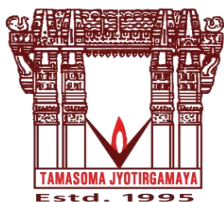


**ACADEMIC REGULATIONS
COURSE STRUCTURE AND
DETAILED SYLLABUS**

Civil Engineering

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2015-2016)



**VALLURUPALLI NAGESWARA RAO VIGNANA JYOTHI
INSTITUTE OF ENGINEERING AND TECHNOLOGY**

An Autonomous Institute, Accredited by NAAC with 'A' Grade
NBA Accreditation for CE, EEE, ME, ECE, CSE, EIE, IT B.Tech. Programmes
Approved by AICTE, New Delhi, Affiliated to JNTUH
Recognized as "College with Potential for Excellence" by UGC
Vignana Jyothi Nagar, Pragathi Nagar, Nizampet (S.O), Hyderabad – 500 090, TS, India.
Telephone No: 040-2304 2758/59/60, Fax: 040-23042761
E-mail: postbox@vnrvjiet.ac.in, Website: www.vnrvjiet.ac.in

Vision and Mission of the Institute

VISION

To be a World Class University providing value-based education, conducting interdisciplinary research in cutting edge technologies leading to sustainable socio-economic development of the nation.

MISSION

- To produce technically competent and socially responsible engineers, managers and entrepreneurs, who will be future ready.
- To involve students and faculty in innovative research projects linked with industry, academic and research institutions in India and abroad.
- To use modern pedagogy for improving the teaching-learning process.

Vision and Mission of the Department

VISION

To develop Civil Engineering Department as a Centre of excellence for imparting value based education to the students at undergraduate and post-graduate level to meet industry needs and to develop as a major research center meeting national and international standards.

MISSION

- To impart in-depth and up-to-date knowledge of Civil Engineering concepts with focus on character enhancement, leadership qualities, effective communication, social responsibility and pursuit of lifelong learning and professional development.
- To provide a platform to the students to engage in original research work in association with faculty.



**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDERABAD**

An Autonomous Institute

ACADEMIC REGULATIONS FOR B.TECH. PROGRAMME

(Applicable for students admitted from the academic year 2015-2016)

1. Programmes of Study

- The following four year B.Tech. degree programmes of study are offered at VNR VJiet from the academic year 2017-2018.

Branch Code	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
10	Electronics and Instrumentation Engineering
12	Information Technology
24	Automobile Engineering

- 'ENGLISH' language is used as the medium of instruction in all the above programmes.

1.1 Eligibility Criteria for Admission

The eligibility criteria for admission into engineering programmes shall be as mentioned below:

- The candidate shall be an Indian National / NRI
- The candidate should have completed 16 years of age as on 31st December of the academic year for which the admissions are being conducted
- The candidate should have passed the qualifying examination (10+2) or equivalent as on the date of admission recognized by BIE, Telangana State

1.1.1 Seats in each programme in the Institution are classified into **Category A** and **Category B** as per the G.Os.

Category – A Seats:

These seats shall be filled through counseling as per the rank in the Common Entrance Test (EAMCET) conducted by the State Government and as per other admission criteria laid down in the G.Os.

Category - B Seats:

These seats shall be filled by the Institute as per the G.Os issued by the State Government from time to time.

1.1.2 Category: Lateral Entry

The candidate shall be admitted into the Third Semester, (2nd year, 1st semester) based on the rank secured by the candidate in Engineering Common Entrance Test (ECET (FDH)) by the Convener, ECET.

2. Distribution and Weights of Marks

- i. The performance of a student in each semester shall be evaluated subject – wise with a **maximum of 100 marks for theory and 100 marks for practical subjects**. In addition, an Industry oriented mini-project, seminar, comprehensive viva-voce and project work shall be evaluated for **100, 100, 100 and 200 marks** respectively.
- ii. For theory subjects, the distribution shall be **40 marks for Mid-term Evaluation** and **60 marks for the Semester End Examination**.

Mid-Term Evaluation (40 M):

Mid-term evaluation consists of mid-term examination (30 M) and assignment/test (10 M).

➤ **Mid-term examination (30 M):**

- For theory subjects, two mid examinations shall be conducted in each semester as per the academic calendar. Each mid examination shall be evaluated for 30 marks.
PART-A 3 X 2M = 6 M (one question from each UNIT)
PART-B 3 X 8 M = 24 M (three internal choice questions one from each UNIT shall be given, the student has to answer one question from each UNIT)
- 80 % weightage for better mid-term examination and 20% weightage for the other mid examination shall be used and calculated as the final mid-term examination marks for each subject.

➤ **Assignment/objective exam/ case study/course project (10 M):**

- Two assignment/objective exam/ case study/course project shall be given to the students covering the syllabus of First Mid and Second Mid Examinations respectively and evaluated for 10 marks each.
- The first assignment shall be submitted before first mid examination and second assignment shall be submitted before second mid examination.
- The average of 2 assignments shall be taken as final assignment marks.

- iii. For practical subjects, there shall be a **continuous evaluation during the semester for 40 marks and 60 marks for semester end examination**. Out of the 40 marks, **day-to-day work in the laboratory shall be evaluated for**

10 marks, and 15 marks for practical examination and 15 marks for laboratory record.

NOTE: 1. Any student who shall remain absent for any assignment/Mid-term examination for any reason what so ever, shall be deemed to have secured 'zero' marks in the test/examination and no makeup test/examination shall be conducted.

2. Evaluation guidelines available with respective HOD's.

- iv. For the subjects having design and / or drawing, (such as Engineering Graphics, Geometrical Drawing, Machine Drawing, Production Drawing Practice, and Estimation etc.,) the distribution shall be **40 marks for internal evaluation (20 marks for day-to-day work and 20 marks for Mid examination (the average of the two examinations shall be taken into account) and 60 marks for semester end examination.**

NOTE: Evaluation guidelines available with respective HOD's.

- v. There shall be an **industry-oriented mini-project**, in collaboration with an industry of their specialization, to be taken up during the summer vacation after III year II semester examination. The **industry oriented mini project shall be evaluated during the IV year I semester.** The industry oriented mini project shall be submitted in report form and presented before a committee, which shall evaluate it for **100 marks**. The committee shall consist of Head of the Department, the supervisor of mini project and a senior faculty member of the department. There shall be **no mid-term assessment for industry oriented mini project. However, attending the shadow engineering program or any such other programme, in lieu thereof, is a pre-requisite for evaluating industry-oriented mini project.**

NOTE: Evaluation guidelines available with respective HOD's.

- vi. There shall be a **seminar presentation in IV year II semester.** For the seminar, the student shall collect the information on a specialized topic other than the project topic and prepare a technical report, showing his understanding of the topic, and submit to the department, which shall be evaluated by a departmental committee consisting of the Head of the department, seminar supervisor and a senior faculty member. **The seminar shall be evaluated for 100 marks based on the report and presentation made.**

NOTE: Evaluation guidelines available with respective HOD's.

- vii. There shall be a **comprehensive viva-voce in IV year II semester.** The comprehensive viva-voce shall be conducted by a committee consisting of the Head of the Department and three senior faculty members of the Department **after submitting the filled and duly signed M.T.P record.** The comprehensive viva-voce is aimed to assess the student's understanding in various subjects studied during the B.Tech. programme of study. The comprehensive viva-voce shall be evaluated **for 100 marks** by the committee. There shall be **no Mid-term assessment for the comprehensive viva-voce.**

Evaluation:-

- a. Objective type examination – 50 marks. (Two hours test)
b. Committee evaluation – 50 marks.

NOTE: Evaluation guidelines available with respective HOD's

viii. The **project work** shall be started by the student in the beginning of the IV year I semester. Out of a total of **200 marks** for the project work, **80 marks shall be for mid-term evaluation** and **120 marks for the semester end examination**. The viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department, the project supervisor and one senior faculty. The evaluation of project work shall be conducted at the end of the IV year II Semester. **The mid-term evaluation shall be on the basis of three seminars conducted during the IV year II semester for 80 marks by the committee consisting of Head of the Department, project supervisor and senior faculty member of the Department.**

NOTE: Evaluation guidelines available with respective HOD's

3. Semester End Examination (60 M):

(a) Theory Courses

Question paper pattern for semester end examination (60 Marks) consists of two sections i.e., Part-A and Part-B.

PART-A:

- Shall consist of 10 questions of 02 marks each. (10X2M = 20M)
- There shall be 02 questions from each unit.
- All the questions are compulsory.

PART-B:

- Shall consist of 05 questions of 08 marks each. (05X8M = 40M)
- There shall be 01 question from each unit with internal choice.

(b) Practical Courses

Each laboratory course shall be evaluated for 60 marks. The semester end examination shall be conducted by two examiners, one Internal and other external concerned with the subject of the same / other department / Industry. The evaluation shall be as per the standard format.

(c) Supplementary Examinations

Supplementary examinations shall be conducted along with regular semester end examinations. (During even semester regular examinations, supplementary examinations of odd semester and during odd semester regular examinations, supplementary examinations of even semester shall be conducted).

4. Attendance Requirements

- i. A student shall be eligible to appear for the semester end examinations if he / she acquire a **minimum of 75% of attendance in aggregate of all the courses** in that semester.
- ii. Shortage of attendance in aggregate **up to 10% (attendance of 65% and above and below 75%)** in a semester may be condoned by the **Institute**

Academic Committee based on the rules prescribed by the Academic Council of the Institute from time to time.

- iii. A student shall not be permitted to write the semester end examination and not promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. He/She may seek re-admission for that semester when offered next, if not promoted to the next semester.
- iv. **Shortage of attendance below 65% in aggregate shall in NO case be condoned.**
- v. Students whose shortage of attendance is not condoned or who have not paid the stipulated fee or who have not cleared any other due to the Institute in any semester are not eligible to write semester end examination of that semester.

5. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in Regulation No.4.

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project, if he/she secures **not less than 35% (21 out of 60 marks) of marks in the semester end examination and a minimum of 40% of marks in the sum total of the mid-term evaluation and semester end examination taken together.**
- ii. For promotion from II year II semester to III year I semester, the student needs to have 50% of credits up to II year II semester which includes
 - Two regular and two supplementary examinations of I B Tech. I semester.
 - Two regular and one supplementary examinations of I B Tech. II semester
 - One regular and one supplementary examinations of II year I semester.
 - One regular examinations of II year II semester.
- iii. For promotion from III year II semester to IV year I semester, the student needs to have 50% of credits up to III year II semester which includes
 - Three regular and three supplementary examinations of I B Tech. I semester.
 - Three regular and two supplementary examinations of I B Tech. II semester
 - Two regular and two supplementary examinations of II year I semester.
 - Two regular and one supplementary examinations of II year II semester.
 - One regular and one supplementary examination of III year I semester.
 - One regular examination of III year II semester.
- iv. A student shall register and put up minimum academic requirement in all **188 credits and earn atleast 180 credits for the award of B.Tech. degree.** The grade obtained for the minimum credits shall be considered for the calculation of CGPA.

