stepped and sloped footing.
8) Reinforcement detailing of a combined footing.
9) Reinforcement detailing of a raft foundation.
10) Reinforcement detailing of a staircase.
References:
1. SP-34 of BIS

Transportation Engineering Lab

Subject Code: 16CE3107   **External Marks: 50**
Credits: 1.5   **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
- to practice ductility test.
- to practice softening point test
- to practice flash and fire point tests
- to practice 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 ,
- to do viscosity test.,
- to do ductility test
- to do softening point test
- to do flash and fire point tests
- to do 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
References:
1. S.K.Khanna & C.E.G.Justo Highway Engineering Lab manual

Concrete Technology Lab

Subject Code: 16CE3108   **External Marks: 50**
Credits: 1.5   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
- To do tests on cement which includedetermination of fineness of cement, specific gravity of cement, normal consistency of cement,soundness of cement,compressive strength of cement
- To do tests on aggregate which include determination of fineness modulus of fine and course aggregate, bulk density of fine and course aggregate, Specific Gravity of Fine and coarse aggregate, bulking of sand
- To do tests on fresh concrete which include determination of workability of concrete by slump cone test, compaction factor test and vee-bee consistometer test.
- To do tests on hardened concrete which include, determination of compressive Strength of concrete cube and concrete cylinder, determination of split tensile strength of concrete cylinder.
- To know how to demonstrate the non-destructive testing of concrete (rebound hammer),

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

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 of Fine Aggregate
   (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.   Determination of Bulking of Sand.

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 .
   (c) Determination of Workability of Concrete by Vee-bee Consistometer test.

TESTS ON HARDENED CONCRETE

9. (a) Determination of Compressive Strength of Concrete cube.
   (b) Determination of Compressive Strength of Concrete cylinder.
10. Determination of Split tensile strength of Concrete cylinder.

DEMONSTRATION

11. Non-destructive testing of Concrete (Rebound hammer).

Self Study Course-II

Subject Code: 16CE3202   **External Marks: 0**
Credits: 01   **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

III YEAR- II Semester

S. No.	Subject code	Theory / Labs	L	T	P	Marks		Credits
						Int	Ext	
1	16CE3016	Design and Drawing of Steel Structures	4	1		30	70	4.5
2	16CE3017	Water Resources Engineering	3	1	-	30	70	3.5
3	16CE3018	Environmental Engineering –II	3	0	-	30	70	3.0
4	16CE3019	Pre-Stressed Concrete	2	-	-	30	70	2.0
5	********	**Elective I**	3	-	-	30	70	3.0
6	********	**Open Elective – IV**	2	-	-	30	70	2.0
7	16CE3109	Hydraulic Machinery Lab	-	-	3	25	50	1.5
8	16CE3110	Computer Aided Engineering Drawing Practice Lab	-	-	3	25	50	1.5
9	16CE3111	Software tools for Structural Engineering Lab	-	-	4	25	50	2.0
10	16HS3202	Intellectual Property Rights and Patents	2	-	-			-
		Total Credits	**19**	**2**	**10**	**255**	**570**	**23.0**

Subject Code	Elective I
16CE3020	Advanced Design of Concrete Structures
16CE3021	Industrial Waste and Waste Water management
16CE3022	Advanced Structural Analysis
16CE3023	Ground Improvement Techniques
16CE3024	Advanced Water shed Management

III B. Tech. (II Sem): (Open Elective – IV)

Code	Subject	Branch Offering
16OE3041	Management Information Systems (MIS)	MBA
16OE3043	Special Machines	EEE
16OE3044	Introduction to Automobile Engineering	MECH
16OE3045	Basics of VLSI	ECE
16OE3046	Simulation and Modeling	CSE
16OE3047	Soft Computing	IT

Design and drawing of Steel Structures

Subject Code: 16CE3016   **External Marks: 70**
Credits: 4.5   **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, 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, basics of bolted 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.

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, 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.

UNIT – I
Basics of bolted connections
Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds. 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. 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.