- v. The students shall take one open elective subject each from the lists given in open elective-1 and open elective-2. The selected subjects shall not belong to their own branch.
- vi. The student shall be qualified in **two certificate courses** during his/her course of study.
- vii. "Gender Sensitization" is compulsory value added course as per the JNTUH procds. No. A1/2557/XXII SCAS/2015(2), dated 19.11.2015.
- viii. Students who fail to earn atleast 180 credits as indicated in the course structure **within eight academic years counting** from the year of their admission shall **forfeit their seat** in B.Tech. programme and their **admission stands cancelled**.

6. Course pattern

- i. The entire programme of study is of four academic years. **All I, II, III and IV years are of semester pattern.**
- ii. A student eligible to appear for the semester end examination in a subject, but absent or has failed in the semester end examination may reappear for that subject in the supplementary examination whenever conducted.
- iii. When a student is detained due to shortage of attendance in any semester, he/she shall seek readmission into that semester when it is offered next, **with the academic regulations of the batch into which he/she gets readmitted and has to obtain the degree within 8 academic years from the year of his/her original admission.**
- iv. When a student is detained due to lack of credits in any year, he/she may be eligible for promotion to the next year after obtaining the required number of credits and fulfillment of the academic requirements.

7. Award of B.Tech. Degree and Class

A student shall be declared eligible for the award of the B. Tech. degree if he/she fulfils the following academic regulations:

- i. Pursued **a programme of study for not less than four academic years and not more than eight academic years.**
- ii. Registered for **188 credits** and secured a minimum of **180 credits with compulsory subjects as listed in the following Table.**

Table: Compulsory Courses

S. No.	Courses Particulars
1.	All Practical Courses
2.	Industry oriented mini project
3.	Comprehensive Viva-Voce
4.	Seminar
5.	Project work
6.	Engineering Graphics / Engineering Drawing / Machine Drawing

NOTE: Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. programme.

8. CGPA System:

Method of awarding absolute grades and grade points in four year B.Tech. degree programme is as follows:

- Absolute Grading Method is followed, based on the total marks obtained in mid-term and semester end examinations.
- Grades and Grade points are assigned as given below.

Marks Obtained	Grade	Description of Grade	Grade Points(GP) Value Per Credit
≥ 90	O	Outstanding	10.00
≥ 80 and < 89.99	A+	Excellent	9.00
≥ 70 and < 79.99	A	Very Good	8.00
≥ 60 and < 69.99	B	Good	7.00
≥ 50 and < 59.99	C	Fair	6.00
≥ 40 and < 49.99	D	Pass	5.00
< 40	F	Fail	--
Not Appeared the Exam(s)	N	Absent	

- The student is eligible for the award of the B.Tech. degree with the class as mentioned in the following table.

CGPA	Class
≥ 7.5	First Class with Distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and < 6.5	Second Class
≥ 5.0 and < 5.5	Pass Class

➤ Calculation of Semester Grade Points Average (SGPA):

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

$$\text{SGPA} = \frac{\text{Total earned weighted grade points in a semester}}{\text{Total credits in a semester}}$$

$$\text{SGPA} = \frac{\sum_{i=1}^p C_i * G_i}{\sum_{i=1}^p C_i}$$

Where C_i = Number of credits allotted to a particular subject 'i'

G_i = Grade point corresponding to the letter grade awarded to the subject 'i'

$i = 1, 2, \dots, p$ represent the number of subjects in a particular semester

Note: SGPA is calculated and awarded for the candidates who pass all the courses in a semester.

➤ **Calculation of Cumulative Grade Point Average (CGPA):**

The CGPA of a student for the entire programme shall be calculated as given below:

- Assessment of the overall performance of a student shall be obtained by calculating Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained in all subjects during the course of study.

$$\text{CGPA} = \frac{\text{Total earned weighted grade points for the entire programme}}{\text{Total credits for the entire programme}}$$

$$\text{CGPA} = \frac{\sum_{j=1}^m C_j * G_j}{\sum_{j=1}^m C_j}$$

Where C_j = Number of credits allotted to a particular subject 'j'

G_j = Grade Point corresponding to the letter grade awarded to that subject 'j'

$j = 1, 2, \dots, m$ represent the number of subjects of the entire program.

- Grade lower than D in any subject shall not be considered for CGPA calculation. The CGPA shall be awarded only when the student acquires the required number of credits prescribed for the program.

➤ **Grade Card**

The grade card issued shall contain the following:

- a) The credits for each subject offered in that semester
- b) The letter grade and grade point awarded in each subject
- c) The **SGPA/CGPA**
- d) Total number of credits earned by the student up to the end of that semester.

9. Withholding of Results

If the student has not paid dues to the Institute, or if any case of indiscipline is pending against him, the result of the candidate may be withheld. The award or issue of the Provisional Certificate and the Degree may also be withheld in such cases.

10. Transitory Regulations

Students who have discontinued or have been detained for want of attendance or any other academic requirements, may be considered for readmission as and when they become eligible. They have to take up Equivalent subjects, as substitute subjects in place of repeated subjects as decided by the Chairman of the BoS of the respective departments. He/She shall be admitted under the regulation of the batch in which he/she is readmitted.

11. Minimum Instruction Days

The minimum instruction days for each semester shall be **90 instruction days**.

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

13. **The decision of the Institute Academic Committee shall be final in respect of equivalent subjects for those students who are transferred from other colleges. The transfer of students from other college or from this institute is to be approved by the Governing Council of the Institute.**

14. General

- i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- ii. The academic regulations should be read as a whole for the purpose of any interpretation.
- iii. In the case of any discrepancy/ambiguity/doubt arising in the above rules and regulations, the decision of the Principal shall be final.
- iv. The Chairman Academic Council may change or amend any or all of the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students concerned with effect from the dates notified by the College.

15. Academic Regulations for B.Tech. (Lateral Entry Scheme)

(Applicable for students admitted from the academic year 2016-2017)

A student shall be declared eligible for the award of the B. Tech. degree if he/she fulfils the following academic regulations:

- i. Pursued a **programme of study for not less than three academic years and not more than six academic years.**
- ii. Registered for **138 credits** and secured a minimum of **130 credits with compulsory subjects as listed in the following Table.**

Table: Compulsory Courses

S. No.	Courses Particulars
1.	All Practical Courses
2.	Industry oriented mini project
3.	Comprehensive Viva-Voce
4.	Seminar
5.	Project work
6.	Engineering Graphics / Engineering Drawing / Machine Drawing

- iii. A student who **fails to earn a minimum of 130 credits** as indicated in the course structure **within six academic years** from the year of their admission shall **forfeit his/her seat in B.Tech. programme and his admission stands cancelled.**
- iv. The same attendance regulations are adopted as that of B.Tech. four year degree course.
- v. For promotion from III year II semester to IV year I semester, the student needs to have 50% of credits up to III year II semester which includes
 - Two regular and two supplementary examinations of II B Tech. I semester
 - Two regular and one supplementary examinations of II B Tech. II semester
 - One regular and one supplementary examinations of III B.Tech. I semester
 - One regular of examinations of III year II semester
- vi. All other regulations as applicable to B.Tech. four year degree course shall hold good for B.Tech. (Lateral Entry Scheme).

16. Malpractice Rules

Disciplinary Action for Malpractices/Improper Conduct in Examinations

S. No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1.	(a) 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 candidate 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) Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons 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 candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2.	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 candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project

		<p>work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.</p> <p>The Hall Ticket of the candidate is to be cancelled.</p>
3.	<p>Impersonates any other candidate in connection with the examination.</p>	<p>The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, 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 candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he shall be handed over to the police and a case is registered against him.</p>
4.	<p>Smuggles 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.</p>	<p>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate 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 for two consecutive semesters from class work and all end semester and supplementary examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</p>
5.	<p>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.</p>	<p>Cancellation of the performance in that subject.</p>

6.	<p>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.</p>	<p>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 candidates are also debarred and they shall forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.</p>
7.	<p>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate 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 for two consecutive semesters from class work and all end semester examinations including supplementary Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</p>
8.	<p>Possesses any lethal weapon or firearm in the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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.</p>

		The candidate 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 any of clauses 6 to 8.	If the student belongs to the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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 shall be handed over to police and, a police case shall be registered against them.
10.	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 candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that series of the 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 candidate has appeared including practical examinations and project work of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the academic council of the Institute for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments shall be given to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center.

- 1) Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee shall meet and discuss/question the candidate and based on the evidences, the committee shall recommend suitable action on the candidate.
- 2) A notice is to be served to the candidate(s) involved, through the Principal, to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.
- 3) The involvement of staff who are in charge of conducting examinations, invigilators, examiners valuing examination papers and preparing / keeping records of documents related to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommend for award of appropriate punishment after thorough enquiry.
- 4) Based on the explanation by the party involved and recommendations of the committee action may be initiated.

5) Malpractice committee:

- | | |
|--|----------|
| i. Dean, Academics | Chairman |
| ii. Controller of Examinations | Convener |
| iii. Invigilator | Member |
| iv. Chief Examiner of the subject/subject expert | Member |
| v. Concerned Head of the Department | Member |

VNR Vignana Jyothi Institute of Engineering and Technology
An Autonomous Institute
Nizampet (S.O.), Hyderabad – 90

Program Educational Objectives (PEOs)

- I. To provide students with a solid foundation in Basic Sciences, Mathematics to analyze, synthesize and evaluate the information to achieve expertise in core areas of Civil Engineering.
- II. To equip students with modern professional abilities such as effective communication, collaborative work in diverse teams, ethical decision making, successful management of personal and professional career objectives and passion for continuous development through lifelong learning.
- III. To prepare the students to achieve high level technical expertise in the fields of Environmental Engineering, Geo-Technical Engineering, Structural Engineering, Transportation Engineering, Water Resources Engineering and to excel in the design and construction of various components or systems of Civil Engineering.
- IV. To provide expertise through learning advanced courses in various streams of Civil Engineering, by offering elective subjects with a view to make the students capable to pursue higher studies and research.
- V. To provide opportunities for students to learn multidisciplinary subjects such as Elements of Electrical and Mechanical Engineering, C Programming & Data Structures, and other open electives to make them a complete engineer
- VI. To establish acquaintance with the practical implementation of the theoretical concepts through laboratories, by bringing the real world into the academics through virtual industry labs, and to enhance experimental skills of students even beyond curriculum and encouraging them to carryout mini and major projects.
- VII. To prepare the students to continue their professional development based on their awareness of professional society activities, professional licensure requirements and opportunities for further education in graduate school.

Program Outcomes (POs)

a: Engineering Knowledge: The student is capable of applying the principles of basic sciences and mathematics in learning the Civil Engineering subjects. Graduates will be proficient in the core principles of Civil Engineering as they pertain to the sub-fields of Structural Engineering, Water Resources Engineering, Transportation Engineering, Geotechnical Engineering and Environmental Engineering and will be able to apply these principles in engineering practice.

b: Problem Analysis: The Graduates will possess critical thinking skills, problem solving abilities and familiarity with the computational procedures essential to the field.

c: Design & Development of Solutions: The student is able to plan, analyse, design and look after the construction of various types of Civil Engineering structures with appropriate consideration for public health and safety and cultural, societal and environmental considerations.

d: Conduct investigations of complex problems: The student will use research based knowledge and research methods to design, conduct experiments and to analyze and interpret experimental data.

e: Modern Tool Usage: The student will get hands on training in the various Modern Civil Engineering software and modern equipment.

f: The Engineer and Society: The Students will apply reasoning informed by the appropriate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Civil Engineering practice.

g: Environment and Sustainability: As the students possess substantial knowledge in multi -disciplinary subjects, he will be able to plan the various projects well keeping in view of its environmental effects on other related fields.

h: Ethics: The student will apply ethical principles and commitment to profession and responsibilities of their profession.

i: Individual and Team work: The Graduate is Capable of working productively as individual, as member or leader in driver set teams and in multi- disciplinary settings.

j: Communication: The Student will excel in expressing ideas, writing technical reports with good communication skills and managerial skills.

k: Project Management and Finance: The Graduates will demonstrate knowledge and understanding of the critical issues for professional practice such as the procurement of works, interaction with contractors during the construction phase of a project and the financial managerial capabilities.

l: Life-Long learning: The student will maintain an awareness of contemporary issues and will contribute to the wellbeing of the community with life-long learning in the broadest context of ever growing technology.

VNR Vignana Jyothi Institute of Engineering and Technology

B. Tech. - CIVIL ENGINEERING (R – 15)

I YEAR I SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5BS11	Advanced Calculus	3	0	3
5BS21	Engineering Physics	3	0	3
5BS31	Chemistry of Engineering Materials	3	0	3
5IT01	C Programming and Data Structures	3	1	4
5CE01	Engineering Mechanics – I	3	1	4
5CE51	Geometrical Drawing -I	0	6	3
5IT51	C Programming and Data Structures Laboratory	0	3	2
5BS25	Engineering Physics and Engineering Chemistry Laboratory	0	3	2
Total:		15	14	24

I YEAR II SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5BS12	Ordinary Differential Equations and Laplace Transforms	3	0	3
5BS22	Physics of Materials	3	0	3
5BS01	English	3	0	3
5BS32	Engineering Chemistry	3	0	3
5CE02	Engineering Mechanics – II	3	1	4
5CE03	Environmental Studies	3	0	3
5CE52	Geometrical Drawing -II	0	6	3
5ME53	IT and Engineering Workshop	0	3	2
5BS02	English Language Communication Skills Laboratory	0	3	2
Total:		18	13	26

VNR Vignana Jyothi Institute of Engineering and Technology

B. Tech. - CIVIL ENGINEERING (R – 15)

II YEAR I SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5BS16	Probability and Statistics	3	0	3
5BS41	Business Economics and Financial Analysis	3	0	3
5CE04	Building Materials, Construction and Planning	3	0	3
5CE05	Fluid Mechanics	3	1	4
5CE06	Strength of Materials – I	3	0	3
5CE07	Surveying	3	0	3
5CE53	Surveying Field Work - I	0	3	2
5CE54	Material Testing Laboratory	0	3	2
Total :		18	7	23

II YEAR II SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5BS13	Computational Methods	3	0	3
5CE08	Hydraulics and Hydraulic Machines	3	0	3
5CE09	Strength of Materials – II	3	1	4
5ME20	Mechanical and Electrical Technology	3	0	3
5CE10	Concrete Technology	3	0	3
5CE11	Structural Analysis - I	3	0	3
5CE55	Fluid Mechanics and Hydraulic Machines Lab	0	3	2
5CE56	Surveying Field Work - II	0	3	2
Total :		18	7	23
#5BS04	Gender Sensitization #	-	3	2

Value added Course

VNR Vignana Jyothi Institute of Engineering and Technology
B. Tech. - CIVIL ENGINEERING (R – 15)

III YEAR I SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5CE12	Engineering Hydrology	3	0	3
5CE13	Design of Reinforced Concrete Structures	3	1	4
5CE14	Engineering Geology	3	0	3
5CE15	Structural Analysis – II	3	1	4
	Open Elective –I	3	0	3
5CE57	Engineering Geology Laboratory	0	3	2
5CE58	Computer Aided Drafting of Buildings Laboratory	0	3	2
5CE59	Concrete Laboratory	0	3	2
Total :		15	11	23

OPEN ELECTIVE – I

Course Code	Course Name	Course Offered By the Department
5CE71	Disaster Management	CE
5EE71	Renewable Energy Technologies	EEE
5ME71	Digital Fabrication	ME
5EC71	Principles of Electronic Communications	ECE
5CS71	Object Oriented Programming through Java	CSE
5EI71	Principles of Measurements and Instrumentation	EIE
5IT71	Cyber Security	IT
5AE71	Principles of Automobile Engineering	AE
5BS71	Professional Ethics and Human Values	H&S

VNR Vignana Jyothi Institute of Engineering and Technology
B. Tech. - CIVIL ENGINEERING (R – 15)

III YEAR II SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5CE16	Design of Steel Structures	3	1	4
5CE17	Irrigation Engineering	3	0	3
5CE18	Highway Engineering	3	0	3
5CE19	Geo-technical Engineering –I	3	0	3
	Open Elective –II	3	0	3
5CE60	Geo-technical Engineering Laboratory	0	3	2
5CE61	Transportation Engineering Laboratory	0	3	2
5BS03	Advanced English Communication Skills Laboratory	0	3	2
	Total :	15	10	22

OPEN ELECTIVE – II

Course Code	Course Name	Course Offered By the Department
5CE72	Introduction to Geographical Information System	CE
5EE72	Energy Auditing Conservation and Management	EEE
5ME72	Optimization Techniques	ME
5EC72	Introduction to Micro Processors and Controllers	ECE
5EC95	Wireless Communications and Networks	ECE
5CS72	Open Source Technologies	CSE
5EI72	LabVIEW Programming	EIE
5EI79	Fundamentals of Robotics	EIE
5IT72	Relational Database Management Systems	IT
5AE72	Modern Automotive Technologies	AE
5BS72	Entrepreneurship	H&S

VNR Vignana Jyothi Institute of Engineering and Technology
B. Tech. - CIVIL ENGINEERING (R – 15)

IVYEAR I SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5CE20	Geographical Information System	3	0	3
5CE21	Geo-technical Engineering -II	3	0	3
5CE22	Transportation Engineering	3	0	3
5CE23	Environmental Engineering	3	0	3
5CE73	ELECTIVE – I Ground Water Development and Management	3	0	3
5CE74	Finite Element Methods			
5CE75	Traffic Engineering			
5CE76	Solid Waste Management			
5CE77	ELECTIVE-II Design And Drawing Of Hydraulic Structures	3	0	3
5CE78	Earthquake Resistant Design of Buildings			
5CE79	Air Pollution and Control Technology			
5CE80	Airport Planning and Design			
5CE62	CAD/GIS Laboratory	0	3	2
5CE63	Environmental Engineering Laboratory	0	3	2
5CE91	Industry Oriented Mini Project	0	0	2
	Total :	18	6	24

T/P/D: Tutorial/Practical/Drawing Practice

VNR Vignana Jyothi Institute of Engineering and Technology
B. Tech. - CIVIL ENGINEERING (R – 15)

IVYEAR II SEMESTER

COURSE STRUCTURE

Course Code	Course Name	L	T/P/D	C
5CE24	Estimating and Costing	3	0	3
5CE81	ELECTIVE – III Construction Technology and Project Management			
5CE82	Advanced Structural Analysis	3	0	3
5CE83	Ground Improvement techniques			
5CE84	Environmental Impact Assessment			
5CE85	ELECTIVE – IV Watershed Management			
5CE86	Prestressed Concrete	3	0	3
5CE87	Pavement Analysis and Design			
5CE88	Geo-synthetics and Soil Reinforcement			
5CE92	Technical Seminar	0	3	2
5CE93	Comprehensive viva - Voce	0	0	2
5CE94	Project Work	0	20	10
	Total :	9	23	23

VNR Vignana Jyothi Institute of Engineering and Technology

I Year B.Tech, I sem
Common to all branches

L	T/P/D	C
3	0	3

(5BS11) ADVANCED CALCULUS

Course prerequisites: Differentiation, Integration

Course Objectives:

- Understand the Taylor's theorem and its application to maxima and minima of $f(x,y)$
- Understand the process of curve Tracing.
- Understand multiple integrals and its applications
- Apply integral theorems of vector calculus.

Course Outcomes:

Students will be able to

- Solve problems involving the maxima and minima of $f(x,y)$.
- Trace curves using basic characteristics.
- Evaluate integrals using special functions and change of variables.
- Evaluate vector integrals.

UNIT I CALCULUS OF ONE AND SEVERAL REAL VARIABLES

Mean value theorems – Rolle's Theorem, Lagrange's Mean value theorem Cauchy's Mean value theorem, Taylor's expansion and McLaurin's expansion of functions (without proofs).

Partial differentiation, partial derivatives of first and second order in terms of partial derivatives, change of variables, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined multipliers.

UNIT II CURVE TRACING AND RELATED APPLICATIONS

Radius of Curvature of curves in Cartesian, parametric and polar coordinates. Tracing of curves in Cartesian, parametric and polar coordinates (like conics, astroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardioid, Lemniscate).

UNIT III MULTIPLE INTEGRALS

Beta, Gamma and Error functions, Introduction of Multiple integrals, evaluation of double and triple integrals, change of order of integration change of variables, Cylindrical and Spherical polar coordinates.