NOTE- All Designs Should be in LIMIT STATE Method

Text Books:
1. Design of Steel structures by Limit state method as per IS-800:2007, S.S.Bhavakatii
2. Steel Structures and Design and practices by N.Subramanya
3. Design of Steel Structures by Ramachandra. Vol – 1, Universities Press. KAKINADA
4. Structural Design and Drawing by N.Krishna Raju; University Press, KAKINADA.
5. 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.

WATER RESOURCE ENGINEERING

Subject Code: 16CE3017   **External Marks: 70**
Credits: 3.5   **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,. unit hydrograph, ,s-hydrograph, design discharge, flood frequency analysis, basic concepts of flood routing etc,.
- to study about ground water Occurrence, aquifer parameters, types of wells, necessity and Importance of Irrigation, indian agricultural soils, preparation of land for Irrigation etc,.
- to study about Types of reservoir- Investigations for reservoir planning, Selection of site for a reservoir, Purpose of reservoir, Reservoir regulation, Reservoir Losses , Measures to reduce evaporation loss in reservoirs sedimentation, control of reservoir sedimentation
- to study about irrigation, Types of irrigation systems ,Direct and Indirect, Methods of irrigation , Soil moisture Constants, Depth of water held by soil in different zones, Water extraction Water requirements of crops, Duty, Delta and Base period , consumptive use of water.
- to study about irrigation canals ,Canal alignment, Design of unlined canals, Regime theories, Kennedy's and Lacey's theories canal outlets, Requirements of a good outlet, Types of outlets, Water logging,Causes and control ,land drainage, canal lining ,methods, canal navigation

COURSE OUTCOMES:
Students will get ability
- to understand about introduction to engineering hydrology and its applications, hydrologic cycle, , types and forms of precipitation -evaporation, infiltration, runoff-components etc,.to learn about unit hydrograph, ,s-hydrograph, design discharge,
- t**o** understan**d** about ground water Occurrence, aquifer parameters, types of wells, necessity and Importance of Irrigation, preparation of land for Irrigation etc,.
- to study about for reservoir planning, Selection of site for a reservoir, Purpose of reservoir, Reservoir regulation, Mass curve and yield from a reservoir of given capacity, Reservoir Losses ,reservoir sedimentation
- to study about Types of irrigation systems ,Direct and Indirect, Methods of irrigation ,Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants, Water extraction Water requirements of crops, Duty, Delta and Base period , consumptive use of water.
- to understand about classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

UNIT – I
Hydrology
Hydrologic cycle, Precipitation – Types, Measurement of rainfall, Evaporation and Evapo – Transpiration. Consumptive use, Runoff – Factors affecting runoff, methods of determination of runoff, hydrograph analysis, base flow separation, unit hydrographs – Hydrograph of different durations, applications of unit hydrograph, S-hydrograph.

UNIT - II
Ground Water Flow
Definitions, sub surface distribution of water, ground water movement, Darcy's law – permeability, intrinsic permeability ,well hydraulics – Steady flow into different types of aquifers and wells – Determination of hydraulic properties of aquifer, Well losses, specific capacity of well, and well efficiency, pumping tests- Recuperation test method for determination of well yield.

UNIT - III
Reservoir Planning And Sedimentation
Types of reservoir- Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir, Purpose of reservoir, Reservoir yield, Mass curve and Demand curve.
Reservoir Losses – Measures to reduce evaporation loss in reservoirs sedimentation, control of reservoir sedimentation.

UNIT - IV
Irrigation
Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants.
Water requirements of crops, Duty, Delta and Base period - Their relationship, Crops – Seasons, consumptive use of water.

UNIT – V
Canal Systems
Classification of irrigation canals – Canal alignment, Regime theories – Kennedy's and Lacey's theories, Balancing depth.
Canal outlets, Requirements of a good outlet – Types of outlets, Water logging-Causes and control – land drainage, canal lining – methods, canal navigation

Textbooks :
1. Water resources engineering – S.K. Garg.
2. Water resources engineering – B.C. Punmia.
3. Water Resource Engineering by Arora

References:
1. Hand book of applied hydrology – Ven te Chow
2. Design of small dams by U.S.B.R.
3. Water resources engineering, Hydrology Subramanya
4. Water resources engineering, Jayaram Reddy

Environmental Engineering-II

Subject Code: 16CE3018   **External Marks: 70**
Credits: 03   **Internal Marks: 30**

COURSE OBJECTIVES:
- To aim for employment in Municipalities and panchayats
- To apply the professional, ethics, attitude, team work skills, multi disciplinary approach in the field of environmental engineering
- To contribute the needs of society in the field of environmental protection.
- To identity different pollutants which are causing air pollution
- To identity the different effects of noise pollution and measurement of noise pollution

COURSE OUTCOMES:
- Able to get successful employment in organizations working for the protection of environment.
- Able to design the different components of waste water treatment plant
- Able to designs water/sewage treatment units for town & industries.
- Able to solve air pollution problems of industries
- Able to control the effects of noise pollution

UNIT – I
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.

UNIT II
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 – Activated sludge processes (ASP)

UNIT-III
Ultimate disposal of sewage – sewage farming – dilution - Sludge digestion – factors effecting – design of Digestion tank – septic tank's working principles and design – soak pits.

UNIT-IV
Air pollution - types of air pollutants – their sources and impacts – air pollution meteorology – air pollution control – air quality standards and limits

UNIT – V
Noise pollution – impacts of noise – permissible limits of noise pollution – measurement of noise and control of noise pollution

TEXT BOOKS:

1. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers
3. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company

References:

1. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
2. Waste water engineering by Metcalf and Eddy.
3. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International
4. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications

Pre-stressed Concrete

Subject Code: 13CE3019   **External Marks:70**
Credits: 02   **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,.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 .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, 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, 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.
- 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.

References :
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.
3. **Pre-Stressed Concrete by** Muttu & Janarthan

Codes: BIS code on prestressed concrete IS 1343 - 1980
Note: Code book is permitted to the examination

HYDRAULIC MACHINERY LAB

Subject Code: 16CE3109   **External Marks: 50**
Credits: 1.5   **Internal Marks: 25**

COURSE OBJECTIVES:
Students will have
  • to study how to calculate the coefficient of loss of head in a sudden contraction.
  • to study how to calculate the friction factor.
  • to study how to verify Bernoulli's equation.
  • to study about the impact of jet on vanes.
  • to study how to calculate hydraulic jump.
  • to study the performance test on Pelton wheel turbine.
  • to study the performance test on Francis turbine.
  • to study the efficiency test on centrifugal pump.
  • to study the efficiency test on reciprocating pump.

COURSE OUTCOMES:
Students will get ability
  • to acquire the knowledge how to calculate the coefficient of loss of head in a sudden contraction
  • to acquire the knowledge about how to calculate the friction factor.
  • to acquire the knowledge about how to verify Bernouli's equation.
  • to acquire the knowledge about the impact of jet on vanes
  • to acquire the knowledge how to calculate the hydraulic jump.
  • to acquire the knowledge how to conduct the performance test on Pelton wheel turbine.
  • to acquire the knowledge how to conduct the performance test on Francis turbine.
  • to acquire the knowledge how to conduct the efficiency test on centrifugal pump.
  • to acquire the knowledge how to conduct the efficiency test on reciprocating pump.

LIST OF EXERCISES:
  1. Determination of Coefficient of loss of head in a sudden contraction
  2. Determination of friction factor.
  3. Verification of Bernoulli's equation.
  4. Impact of jet on vanes.
  5. Study of Hydraulic jump.
  6. Performance test on Pelton wheel turbine
  7. Performance test on Francis turbine.
  8. Efficiency test on centrifugal pump.
  9. Efficiency test on reciprocating pump.

Computer Aided Engineering Drawing Practice Lab

Subject Code: 16CE3110   **External Marks: 50**
Credits: 1.5   **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.

SOFTWARE TOOLS FOR STRUCTURAL ENGINEERING LAB

Subject Code: 16CE3111   **External Marks: 50**
Credits: 02   **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

INTELLECTUAL PROPERTY RIGHTS AND PATENT

Subject Code : 16HS3202   **Internal marks: 00**
Credits   : 0   **External Marks: 00**

Course objective:
- To study the basics of intellectual property law.
- To acquire knowledge on copy right law and other formalities related to it.
- To explore knowledge on patent law and cyber law.
- To become familiar about trade mark law.
- To provide knowledge on different aspects of trade secrets.