UNIT IV VECTOR DIFFERENTIAL CALCULUS

Scalar and Vector point functions, Gradient, Divergence, Curl with geometrical & physical interpretation, Directional derivatives, vector identities (without proofs).

UNIT V VECTOR INTEGRAL CALCULUS

Line integrals and application to Work done and Circulation, Scalar potential function, Surface integrals and Volume integrals, Gauss divergence theorem, Green's theorem, Stokes' theorem (theorems without proof).

TEXT BOOKS:

1. Higher Engineering Mathematics – by B. S. Grewal, *Khanna publishers*
2. Calculus and Analytic Geometry by Thomas and Finney, 9th edition; *Publisher: Pearson Education.*

REFERENCES:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition; *Publisher: John Wiley.*
2. Advanced Engineering Mathematics by Peter 'O' Neil, publisher: Cengage Learning .
3. Advanced Engineering Mathematics by *R.K.Jain and S.R.K.Iyengar; Narosa Publications*

VNR Vignana Jyothi Institute of Engineering and Technology

I Year B.Tech, I sem
Common to all branches

L	T/P/D	C
3	0	3

(5BS21) ENGINEERING PHYSICS

Course Objectives:

- To supplement and enhance the knowledge of basic concepts in physics essentially required in the study of interaction of light with matter and behavior of a particle quantum mechanically.
- To Study and understand various phenomena of light- Interference, Diffraction, Dispersion and total internal reflection.
- To learn and enhance the basic concepts in physics required to deal with large number of particles and behavior of an electron in metals.
- To understand the basic principles and working of lasers and optical fibers.
- To learn simple applications of these concepts and principles in engineering and technology.

Course Outcomes:

After completion of the course the student is able to

- realize influence of diffraction and resolvability in optical elements.
- recognize importance of interference in thin films.
- distinguish LASER light from ordinary light and describe propagation of light through Optical fiber by Total Internal reflection.
- illustrate behavior of a particle in one dimensional potential box.
- understand behavior of electron in a periodic potential in real crystal and classify Solids based on conduction.

UNIT I

INTERFERENCE:

Introduction, Superposition principle, Resultant amplitude, Coherence - Methods to obtain coherent sources, Interference, Young's Double Slit Experiment, interference thin films by reflection, Newton's rings Experiment-Formation of Rings and Experimental Method, Characteristics of rings, Applications.

UNIT II

DIFFRACTION:

Introduction, Distinguish between Fraunhofer and Fresnel diffraction, diffraction at single slit (Phasors approach). Diffraction at double slit, circular aperture, and multiple slits (grating) (Qualitative Approach)-Width of Principal Maxima and Dispersion, Resolution of spectral lines, Rayleigh criterion, and resolving power of grating.

UNIT III

LASERS AND OPTICAL FIBERS:

Introduction, Characteristics of Lasers, Spontaneous and Stimulated Emission of radiation, Meta stable state, population inversion, lasing action, Einstein's coefficients and relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Laser, Principle of optical fiber and Properties, Acceptance angle and acceptance cone, Numerical aperture, Types of fibers based on refractive index profiles, Qualitative analysis of attenuation in optical fibers, Application of Lasers and Optical fibers.

UNIT IV

ELEMENTS OF QUANTUM MECHANICS:

Waves and particles, De Broglie hypothesis, Matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle- Applying it to Non existence of electron in Nucleus and Single slit Experiment, Schrodinger Wave Equation – Wave function and its Physical Significance, Particle in one dimensional potential box(wave functions, probability densities and energy states), Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (non-mathematical treatment).

UNIT V

ELECTRON THEORY OF METALS:

Energy levels in one dimension, Effect of temperature on the Fermi-Dirac distribution, Electrical conductivity & Ohm's law, Electrical Resistivity of Metals (Qualitative), Electron in a periodic potential, Bloch Theorem, Kronig-Penney model (non-mathematical treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors & Insulators and Concept of effective mass of an electron.

TEXT BOOKS:

- (1) Physics vol.2, by Halliday, Resnick and Krane; John Wiley & Sons
- (2) Engineering Physics by R.K.Gaur and S.L.Gupta; Dhanpat Rai and Sons

REFERENCES:

- (1) Optics by Ghatak and Thyagarajan, Tata Mc Graw
- (2) Concepts of Modern physics by Arthur Beiser, McGraw Hill Inc.
- (3) Introduction to Solid State Physics by Charles Kittel : John Wiley & Sons
- (4) Applied Physics by P.K.Mittal, IK International Publishing House (P) Ltd.
- (5) Engineering Physics by G Sahashra Buddhé; University Press

VNR Vignana Jyothi Institute of Engineering and Technology

I Year B.Tech - I Semester
CE, ME & AE

L	T/P/D	C
3	0	3

(5BS31) CHEMISTRY OF ENGINEERING MATERIALS

Course Objectives:

- Classification and applications of abrasives and adhesives.
- Familiarity of the types and applications of refractories and ceramics.
- Examining the properties of lubricants and learning the mechanism of lubrication.
- Knowledge of manufacturing of cement and its properties.
- Listing out various types of fuels and understanding the concept of calorific values.

Course Outcomes:

After the completion of the course student will be able to,

- Formulate and infer the suitability of abrasives and adhesives in different industries.
- Understand benefits of refractories and ceramics as heat resistant materials in industries.
- Assess the quality of lubricants and their appropriate usage in machinery.
- Interpret the setting and hardening process of cement.
- Acquire the knowledge of efficiency of fuels and identify a better fuel source of less pollution.

UNIT I

Engineering Materials

Abrasives - Introduction, classification and applications of natural abrasives (diamond, quartz (SiO_2)), synthetic abrasives (silicon carbide, boron nitride).

Adhesives –Criteria of a good adhesive, classification and applications of thermoplastic adhesives (cellulose and acrylics), thermosetting adhesives (phenol formaldehyde and epoxy resins).

UNIT II

Refractories and Ceramics

Refractories: Definition; classification with examples; characteristics of a good refractory; causes for the failure of a refractory material; properties of refractories - refractoriness, RUL test, porosity.

Ceramics: Introduction; classification- whiteware, stoneware, earthenware and their applications, Glazing- definition, liquid glazing.

UNIT III

Lubricants

Criteria of a good lubricant; classification of lubricants (lubricating oils, greases or semisolid lubricants, solid lubricants). Mechanism of lubrication-fluid film lubrication, boundary lubrication, and extreme pressure lubrication; Properties of lubricants – definition and significance of viscosity, cloud point, pour point, flash & fire point, mechanical stability, oiliness, and carbon residue.

Biodegradable lubricants: classification, advantages and disadvantages of biodegradable lubricants.

UNIT IV

Cement

Types of cement; chemical constituents and composition of Portland cement; manufacturing methods of Portland cement (wet and dry processes). Setting & Hardening of cement (reactions); decay of cement; cement concrete - RCC.

UNIT V

Energy sources

Fuels - classification (solid, liquid, gaseous), calorific value of fuel (HCV, LCV), Dulong formula- numericals, Solid fuels – coal – analysis – proximate and ultimate analysis and their significance (no numerical problems), Liquid fuels – petrol – cracking, need for cracking, types of cracking(thermal and catalytic cracking), fluid bed catalytic cracking, synthetic petrol by Fischer- Tropsch's process. Knocking- octane number, cetane number. Gaseous fuels- natural gas, LPG, CNG (composition and uses). Biofuels- characteristics, biodiesel - transesterification, properties and applications.

TEXT BOOKS

1. Text book of Engineering Chemistry by Y.Bharathi Kumari, and Jyotsna Cherukuri; *Publisher: VGS Book Links.*
2. Engineering Chemistry by P.C.Jain & Monica Jain; *Publisher: Dhanpatrai.*

REFERENCES

1. Engineering Chemistry by O G Palanna; McGraw Hill Edu.Pvt.Ltd.
2. Text book of Engineering Chemistry by Shashi Chawla Publisher: Dhanpat rai &Co
3. Engineering Chemistry by R.P.Mani, S.N. Mishra, B.Rama Devi, Cengage Learning Publications.
4. Text book of Engineering Chemistry by R.Gopalan, D.Venkappayya, Sulochana Nagarajan; Publisher: Vikas Publishers.

(5IT01) C PROGRAMMING AND DATA STRUCTURES

Course Objectives:

Student shall be able to

- **Discuss** the history of computers and fundamentals of problem solving using structured programming
- **Identify** the appropriate decision making and branching statements to solve the problem
- **Understand** different derived data types
- **Identify** basic and advanced sorting and searching techniques and understand the operations of linear data structures

Course Outcomes:

After completion of the course the student is able to

- **Apply** knowledge of mathematics, science engineering and technology in problems solving using C programming Language
- **Analyze** structured programming methods, techniques and standard library functions
- **Understand** and relate different derived data types and able to choose the loops and decision making statements to solve the given problem
- **Identify** trade-offs involved in choosing static versus dynamic data structures and also implementation of stacks, queues and linked lists and different searching and sorting techniques for a given application

UNIT – I

Introduction to Computers-Computer Systems, Computing Environments, Computer languages, creating and running programs, Software Development Methods.

UNIT – II

Algorithm / pseudo code, flowchart, program development steps, structure of C program, identifiers, basic data types, Constants, variables, operators, expressions, precedence and order of evaluation.

Input-output statements, if and switch statements, loops- while, do-while and for statements, break, continue, goto and labels, example C programs.

UNIT - III

Functions, basic concepts, parameter passing, storage classes, scope rules, user defined functions, standard library functions, recursive functions, example C programs. Arrays- Basic concepts, one-dimensional and two-dimensional arrays, Character array, string handling functions, example C programs.

UNIT - IV

Derived types- structures- Basic concepts, nested structures, arrays of structures, program examples.

pointers- Basic concepts, pointers and functions, pointers and strings, pointers and arrays, pointers and structures, self referential structures, example C programs.

UNIT - V

Searching - Linear and binary search methods, sorting - Bubble sort, selection sort, Insertion sort.

Introduction to data structures, Dynamic memory allocation, stacks and queues- implementation using arrays.

TEXT BOOKS

1. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
2. C Programming and Data structures, E.Balagurusamy, TMH.