Course outcomes:
CO1: Able to **study** basics of intellectual Property Law.
CO2: Able to **describe** copy right law and other formalities.
CO3: Able to **analyze** patent and cyber law.
CO4: Able to **explain** trade mark law.
CO5: Able to **summarize** different aspects of trade secrets.

UNIT I
Basics of Intellectual Property Law: Introduction to Intellectual Property Law; Evolutionary past; Intellectual Property Law Basics; Types of Intellectual Property; Innovations and Inventions of Trade related Intellectual Property Rights; Agencies Responsible for Intellectual Property Registration; Infringements; Over use or Misuse of Intellectual Property Rights; and Compliance and Liability Issues.

UNIT II
Copyright Law and Infringements: Introduction to Copyrights; Principles of Copyright; Subject Matters of Copyright; Rights Afforded by Copyright Law; Copyright Ownership; Transfer and Duration; Right to Prepare Derivative Works; Rights of Distribution; Rights of performers; Copyright Formalities and Registration; Limitations; Infringement of Copyright; International Copyright Law; and Semiconductor Chip Protection Act.

UNIT III
Fundamentals of Patent and Cyber Law: Introduction to Patent Law; Rights and Limitations; Rights under Patent Law; Patent Requirements; Ownership and Transfer; Patent Application Process and Granting of Patent; Patent Infringement and Litigation; International Patent Law; Double Patenting; Patent Searching; Patent Cooperation Treaty; and New developments in Patent Law.
Introduction to Cyber Law; Information Technology Act; and Cyber Crime and E-commerce.

UNIT IV
Trade Mark Law: Introduction to Trade Mark; Trade Mark Registration Process; Post registration procedures; Trade Mark maintenance; Transfer of rights; Inter parties Proceedings; Infringement; Dilution of Ownership of Trade Mark; Likelihood of confusion; Trade Mark claims; Trade Marks Litigation; and International Trade Mark Law.

UNIT V
Principles of Trade Secrets: Introduction to Trade Secrets; Maintaining Trade Secret; Physical Security; Employee Access Limitation; Confidentiality Agreement; Trade Secret Law; Unfair Competition; Trade Secret Litigation; Breach of Contract; and Application of State Law.

TEXT BOOKS:
1. Deborah E. Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications

Reference:
1. Prabhuddha Ganguli: 'Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi
2. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: "Intellectual PropertyRights", Excel Books. New Delhi.
4. P Narayanan, Intellectual Property Law, Eastern Law House; Third Edition (2013)

Advanced Design of Concrete Structures
(Elective 1)

Subject Code: 16CE3020   **External Marks: 70**
Credits: 02   **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

- to study about slabs which include circular slabs, simply supported and fixed end conditions with uniformly distributed loads, flat slabs
- 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.

- 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)

- 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.
- 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 on ground, Circular, square and rectangular types.

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

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
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. Reinforced concrete design by S.U,Pillai and D.Menon, Tata Mc.Ghrawhill Publishing company

Codes: Relevant IS: codes.

Industrial Waste and Waste Water Management
(Elective 1)

Subject Code: 16CE3021   **External Marks:70**
Credits:02   **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. Basic theories of industrial waste water management, volume reduction, strength reduction, neutralization, equalization and proportioning.
- 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. Joint treatment of industrial wastes and domestic sewage, consequent problems.
- To study about manufacturing process and design origin of liquid waste from textiles, paper and pulp industries, tanneries, dairy plants etc,.
- To study about manufacturing process and design origin of liquid waste from sugar mills, steel plants, oil refineries, pharmaceutical plants 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 and also to learn about basic theories of industrial waste water management , volume reduction ,strength reduction , neutralization , equalization and proportioning.
- To understand the problems due to industrial waste water discharges into streams, 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, tanneries, dairy plants etc,.
- To learn about manufacturing process and design origin of liquid waste from sugar mills, steel plants, oil refineries, pharmaceutical plants etc,.
- To understand about common effluent treatment plants(CETP) , advantages and suitability, limitations, effluent disposal methods

UNIT I
Principles of Industrial waste treatment - physical chemical, organic and biological properties of industrial wastes: Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning.

UNIT II
Industrial waste water discharges into streams, lakes and consequent problems - Recirculation of Industrial Wastes –Joint treatment of industrial wastes & domestic sewage and consequent problems.

UNIT III
Manufacturing Process, sources of pollution, special characteristics and treatment methods of liquid wastes from cotton textile mills, paper mills, breweries, tanneries and Dairy plants

UNIT IV
Manufacturing Process, sources of pollution, Special Characteristics and treatment methods of liquid wastes from fertilizer plants, Sugar mills, steel plants, oil refineries and pharmaceutical (Antibiotic) plants

UNIT V
Common Effluent Treatment Plants (CETP) – Advantages – Limitations; Effluent Disposal Methods; Design of treatment plant for the effluent of corn starch industry.

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

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

Advanced Structural Analysis
(Elective 1)

Subject Code: 16CE3022   **External Marks:70**
Credits:02   **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 framesStrain 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 tocontinuous beams and plane trusses.
Stiffness method: Introduction to the structural analysis by stiffness concept using Matrix approach and application tocontinuous 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 BhaviKattiVikas Publications.
3. Matrix structural analysis by T.N.Gayl; Tata Mc.Graw Hill company

Ground Improvement Techniques
(Elective –I)

Subject Code: 16CE3023   **External Marks: 70**
Credits: 02   **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.
- They know about the functions and applications of Geotextiles, geogrids and geo membranes.
- They solve problems on expansive soils and foundation techniques.

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 .

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
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 –IV
Geosynthetics : Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and applications.
Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

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

ADVANCED WATERSHED MANAGEMENT
(Elective –I)

Subject Code: 16CE3024   **External Marks: 70**
Credits: 02   **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.

MANAGEMENT INFORMATION SYSTEMS (MIS)
(Open Elective – IV)

Subject Code: 16OE3041   External Marks: 70
Credits: 2.0   Internal Marks: 30

COURSE OBJECTIVES:

- To gain knowledge on formulation and implementation best practices on technology management policies by managers.
- To identify the crucial indicators related to process management and channels of technology flow for the development of the organization.
- To identify and implement the innovation factor in every process for enhancing cutting-edge performance by the organizations.
- To understand the usage of information systems in the functional areas of business.
- To develop the skill in the key areas of system planning, analysis and design.

COURSE OUTCOMES:

- Students will able to adapt an experiential learning perspective in the stream of information technology.
- Students will be able to act autonomously in planning, implementing and reflecting at a professional level, on the development and use of technology to address organizational problems.
- Students will be able to augment analytical and reflective skills in decision making.
- Students will be able to acquire knowledge of the functional areas of business and the interrelationships among the functional areas within a business.
- Enable students to develop their skill in the key areas of system planning, analysis and design.

UNIT 1: Management Information Systems

MIS -Management Information systems-Concept- Nature, Importance and Scope of MIS-Structure of MIS-MIS Classification- Types of Information- Dimensions of Information-Systems-Kinds of Systems

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.3-13

UNIT 2: Basics of Computer system

A computer System-Computer Hardware Classification-Computer Software- Database Management System- Types of Database Structures or Data Models- Advances in Database Technology.

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.91-122

UNIT 3: Telecommunications and Networks

Telecommunications-Types of Signals-communication Channel-Characteristics of Communication Channels-Communications Hardware-Communication Networks

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.150-171

UNIT 4: Decision Support Systems

Decision-Making and Decision-Support Systems-Decision-Making: A Concept-Simon's Model of Decision-Making-Types of Decisions-Methods for Choosing among Alternatives-Characteristics and Capabilities of DSS-Disaster Management-System Development Approaches-System Development Stages-System Development Approaches-Systems Analysis and Design Systems Analysis-Introduction-requirement Determination- Strategies for Requirement Determination- Structured Analysis Tools -Design Methods-Detailed System Design