REFERENCES

1. Data Structures Using C - A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.
2. Programming in C - Stephen G. Kochan, III Edition, Pearson Educaion.
3. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.
4. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education

(5CE01) ENGINEERING MECHANICS – I

Course Objectives:

Student shall be able to

- **Understand** and analyse the forces and reactions for equilibrium
- **Discuss** various types of friction, laws of friction and analyse body/bodies lying on rough planes
- **Distinguish** between centroid, centre of mass and centre of gravity
- **Understand** the concept of area moment of inertia and mass moment of inertia about any axes

Course Outcomes:

After the completion of the course student should be able to

- **State** and **explain** fundamental laws and concepts of Engineering mechanics for statics
- **Apply** concepts of Mechanics to Engineering Applications
- **Analyse** the systems which are at rest for equilibrium conditions
- **Solve** the numerical problems related to friction, centroid and moment of Inertia

UNIT-I

Forces

Introduction to Engineering Mechanics – Basic Concepts - Classification of a force system - Parallelogram law of forces - Triangle law of forces - Polygon law of forces – law of transmissibility of forces – Principle of superposition - Lami's theorem - Free Body Diagram – Resultant – Equilibrant - Resultant of coplanar concurrent forces - Equilibrium of coplanar concurrent forces.

UNIT-II

Moments

Moment of a force - Varignon's principle - Parallel forces - Resultant of parallel forces – Couple - Moment of a couple about any point lying in the plane - Resolution of a force into a force-couple and vice-versa - Resultant of coplanar non-concurrent forces - Equilibrium of coplanar non-concurrent forces –Types of supports - Support reactions

UNIT - III

Friction

Types of Friction - Limiting Friction - Laws of Friction - Equilibrium of bodies on rough horizontal and inclined planes- Equilibrium of connected bodies on rough horizontal and inclined planes - Ladder friction – wedge friction – screw friction

UNIT – IV

Centroid, Centre of Mass, Centre of Gravity

Centroid - Centroids of simple figures (from basic principles) – Centroids of composite figures and built-up sections - Centre of mass of simple bodies - Centre of gravity of simple bodies - Centre of gravity of composite bodies - Pappu's theorems.

UNIT – V

Area moment of Inertia

Introduction- Inertia - Inertia of areas - Rotation of areas - Radius of gyration - Polar moment of inertia - Parallel axis theorem - Perpendicular axis theorem - Moments of inertia of simple figures and composite figures.

Mass Moment of Inertia

Moment of inertia of Masses – Significance - Rotation of mass - Mass moment of inertia of simple bodies.

TEXT BOOKS

1. Engineering Mechanics by S.P. Timoshenko, D.H.Young & J.V.Rao, Tata McGraw Hill Publishers,4th Edition,2010
2. Singer's Engineering Mechanics by K. Vijaya Kumar Reddy & J. Suresh kumar ,B.S Publishers,3rd Edition,2011

REFERENCES

1. Engineering Mechanics by S.S. Bhavikatti, Newage International Publishers,2012
2. Engineering Mechanics (Statics) by J.L.Meriam & L.G.Kraige, Wiley Publishers, 6th Edition,2006
3. Engineering Mechanics by A.K.Tayal, Umesh Publications,13th Edition,2010
4. Engineering Mechanics by R.K. Rajput, Ixmi Publications,1998

(5CE51) GEOMETRICAL DRAWING-I

Course Objectives:

Student shall be able to

- **Learn** basic Auto Cad skills.
- **Know** Principles of Engineering drawing.
- **Differentiate** various curves used in engineering practice & types of scales.
- **Learn** and **draw** orthographic projections and projection of planes & solids.

Course Outcomes:

After the completion of the course student should be able to

- **Draw** two dimensional drawings using Auto Cad.
- **Apply** the principles of engineering drawing.
- **Use** various engineering scales, various curves in drawings.
- **Generate** orthographic projections of planes and solids.

UNIT- I

Introduction to Auto CAD

Introduction to Engineering Drawing

Principles of engineering graphics and their significance - Drawing instruments and their uses - Different types of scales, scale of chords.

UNIT – II

Curves Used In Engineering Practice & Their Construction

Circle, Ellipse, Parabola, Hyperbola & Rectangular hyperbola-general method and by any other appropriate method.

UNIT – III

Orthographic Projection

Introduction – First angle projection – Third angle projection.

Projection of Points. Projection of straight lines inclined to both planes by first angle projection method -True lengths & traces.

UNIT- IV

Projection of Planes

Projection of plane figures inclined to both planes - Auxiliary Projections.

UNIT- V

Projection of Solids

Projection of regular solids inclined to both planes – Auxiliary Projections.

TEXT BOOKS

1. Engineering drawing by N.D.Bhatt - Charotar Publishing House Pvt.Ltd., 53rd Edition, 2014.
2. Engineering Drawing by Basant Agrawal – McGraw hill education (India) Pvt. Ltd., 1st edition, 2013.

REFERENCES

1. Engineering Drawing with Auto CAD by K.Venkata Reddy - B.S Publications, 4th edition, 2009.

2. Engineering Drawing by M. B. Shah, Pearson Education India, 2nd edition, 2009.
3. Engineering Drawing and Graphics by K Venugopal, New Age International, 5th edition, 2004.
4. Engineering Drawing with AutoCAD by B V R Gupta, IK International Pvt. Ltd., 2nd edition, 2009.

(5IT51) C PROGRAMMING AND DATA STRUCTURES LABORATORY

Course Objectives:

Student shall be able to

- **Understand** the basic structure of C programming
- **List** different decision making and branching statements and their usage in analyzing problems
- **Understand** the usage of derived data types to solve the problems
- **Apply** different searching and sorting methods and implement linear data structures

Course Outcomes:

After completion of the course the student is able to

- **Apply** mathematics, science, engineering and technology in problem solving using C programming language.
- **Design** c programs using different c tokens .
- **Experiment** appropriate decision making statements and derived data types to solve a given problem.
- **Analyze** and implement linear data structures, and differentiate the various searching and sorting techniques.

Week 1

1. Write a program that reads three different integers from the keyboard and prints – sum, average, product, smallest, largest of the numbers.
2. Write a program that reads two integers and prints – difference, quotient and remainder
3. WAP that reads two integers and determines whether the first is a multiple of the other

Week 2

1. Write a C program to find the sum of individual digits of a positive integer.
2. Write a C program for Fibonacci sequence.
3. Write a C program to generate the first n terms of the sequence.
4. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Week 3

1. Write a C program to calculate the following Sum:
 $Sum=1-x^2/2! +x^4/4! -x^6/6!+x^8/8!-x^{10}/10!$
2. Write a C program to find the roots of a quadratic equation.

Week 4

1. Write C programs that use both recursive and non-recursive functions
 - i) To find the factorial of a given integer.
 - ii) To find the GCD (greatest common divisor) of two given integers.
 - iii) To solve Towers of Hanoi problem.

Week 5

1. Write a C program, which takes two integer operands and one operator from the user,

performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch Statement)

2. Write a program to print a given number [0-1000] in words. For example, 123 as One Hundred and Twenty Three

Week 6

1. WAP to check whether a given number is an Armstrong, Palindrome, Perfect, Prime, or a Fibonacci Number
2. Write a C program to find both the largest and smallest number in a list of integers

Week 7

1. Write a C program to generate Pascal's triangle.
2. Write a C program to construct a pyramid of numbers.

Week 8

1. Write a C program to calculate
 - i) Minimum and maximum of an 1-d array
 - ii) Sorting an array
 - iii) Searching an array

Week 9

1. Write a C program that uses functions to perform the following:
 - i) Addition of Two Matrices
 - ii) Multiplication of Two Matrices
 - iii) To find the determinant of a 3 by 3 matrix

Week 10

1. Write a C program that uses functions to perform the following operations using Pointers:
 - i) To insert a sub-string in to a given main string from a given position.
 - ii) To delete n Characters from a given position in a given string.
 - iii) To reverse a given string

Week 11

1. Write C Programs to implement Structures and Nested structures with suitable Examples
(Students has to practice with relevant examples taught in the class room)

Week 12

1. Write C Programs using Pointers and Pointer Arithmetic operations
2. Write C Programs using Pointers to structures, Pointers to Arrays and Pointers to strings
(Students has to practice with relevant examples taught in the class room)

Week 13

1. Write C Programs to implement the following sorting algorithms
 - a. Bubble Sort
 - b. Selection sort
 - c. Insertion Sort

Week 14

1. Write a C program to implement STACK and QUEUE operations using Arrays

Week 15

1. Write a C program to implement the following searching techniques.

a. Linear Search

b. Binary Search

Week 16 Lab Internal Examination

TEXT BOOKS

1. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
2. C Programming and Data structures, E.Balagurusamy, TMH.

REFERENCES

1. Data Structures Using C - A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.
2. Programming in C - Stephen G. Kochan, III Edition, Pearson Eductaion.
3. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.

I Year B. Tech CE-I Sem

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(5BS25) ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LABORATORY

ENGINEERING PHYSICS LAB LABORATORY

Course Objectives:

- To practically learn interaction of light with matter through physical phenomena like interference, diffraction and dispersion.
- To understand the periodic motion and formation of standing waves and to know the characteristics of the capacitors and resistors.
- To compare the experimental results with the class room learning.

Course Outcomes:

After completion of the course the student is able to:

- Demonstrate the optical phenomena with formation of Newton Rings, and formation of spectra with a grating and a prism.
- Illustrate periodic motion by measuring rigidity modulus of a material and formation of standing waves by Melde's apparatus and also discharging of a capacitor.
- Correlate the experimental results with the class room learning.

Any Eight Experiments from the following:

1. Dispersive Power of the material of a Prism using Spectrometer
2. Diffraction Grating (both with Laser and non laser source)
3. Single Slit with laser light
4. Newton Rings
5. Finding thickness of a thin wire or sheet by forming a wedge shaped film
6. Energy gap of a semiconductor material
7. To determine the rigidity modulus of material of a wire
8. Melde's experiment
9. Sonometer Experiment
10. AC frequency by sonometer method
11. Numerical Aperture and Acceptance angle of an optical fiber cable
12. Attenuation and Bending losses in optical fiber
13. Stewart Gee's experiment
14. Characteristics of LED/Laser Diode.
15. Photo cell/ Solar Cell
16. C circuit

REFERENCES:

1. Essential Practical Lab Manual in Physics: by Dr.P.Raghavendra Rao,P.Pavankumar and B.Ashok (inhouse document)
2. Engineering Physics Practicals by B.Srinivasa Rao, V.K.V.Krishna and K.S.Rudramamba, University Science Press, New Delhi

ENGINEERING CHEMISTRY LABORATORY

Pre-requisites: Basic knowledge of Volumetric Analysis and Mathematics.