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp. 202-217

UNIT 5: Implementation, Maintenance, Evaluation and Security of IS

System Maintenance-Evaluation of MIS-IS Security-Information System Planning- The Nolan Stage Model-The four-Stage Model of IS Planning

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp. 320-345

TEXT BOOKS:

1. Management Information systems, Managerial Perspectives, 4/e (2016), D.P. Goyal, Macmillan Publishers India Ltd.

REFERENCES:

1. Management Information systems, 10/e (2010), James A. O'Brien, George M. Marakas, McGraw-Hill Education.
2. Management Information systems, 12/e (2011), Kenneth C. Laudon, Jane P. Laundon, Prentice Hall.

WEB-REFERENCES:

1. *Information Technology for Management* (Global Text Project edition, c2009), by Henry C. Lucas (PDF at Global Text Project)
2. *Information Systems Foundations: Constructing and Criticising* (2005), ed. by Dennis N. Hart and Shirley Diane Gregor (multiple formats with commentary at ANU E Press)
3. *Information Systems: A Manager's Guide to Harnessing Technology* (derived from Creative Commons licensed edition published by Flat World Knowledge, ca. 2010), by John Gallaugher (PDF at saylor.org)

SPECIAL MACHINES
(Open Elective – IV)

Subject Code: 16OE3043   **External Marks:70**
Credits: 2.0   **Internal Marks: 30**

Course objectives:

To develop knowledge on Principles & operation, construction, performance, maintenance, testing and performance of special motors such as BLDC motors, stepper motors and electrical motor drives.

Course Outcomes:

Students will be able to:
CO1 Analyze the structure of Electrical drive system of SRM motor.
CO2 Understand open loop and closed loop control of Stepper motors and also compare the open loop and closed loop systems
CO3 Evaluate torque, speed and position controller of BLDC motor drives.
CO4 Explain the basic properties of magnetic materials as applied to electric machines and applications of LIM.
CO5 Describe the operation of motor drives to meet mechanical load requirements

Unit I:Switched Reluctance Motor

Principle of operation, Power converter for switched reluctance motor, Control of switched reluctance motor.

Unit II: Stepper Motors

Stepper Motors Construction – Principle of operation – Theory of torque production – Hybrid stepping motor – Variable reluctance stepping motor – Open loop and closed loop control.

Unit III: Brushless DC motor

Permanent Magnet Brushless DC Motor Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor.

Unit IV: Linear induction motors

 Construction– principle of operation– application of Linear induction drive for traction
Permanent Magnet Motors

Construction – Principle of working – Torque equation and equivalent circuits, electrically commutated DC motor.

 Unit V: Electric Motors for traction

AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:
 1. Special electrical Machines, K.VenkataRatnam, University press, 2009, New Delhi.
 2. Special electrical machines, E.G.Janardhanan, PHI learning private limited.
Reference Books:
1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.

Introduction to Automobile Engineering
(Open Elective - IV)

Subject Code: 16OE3044   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
- To provide broad knowledge about the engine, transmission, braking system, steering, suspension and electrical subsystems of an automobile.

COURSE OUTCOMES:
On completion of this course, students should be able to
- Explain construction and operation of components of engine and its lubrication system.
- Explain the operation of the components involved in both carburetor based.
- Explain the working of components involved in the cooling system.
- Explain mechanism of starting and charging electrical systems, and electrical accessories. Discuss construction and operation of transmission system components including clutch, gearbox.
- Explain construction and operation of steering, suspension and braking system components.

UNIT-I
INTRODUCTION:
Components of four wheeler automobile – Power transmission – Rear wheel drive, front wheel drive, 4 wheel drive – Types of automobile engines, Engine lubrication: Splash, Pressure lubrication systems, Oil filters, Oil pumps..

UNIT-II
FUEL SYSTEM:
S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump, fuel filters – Carburetor,

C.I. ENGINES:
Requirements of diesel injection systems, Types of injection systems, Fuel pump, Injection timing,

UNIT-III
COOLING SYSTEM:
Cooling requirements, Air cooling, Liquid cooling – Thermo, Water and Forced Circulation System

IGNITION SYSTEM:
Function of ignition system – Battery ignition system, Magneto coil ignition system and Electronic ignition system.