Course Objectives:

- Familiarize the preparation of solutions and operation of instruments
- Conduct of experiment, collection and analyzing the data
- Summarizing the data and find the applicability of the experiment to common society

Course Outcomes:

- Understanding the preparation of standard solutions and handling of instruments
- Knowledge of experimentation and recording the data
- Interpretation of results to real world scenario

LIST OF EXPERIMENTS

1. **Titrimetry:** Estimation of hardness of water by EDTA method.
2. **Conductometry:** Conductometric titration of acid vs base.
3. **Colorimetry:** Estimation of copper by colorimetric method.
4. **pH metry:** Determination of pH of sample solutions.
5. Determination of viscosity of sample oil by Redwood Viscometer.
6. **Preparations:** Soap and Nanoparticles.

TEXT BOOKS:

1. Laboratory Manual on Engineering Chemistry by S.K.Bhasin and Sudha Rani; Publisher: Dhanpat Rai.
2. Laboratory Manual on Engineering Chemistry by Y.Bharathi Kumari and Jyotsna Cherukuri; Publisher: VGS Book Links.

(5BS12) ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Course prerequisites: Differentiation and Integration

Course Objectives:

- Understand the methods of solving first order differential equations and learn about its applications to basic engineering problems.
- Understand the methods of solving higher order differential equations and learn about its applications to basic engineering problems.
- Understand the method of series solutions of second order ordinary differential equations.
- Apply the convolution theorem to evaluate Inverse Laplace Transform of the functions.

Course Outcomes:

After completion of the course the student is able to:

- Solve the problems in first order differential equations.
- Solve the problems in second order differential equations.
- Obtain the series solutions of second order ordinary differential equations.
- Learn Laplace Transform as a tool.

UNIT I

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS

Differential equations of first order and first degree - Exact differential equation , Linear and Bernoulli differential equation , Applications of differential equations of first order and first degree - Newton's law of cooling, Law of natural growth and decay, Orthogonal trajectories and basic circuits(L-R Circuits, R-C Circuits).

UNIT II

DIFFERENTIAL EQUATIONS OF HIGHER ORDER AND THEIR APPLICATIONS

Differential equations of higher order - homogeneous and non-homogenous type, differential equations of second order and higher order with constant coefficients with

right hand side term of the type $e^{ax} \sin(ax)$, $\cos(ax)$, polynomials in x , $e^{ax} V(x)$, $x V(x)$ and method of variation of parameters, applications to spring mass system ,Simple harmonic motion and L-C-R Circuits.

UNIT III

DIFFERENTIAL EQUATIONS WITH VARIABLE COEFFICIENTS

Euler-Cauchy's 2nd order differential equations, Series solutions of second order Ordinary Differential Equations, Regular point, Regular singular point, Frobenius Method.

UNIT IV

LAPLACE TRANSFORMS

Existence condition, Laplace transform of Elementary functions, Properties of Laplace transforms, Laplace transform of special functions (Unit step function, Dirac delta function and Periodic function).

UNIT V

INVERSE LAPLACE TRANSFORMS

Inverse Laplace transform of functions using partial fractions, Convolution theorem (statement only). Solving linear differential equations and Integro-differential equations using Laplace transform.

TEXT BOOKS:

1. Higher Engineering Mathematics – B. S. Grewal, Khanna publishers.
2. A First Course in Differential Equations by Dennis G. Zill; *Publisher: Brooks Cole publishers.*

REFERENCES:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition; *Publisher: John Wiley.*
2. Advanced Engineering Mathematics by Peter V. O'Neil, 9th Edition; *Publisher: Cengage Learning*
3. Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar; *Narosa Publications.*

(5BS22) PHYSICS OF MATERIALS

Course Objectives:

- To learn basic structures and classifications of solids.
- To study nature of dielectric, magnetic and size dependent properties of materials.
- To visualize different kinds of materials in engineering and technology.

Course Outcomes:

After completion of the course the student is able to

- Identify different types of crystals, their defects and importance of X-ray studies in crystals.
- recognize materials' magnetic, dielectric and size dependent behavior.
- show case some applications of crystals and different kinds of materials in engineering.

UNIT I

CRYSTAL STRUCTURES:

Space lattice, Unit cell, Lattice parameters, Crystal systems, Bravais lattice, Atomic radius, Co-ordination number, Structures and Packing fractions of Simple Cubic, Body Centered Cubic, Face Centered Cubic, Hexagonally closed packed & Diamond Cubic Crystals.

BONDING IN SOLIDS:

Force and energy between two approaching atoms, primary and secondary bonds, binding energy and cohesive energy, Madelung constant, cohesive energy and Madelung constant for NaCl crystal

UNIT II

DIRECTIONS, PLANES AND X-RD:

Miller Indices for Crystal planes and directions, Inter planar spacing of orthogonal crystal systems, Diffraction of X-rays by crystal planes and Bragg's law, Laue method, Powder method.

DEFECTS IN SOLIDS:

Imperfections in crystals, Point defects (Vacancies, Interstitial and Impurities) Schottky and Frenkel defects (with mathematical treatment), Line imperfections, Edge and Screw dislocation, Burger vector, Surface defects and volume defects (Qualitative Treatment).

UNIT III

MAGNETIC PROPERTIES OF MATERIALS:

Permeability, Field intensity, magnetic field induction, Magnetization and Magnetic susceptibility – Origin of magnetic moment, Bohr magneton – Classification of magnetic materials (Dia, Para and Ferro)- Domain theory of ferromagnetism, Hysteresis curve – Soft and Hard magnetic materials – Ferrites and their applications.

UNIT IV

DIELECTRIC PROPERTIES:

Electric dipole, Dipole moment, Dielectric constant, Electronic, Ionic and Orientation Polarization – Calculation of Polarizabilities, Internal fields, Clausius – Mossotti equation, Piezo and Ferro electricity

SUPERCONDUCTORS:

Experimental survey and superconductivity phenomenon, Meissner effect, Critical fields and Persistent currents, Type I and Type II superconductors, London equations, flux quantization, Applications of Superconductors.

UNIT V**SCIENCE & TECHNOLOGY OF NANOMATERIALS:**

Work function, Thermionic emission, Contact Potential, Electron Microscope, Scanning Tunneling Microscope. Origin of nano science, (Basic principles of Nanoscience & Technology) surface to volume ratio, quantum confinement, Fabrication of nano materials, Bottom up fabrication: sol-gel & combustion methods, Top down fabrication: CVD& PVD methods, Applications of nanotechnology.

TEXT BOOKS:

- (1) Introduction to Solid State Physics by Charles Kittel (Publishers: John Wiley & Sons)
- (2) Applied Physics by P.K.Mittal, IK International Publishing House (P) Ltd

REFERENCES

1. Solid State Physics by A.J.Dekker; Macmillan Publishers India Lt.
2. Engineering Physics by G Sahashra Buddhé; University Press
3. Elements of Solid State Physics by J.P.Srivatsva, PHI Publishers
4. Engineering Physics by M.R.Srinivasan, New Age Publishers
5. Solid State Physics by M.A. Wahab.

(5BS01) ENGLISH

Introduction

This is the age of information and communication technologies. Engineers and technical professionals need to convey technical information in English for various purposes.

Besides learning general English as an international language, engineering students need to be equipped with adequate writing ability so that they can communicate technical information clearly on at least a basic level. A good English writing proficiency can be a contributing factor to professional recognition and career prospects. This course teaches those writing strategies that scientists, engineers, and others will need in order to write successfully on the job. It initiates the students into Technical Writing. The purposes of technical writing are to inform and persuade. This program aims to train students in writing clear, concise and effective English and also develop their reading skills.

This Syllabus is therefore, a Pragmatic English Writing and Reading Program for engineering students with intermediate proficiency. The program covers a syllabus outline and instructional approaches on basic writing and reading skills with particular reference to technical writing.

Course Objectives:

- To equip the students with all the LSRW skills for academic writing and speaking.
- To equip the students with basic grammar, infrastructural patterns, reading techniques and grammatical constructions required in technical writing as well as oral communication.
- To acquaint the students with the writing process in preparation for academic and workplace writing.
- Equip the students with the concept of coherence and cohesion for meaningful and coherent communication.

Course Outcomes:

After going through this course the student will be able to

- Comprehend technical writing produced in the engineering profession
- Understand the writing process and create logical paragraphs
- Use infrastructural patterns in writing and speaking
- Students communicate coherently orally and in writing.

Methodology

A Task-based, process oriented methodology will be used by the teachers to give a practical orientation to the teaching of language. An inductive approach will be used to demonstrate the use of language in context. This should enable the students to internalize the language structures and vocabulary used in context. Students will be exposed to numerous examples and ample practice will be given in the contextual use of language structures.

Unit I : Review of Grammar

- i) Common Errors v) Use of Articles and Prepositions
- ii) Subject-Verb Agreement vi) Conjunctions
- iii) Adverbs vii) pronoun reference
- iv) Transitional elements

Unit II : Prose 1

- Heaven's Gate by Pico Iyer
- The Connoisseur by Nergis Dalal

Unit III : Reading and Writing Skills

- Reading Comprehension -- Skimming & scanning
- Reading Comprehension -- Intensive & extensive reading
- Paragraph Writing
- Letter Writing
- Memo Writing

Unit IV : Prose 2

- The Cuddalore Experience by Anu George
- The Odds Against Us by Satyajit Ray

Unit V : Writing Skills

1. Comparison and Contrast Pattern
2. Cause and Effect Pattern
3. Classification
4. Analogy (Introductory Level)
5. Problem-Solution Pattern

TEXT BOOKS

- **Enjoying Everyday English** by A. Ramakrishna Rao
- **Effective Technical Communication** by Ashraf Rizvi
- **Technical Writing Process and Product** by Gerson Sharon J. and Steven Gerson
3rd edition, New Jersey: Prentice Hall 1999

References

- M. Raman and S. Sharma, 2004; Technical Communication : Principles and Practices, OUP, (Indian Edition)
- Blanton, L.L. 1993; Composition Practice, Book 4 ,Second Edition, Heinle & Heinle Publishers, pp. 54
- Georges, T.M. 1996; A course in Analytical Writing for Science and Technology,
<http://www.mspiggy.etl.noaa.gov/write/>

(5BS32) ENGINEERING CHEMISTRY

Course Objectives:

- Understanding the concept of generating electricity by batteries.
- Conceptual knowledge of corrosion science.
- Acquiring the knowledge of preparation, properties and usage of polymers.
- Applying the concept of hardness to analyze various boiler troubles in the steam generation.
- Familiarize the features of carbon nanotubes, composites and self- healing materials.