UNIT-IV
ELECTRICAL SYSTEM:
Charging circuit, Generator, Current regulator, Voltage regulator – Starting system, Lighting systems, Horn, Wiper, Engine temperature indicator.

TRANSMISSION SYSTEM:
Clutches, Fluid flywheel – Gear box, Types: Sliding mesh, Constant mesh, Synchro mesh and epicyclic

UNIT-V
STEERING SYSTEM:
Types of steering mechanism : Ackerman, Davis – Steering gears.

SUSPENSION SYSTEM:
Objects of suspension systems and Shock absorber

BRAKING SYSTEM:
Mechanical braking system and Hydraulic brake system:

TEXT BOOKS:
1. Automotive Mechanics Vol-I&II, Kripal Singh, Standard Pub.
2. Automobile Engineering, William H Crouse, Donald L Anglin, McGraw Hill Pub.

REFERENCES BOOKS:
1. Automotive Technology: Principles, Diagnosis, and Service, James D. Halderman, Pearson Pub.
2. Automotive Mechanics, G.B.S. Narang, Khanna Pub.
3. Automotive Mechanics, Joseph Heitner, Van Nostrand Reinhold Pub.

References:
1. R. B. Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990
2. Savinder Singh Environmental Geography, PrayagPustakBhawann 1997
3. Kates, B. I & White, G. F The Environment as Hazards, oxford, New York, 1978
4. R. B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
5. H. K. Gupta (Ed) Disaster Management, Universities Press, India, 2003
6. R. B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
   Dr. Satender, Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003
7. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V. K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
8. R. K. Bhandani An overview on Natural &Man made Disaster & their Reduction, CSIR, New Delhi
9. M. C. Gupta Manuals on Natural Disaster Management in india, National Centre for Disaster Management, IIPA, New Delhi, 2001.

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BASICS OF VLSI
(Open Elective – IV)
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Subject Code: 16OE3045   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

Objectives

- Understand the VLSI design and VLSI technologies.
- Describe basic circuit concepts.
- Explain how to draw stick and layout diagrams
- Know about scaling and limitations.
- Can calculate the resistance and capacitance

Outcomes

At the end of the course the student will be able to
- Identify different MOS technologies for VLSI design
- Distinguish characteristics of CMOS and BICMOS
- Able to draw the stick &layout diagrams of various circuits
- Analyze about scaling factors
- Evaluate the resistance and capacitance

UNIT I
Introduction: Introduction to IC technology, the IC era, MOS and related VLSI technology and basic MOS transistors. MOS and CMOS fabrication process. Bi-CMOS technology and comparison between CMOS and bipolar technologies.

UNIT II
Basic electrical properties of MOS and Bi-CMOS circuits : $I_{ds} - V_{ds}$ relationship, , trans-conductance, output conductance and figure of merit. Pass transistor, MOS inverter, determination of pull-up to pull-down ratio of NMOS. NMOS inverter driven through another NMOS inverter and driven through one or more pass transistors. Alternative forms of pull-up, CMOS inverter, MOS transistor circuit model, Bi-CMOS inverter and latch-up in CMOS circuits.

UNIT III
VLSI Circuit design process: VLSI design flow, layers of abstraction and stick diagrams. Design rules for wires, contacts and transistor layout diagrams for NMOS and CMOS inverters and gates.

UNIT IV
Scaling of MOS circuits: Scaling models, scaling factors for device parameters and limitations of scaling.

UNIT V
Basic circuit concepts: Sheet resistance (R_s) and its concept to MOS. Area capacitance calculations, delays, driving large capacitive load, wiring capacitances, fan-in and fan-outs and choice of layers.

Text books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005.
2. Principles of CMOS VLSI Design – Weste and Eshraghian, Pearson Education, 1999.

Reference books:

1. VLSI Design – Debaprasad Das, Oxford university press, 2010.
2. VLSI Design – A.Albert Raj and T.Latha, PHI Learing private limited 2010.
3. ASIC design - Smith.