Course outcomes:

After the completion of the course student will be able to,

- Interpret the chemical applications of the various types of batteries used in the present day world.
- Acquire the knowledge of corrosion for protecting structures and safeguarding the economy.
- Evaluate the suitability of various polymers for different applications.
- Analyze and compare the different softening techniques of water.
- Summarize the applications of carbon nanotubes, composites and self- healing materials.

UNIT I

Batteries and Fuel cells

Electrochemistry-definition, types of cells- differences between electrolytic and electrochemical cells, conditions of reversibility, principle of batteries, Primary cells-(Dry cell, Mercury battery) and secondary cells -lead-acid cell; Ni-Cd cell; lithium- ion cells (intercalated); Fuel cells : methanol – oxygen fuel cell, advantages of fuel cells; Solar cells - principle and applications.

UNIT II

Corrosion and its control

Introduction; Causes and effects of corrosion; Theories of corrosion – chemical and electrochemical corrosion (reactions); Types of corrosion (Differential aeration corrosion: pitting, crevice and waterline corrosion, Differential metal corrosion: galvanic corrosion) ; Factors affecting corrosion – nature of metal(galvanic series; passivity; purity of metal; nature of oxide film; nature of corrosion product), and nature of environment (effect of temperature; effect of pH; humidity; formation of oxygen concentration cells)

Corrosion control methods – cathodic protection-sacrificial anode and impressed current cathodic protection.

Surface coatings –differences between galvanizing and tinning; cladding; electroplating (copper plating), paints - constituents and functions.

UNIT III

Polymers

Plastics - Thermoplastic resins, and Thermosetting resins, fabrication of plastics – compression, injection. Preparation, properties, and engineering applications of PE, PVC, Teflon, Bakelite, Nylon and Kevlar.

Rubber

Processing and vulcanization, preparation, properties, and engineering applications of Buna-s; Butyl rubber; Thiokol rubber.

UNIT IV

Water and its Treatment

Introduction; Hardness - causes, expression of hardness, units, types of hardness, numerical problems. Estimation of temporary & permanent hardness of water by EDTA method (no numerical problems). Boiler troubles - scale & sludge formation, caustic embrittlement, boiler corrosion, priming & foaming. Softening of water by zeolite and ion exchange process (no numerical problems), Desalination processes - reverse osmosis

UNIT V

Smart materials

Nanomaterials -Introduction; preparation and applications of nanomaterials with special reference to carbon nanotubes.

Composites-Need for composites, classification based on reinforcing material (Fiber reinforced composites), and applications of composites.

Self-healing materials- Definition, features, principle of self-healing materials and their applications.

TEXT BOOKS

1. Text Book of Engineering Chemistry by Y.Bharathi Kumari, Jyotsna Cherukuri; Publisher: VGS Book Links.
2. Engineering Chemistry by P.C.Jain & Monica Jain, Publisher: Dhanpatrai Publishing Company.

REFERENCES

1. Text Book of Engineering Chemistry by S.S. Dhara & Mukkanti; Publisher: S.Chand & Co.
2. Engineering Chemistry by O G Palanna
3. Text Book of Engineering Chemistry by R.Gopalan, D.Venkappayya, Sulochana Nagarajan; Publisher: Vikas Publishers.
4. Engineering Chemistry by R.P.Mani, S.N. Mishra, B.Rama Devi ,Cengage Learning Publications.

(5CE02) ENGINEERING MECHANICS – II

Course Objectives:

Student shall be able to

- **Understand** the assumptions in the analysis of trusses and list the types of trusses.
- **Understand** the principle of virtual work and its applications.
- **Distinguish** between statics and dynamics & kinematics and kinetics
- **Explain** the work-energy principle and impulse-momentum principle.

Course Outcomes:

After the completion of the course student should be able to

- **State** and **explain** concepts of Engineering mechanics for Dynamics
- **Apply** concepts of dynamics to Engineering Applications
- **Analyse** the systems which are in motion for equilibrium conditions
- **Solve** the numerical problems related to dynamics problems

UNIT – I

Trusses

Types of frames – Analysis of pin jointed frames – Assumptions - Method of Joints - Method of Sections - Force table - Cantilever Trusses - Trusses with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT – II

Virtual work

Concept of virtual work - Principle of virtual work - Application of principle of virtual work to beams - ladders and framed structures

UNIT – III

Kinematics

Kinematics of particles – Kinematics of Rectilinear motion – Kinematics of Curvilinear motion – Projectiles – Kinematics of rigid bodies about a fixed axis

UNIT – IV

Kinetics

Kinetics of particles – Newton's Second Law – Differential equations of rectilinear and curvilinear motion – Dynamic equilibrium – Inertia force - D' Alembert's Principle applied for rectilinear and curvilinear motion - Kinetics of rigid bodies

UNIT – V

Work–Energy, Impulse–Momentum

Work of a force - Principle of Work and Energy - Application of principle of Work-Energy - Impulse-Momentum Principle, Application of Impulse - Momentum principle to connected bodies

TEXT BOOKS

1. Engineering Mechanics by S.P.Timoshenko, D.H.Young & J.V.Rao, Tata McGraw Hill Publishers, 4th Edition, 2010

2. Singer's Engineering Mechanics by K. Vijaya Kumar Reddy & J. Suresh kumar ,B.S Publishers,3rd Edition,2011

REFERENCES

1. Engineering Mechanics by S.S. Bhavikatti, Newage International Publishers,2012
2. Engineering Mechanics (Dynamics) by J.L.Meriam & L.G.Kraige, Wiley Publishers, 6th Edition,2006
3. Engineering Mechanics by A.K.Tayal, Umesh Publications,13th Edition,2010
4. Engineering Mechanics by R.K. Rajput, laxmi Publications,1998

I Year B. Tech CE - II Sem
Common to all branches

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(5CE03) ENVIRONMENTAL STUDIES

Course Objectives:

Student shall be able to

- **Recognize** the importance of environment and ecosystem
- **Identify & Analyze** human activities and its impact on environment.
- **List and understand** about the importance of natural resources, Biodiversity & effect of environment pollution
- **Understand** about environmental regulations, economy and environment interaction

Course Outcomes:

After the completion of the course student should be able to

- **Acquire** the knowledge about importance of environment & ecosystem
- **Develop** skills in understanding of various environmental problems
- **Find** the solution and strategies to protect the Environment
- **List & Distinguish** various organizations, regulations for environment protection

UNIT-I

Environmental Studies:

Introduction, Definition, scope and importance. **Ecosystems:** Introduction, types, characteristic features, structure and functions of ecosystems. Bio-geo-chemical cycle, Classification of Ecosystem.

Bio-diversity and its conservation- Value of bio-diversity, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – In-situ and Ex-situ conservation.

UNIT-II

Natural Resources: classification of Resources, Land resources, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems, Forest resources - Use and over-exploitation - food resources, food miles.

Mining and dams – benefits & effects, Water resources, Use and over - utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Conflicts over Water, Energy resources.

UNIT-III

Environmental pollution and its control: Classification of pollution and pollutants, Air pollution, Causes, Effects, Control measures, ambient air quality standards, water pollution causes, effects, control measures, water quality standards, Marine pollution causes, effects & control measures, noise pollution causes, effects and control measures, land pollution causes, effects and control measures, solid waste management, e-waste management.

UNIT-IV

Global environmental problems and global efforts: Nuclear hazards, Nuclear Pollution, Global warming, Acid rains, ozone layer depletion, over population, hazardous waste. Clean development mechanism, green building, carbon credits, carbon trading.

International Conventions/protocols: UNEP, UNFCCC, Earth summit, Kyoto protocol, Montreal protocol and Stockholm declaration.

UNIT-V

Environmental policy, legislation, rules and regulations : National Environmental Policy Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act-1981, Water(Prevention and Control of pollution) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .

Economy and Environment, The economy and environment interaction, Economics of development, preservation and Conservation, Sustainability: theory and practices.

Environmental Impact Assessment, Rain water harvesting, cloud seeding and watershed management.

TEXT BOOKS

1. Environmental Science by Y.Anjaneyulu, B S Publications, 2004.
2. Environmental studies by Deeksha dave, Cengage learning India Pvt. Ltd, 1st edition, 2011.
3. Environmental Science and Technology by M. Anji Reddy, B S Publications, 2010

REFERENCES

1. Environmental Studies for UG Courses, Bharucha Erach, UGC Publications, Delhi, 2004.
2. Environmental Encyclopedia by Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.
3. Environmental sciences and Engineering by P.Venugopal Rao, PHI Learning Pvt. Ltd.,

(5CE52) GEOMETRICAL DRAWING-II

Course Objectives:

Student shall be able to

- **Learn** Sections and Sectional views of different solids.
- **Differentiate** Orthographic projections and Isometric Projections.
- **Learn and draw** Perspective projections of planes & solids.
- **Know** Sign conventions of different materials used in Civil Engineering Construction.

Course Outcomes:

After the completion of the course student should be able to

- **Draw** Sectional views of different solids.
- **Practice** transformation of Orthographic projections to Isometric Projections.
- **Generate** Perspective projections of planes & solids.
- **Identify** different sign conventions of materials.

UNIT- I

Sections and Sectional Views of Solids

Sections of right regular solids-prisms, pyramids, cylinders and cones. Sections of solids cut by planes parallel to one plane and perpendicular to other plane and Oblique plane.

UNIT- II

Isometric Projections

Principles of isometric projections, Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids.

UNIT- III

Transformation of Projections

Conversion of isometric views to orthographic views-conventions and vice versa.

UNIT- IV

Perspective Projections

Perspective view of points, lines, plane figures and simple solids, vanishing point method & visual ray method.

UNIT- V

Sign Conventions: Brick, Stone, Sand filling, Mortar, Concrete, Glass, Steel, Aluminium, Earth, Rock and Timber, doors and windows.

Introduction to Line Plan and Sectional Plan of Buildings.

TEXT BOOKS

1. Engineering drawing by N.D.Bhatt - Charotar Publishing House Pvt.Ltd., 53rd Edition, 2014.
2. Engineering Drawing by Basant Agrawal – McGraw hill education (India) Pvt. Ltd., 1st edition, 2013.

REFERENCES

1. Engineering Drawing with Auto CAD by K.Venkata Reddy - B.S Publications, 4th edition, 2009.

2. Civil Engineering Drawing-I by N.Sreenivasulu, S.Rama Rao – Radiant Publishing house, 2nd edition, 2013.
3. Engineering Drawing by M. B. Shah, Pearson Education India, 2nd edition, 2009.
4. Engineering Drawing and Graphics by K Venugopal, New Age International, 5th edition, 2004.