SIMULATION AND MODELING
(Open Elective – IV)

Subject Code: 16OE3046   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

Course Objectives:
- Educate students with fundamental knowledge of continuous and discrete system models and Gain some fundamental knowledge about system simulation techniques
- Gain knowledge probability theory and probability functions.
- Acquire knowledge queuing theory, discrete system simulation and different models of discrete system simulation
- Acquire knowledge about simulation programming techniques.
- Explain some elementary features of SIMSCRIPT and GPSS algorithms.

Course Outcomes:
Upon completion of this course, students shall be able to:
1. Differentiate continuous and discrete system models and describe system simulation techniques.
2. Describe the steps in continuous system simulation and list the continuous simulation methods
3. Analyze stochastic variables and probability functions, Outline methods for discrete simulation
4. Articulate queuing disciplines with mathematical solutions
5. Assess problems and propose solutions to SIMSCRIPT and GPSS algorithms.

Unit-I: Introduction:
Nature of Simulation: Systems, Models and Simulation; Continuous and Discrete Systems; Components of a simulation study; Static and Dynamic physical models; Static and Dynamic Mathematical models; Advantages, Disadvantages and pitfalls of Simulation.

Unit-II: System Simulation and Continuous System Simulation:
Types of System Simulation: analytical and Simulation methods: Comparison; Monte Carlo Method; Distributed Lag Models; Cobweb Model

Unit –III: System Dynamics & Probability concepts in Simulation
Exponential growth and decay models; logistic curves; Generalization of growth models; System dynamics diagrams; Discrete and Continuous probability functions; Generation of Discrete distributions.

Unit-IV: Simulation of Queuing Systems and Discrete System Simulation
Queuing Theory: Poisson Arrival patterns; Normal and Exponential distribution; Service times and Queuing disciplines

Unit-V: Introduction to Simulation languages and Analysis of Simulation output
GPSS: Action times, Succession of events, Choice of paths; Conditional transfers and Program control statements; SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels; SIMSCRIPT statements, Estimation methods

TEXT BOOKS:
1. Geoffrey Gordon, "System Simulation", 2nd Edition, Prentice Hall, India, 2002.

REFERENCES:

1. Jerry Banks and John S.Carson, Barry L. Nelson, David M.Nicol, "Discrete Event System Simulation",
3rd Edition, Prentice Hall, India, 2002.
2. Narsingh Deo, "System Simulation with Digital Computer, "Prentice Hall, India, 2001.
3. Thomas J. Schriber, Simulation using GPSS, John Wiley, 1991.

SOFT COMPUTING
(Open Elective – IV)

Subject Code: 16OE3047   **External Marks: 70**
Credits: 2.0   **Internal Marks: 30**

COURSE OBJECTIVES:
1. To provide an understanding of the soft computing field
2. To provide adequate knowledge about fuzzy set theory and Fuzzy Inference.
3. To expose the ideas about genetic algorithm
4. To provide adequate knowledge about feedback neural networks
5. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.

COURSE OUTCOMES:
Upon completion of the course, students should:

1. Demonstrate Fuzzy set theory
2. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

3. Analyze the genetic algorithms and their applications
4. Design single and multi-layer feed-forward neural networks

5. Apply neural networks to pattern classification problems

FUZZY LOGIC

UNIT-I
Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Membership Function Formulation and Parameterization, MF of two dimensions.

UNIT -II
Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning. Fuzzy Inference System   Introduction, Mamdani Fuzzy Models, Sugeno Fuzzy Models.

OPTIMIZATION

UNIT –III
Derivative-free Optimization :Genetic Algorithms , Simulated Annealing ,Random Search

ARTIFICIAL NEURAL NETWORKS

UNIT –IV
Supervised Learning Neural Networks:Perceptron ,Adaline, Back propagation Multi layer Perceptron , Radial Basis Function Networks

UNIT –V
 Unsupervised Learning Neural Networks : Competitive Learning Networks ,Kohonen Self-Organizing Networks
 Learning Vector Quantization, Hebbian Learning, Principal Component Analysis.

TEXT BOOK
1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

REFERENCES
1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E.Goldberg,"Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.

4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.