VNR Vignana Jyothi Institute of Engineering and Technology

I Year B.Tech (Common to EEE, ECE, EIE, CSE, IT,CE)

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(5ME53) IT AND ENGINEERING WORKSHOP

Course Prerequisites: basic knowledge about different Trades, computer hardware, Operating System, different trades in mechanical engineering.

Course Objectives:

After going through this course the student will be able to

- To study/demonstrate the concepts of computer w.r.t. it's hardware.
- To install the operating system and perform various tasks
- To conduct the experiments related to production engineering technology.
- To demonstrate the usage of power tools, CNC lathe and machine shop for different exercises

Course Outcomes:

Students will be able to

- Identify, assemble and disassemble the given configuration of a computer.
- Install the operating system in the given configuration of a computer and execute commands for LINUX Operating System
- To develop components using the techniques of carpentry, tin smithy, forging, etc. listed in trades for exercises.
- To work out the given models in machine shop and CNC lathe.

IT WORKSHOP

1. Computer Hardware: Identification of Peripherals
2. Study of UPS and SMPS
3. Assembling and disassembling of a PC
4. Simple diagnostic exercises – Related to hardware
5. Installation of Windows Operating System
6. Installation of Linux Operating System
7. Linux Basic Commands
8. Simple diagnostic exercises –Related to Operating System

TEXTBOOKS:

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by Davis Anfinson and Ken Quamme CISC Press, Pearson Education.
2. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

ENGINEERING WORKSHOP TRADES FOR EXERCISES

At least **two** exercises from each trade:

1. Carpentry
2. Tin-Smithy
3. Fitting
4. Welding
5. Electrical Wiring

TRADES FOR DEMONSTRATION and EXPOSURE:

1. Power tools in construction, wood working, electrical engineering and mechanical engineering.
2. Machine shop.

3. CNC Lathe.
4. 3D Printing.

TEXT BOOKS:

1. Workshop Manual by P.Kannaiah and K.L.Narayana; Publisher: Scitech.

(5BS02) ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

The English Language Communication Skills Lab aims to provide practice in all the four skills of LSRW, with a special emphasis on listening and speaking skills.

Course Objectives:

- Provide ample practice in LSRW skills and train the students in oral presentations, public speaking, role play and situational dialogue.
- Provide practice in word usage, grammatical construction, structural patterns, and improve comprehension abilities in the students.
- Train students to use neutral pronunciation through phonetic sounds, symbols, stress and intonation.
- Enable students to transfer information from verbal to graphic representation and vice versa.

Course Outcomes:

After going through this course the student will be able to

- Comprehend spoken and written discourse.
- Speak fluently with neutral pronunciation and exhibit interpersonal skills.
- Write accurately, coherently and lucidly making appropriate use of words depending on context and present data clearly.
- Introduce oneself to people and be able to speak extempore.

UNIT I

Computer Aided Language Lab:

- Grammar : Nouns and Pronouns; Articles; The Present Tense
- Vocabulary: Lesson 1
- Listening Comprehension

Communication Skills Lab: Introduction of Self and others

UNIT II

Computer Aided Language Lab:

1. Grammar: Concord; Adjectives; The Past Tense
2. Vocabulary: Lesson 2
3. Listening Skills

Communication Skills Lab: Seeking and Giving Information, Giving and Taking Instructions

UNIT III

Computer Aided Language Lab:

Grammar --- Adverbs, Conjunctions, Prepositions; The Future Tense

- Vocabulary: Lesson 3
- Telephoning Skills

Communication Skills Lab: Role Play/ Situational Dialogues

UNIT IV

Computer Aided Language Lab:

1. Grammar ---- Active and Passive Voice
2. Vocabulary: Lesson 4
3. Listening Comprehension

Communication Skills Lab: i) JAM/ Short Talk ii) Information Transfer a) Interpretation of Graph

UNIT V

Computer Aided Language Lab:

1. Introduction to Technical Writing

- A. Definition of a Technical Term
- B. Description of a Mechanism
- C. Description of a Technical Process

2. Vocabulary: Lesson 5

Communication Skills Lab : Presentation Skills: Oral Presentation

Computer Aided Language Lab Requirements:

The English Language Lab shall have two parts:

- i) **The Computer aided Language Lab** for 30 students with 30 systems, one master console, LAN facility and English language software for self- study by learners.
 - ii) **The Communication Skills Lab** with conference tables and movable chairs for 30 students and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and a camcorder
- **System Requirement (Hardware component):**
Computer network with Lan with 30 multimedia systems with the following specifications:
 - P – IV Processor
 - Speed – 2.8 GHZ
 - RAM – 512 MB Minimum
 - Hard Disk – 80 GB
 - Headphones of High quality

iv) Suggested Resources:

Software consisting of the prescribed topics elaborated above may be procured and used. Additionally, the abundantly available online resources may also be used.

List of suggested software:

- **Tense Busters (5 Levels)**
- **Walden Educare**
- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)**

(5BS16) PROBABILITY AND STATISTICS

Course prerequisites: Permutations and Combinations, Basic Statistics.

Course Objectives:

- Introduce the elementary ideas in basic probability.
- Develop the concept of Probability distributions
- Introduce the basic concepts in estimation theory and test of hypothesis
- Introduce the notion of time series and its utility in engineering applications

Course Outcomes:

Students will be able to

- Comprehend the concepts of sample spaces and Discrete and Continuous distributions
- Apply the concepts of Sampling distributions, Point and interval estimation and Hypothesis Testing to solve problems in engineering
- Analyze Paired data, Linear regression models and Correlation .
- Use Least squares method to compute time series

UNIT I

Probability and Distributions

Sample space and events, Probability- The axioms of probability, some elementary theorems, conditional probability, Baye's theorem. Random variables - discrete and continuous. Distributions - Binomial, Poisson and Normal distributions–related properties.

UNIT II

Correlation and Regression

Coefficient of correlation, regression coefficient, the lines of regression, rank correlation

UNIT III

Sampling Distributions and Testing of Hypothesis

Sampling distributions, sampling distribution of means (σ known and unknown). Point estimation, interval estimation. Tests of hypothesis - null hypothesis, alternate hypothesis, type I, type II errors, critical region. Inferences concerning means and proportions- Large samples- test of hypothesis for single mean and difference between the means. Test of hypothesis for the proportions- single and difference between the proportions, confidence interval for the mean and proportions.

UNIT IV

Tests of significance- Small samples

Tests of significance-t distributions, confidence interval for the t- distribution, F-distributions and Chi square distributions.

UNIT V

Time Series analysis

Time series- utility of time series analysis, components of time series. Preliminary adjustments before analyzing time series. Measurement of trend by the method of least squares, method of moments.

TEXT BOOKS

1. Probability and Statistics for Engineers – Richard . A.Johanson, 1995, 5th Edition, Prentice-Hall.
2. Statistical Methods - S.P. Gupta, (2011), Sultan Chand and sons.

REFERENCES

1. Applied Statistics for Engineers-Jay.L.Devore, Nicholas. R.Famum, Jimmy.A.Do, 3rd Edition, Cengage
2. The Analysis of Time Series -An Introduction:-Chris Chatfield, Sixth Edition, CRC Press.

VNR Vignana Jyothi Institute of Engineering & Technology

II Year B. Tech CE - I Sem

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(5BS41) BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

Course Prerequisites: Basic knowledge of Economics

Course Objectives:

The objective of this course is to:

- To explain different forms of organizing private and public sector business enterprises and to analyze the significance of Business Economics in solving the problems of business enterprise. Also to define and analyze the concepts of Demand, Elasticity of Demand and Demand Forecasting Methods.
- To analyze the various types of costs and to determine the level of output at which there is neither profit nor loss. To estimate capital requirements and to describe various sources of mobilizing funds. Also to identify least cost combinations of inputs produce desired quantity of output.
- To describe the features of different market structure and pricing strategies.
- To explain the basic accounting concepts and conventions. To elaborate the importance of finance function for evaluating the economic status of a business unit.

Course Outcomes:

Upon completion of this course students should be able to:

- Select the suitable form of business organization which meets the requirement of selected business also perform decision – making function effectively in an uncertain frame work by applying concepts of Managerial Economics. Meet and manipulate the demand efficiently and plan the future course of action.
- Apply right kind cost to reduce cost by paying attention towards the costs which can be reduced. Take decision whether to buy or produce? Reduce the cost of capital by selecting best source of fund mobilization and select best investment opportunity which yields higher rate of return.
- Fix the right price which can best meets the predetermined objectives of the business firm under different market conditions. Able to select best combination of inputs to produce required quantity of output.
- Prepare books of accounts and know over all financial position of the business enterprise which enables the concerned to take appropriate measures to improve the situation. Also interpret the financial position from difference angles and initiates the measures/ efforts in that direction.

UNIT I

Business and new economic environment

Characteristic features of business; Features and evaluation of sole proprietorship; Partnership; Joint stock company; Public enterprises and their types; Changing business environment in post- liberalization scenario.

UNIT II

Introduction to business economics, and demand analysis

Definition; Nature and scope of managerial economics - demand analysis determinants; Law of demand and its exceptions.

Elasticity of demand and demand forecasting

Definition; Types; Measurement and significance of elasticity of demand; Demand forecasting; Factors governing demand forecasting; Methods of demand forecasting - survey

methods, statistical methods, expert opinion method, test marketing, controlled experiments, and judgmental approach to demand forecasting.

UNIT III

Cost analysis

Cost concepts - opportunity cost, fixed vs. variable costs, explicit costs vs. implicit costs, and out of pocket costs vs. imputed costs; Break-even analysis (BEA) - determination of break-even point (simple problems), managerial significance, and limitations of BEA.

Capital and capital budgeting

Capital and its significance; Types of capital; Estimation of fixed and working capital requirements; Methods and sources of raising finance.

Nature and scope of capital budgeting; Features of capital budgeting proposals; Methods of capital budgeting - payback method, accounting rate of return (ARR), and net present value method (simple problems)

UNIT IV

Theory of production

Production function - isoquants and isocosts, least cost combination of inputs, and laws of returns; Internal and external economics of scale.

Market structures

Types of competition; Features of perfect competition, monopoly, and monopolistic competition; Price-output determination in case of perfect competition and monopoly.

Pricing policies and methods

Cost plus pricing; Marginal cost pricing; Sealed bid pricing; Going rate pricing, Limit pricing, Market skimming pricing, Penetration pricing, Two-part pricing, Block pricing, Bundling pricing, Peak load pricing, Cross subsidization.

UNIT V

Introduction to financial accounting

Double-entry book keeping; Journal; Ledger; Trial balance; Final accounts - trading account, profit and loss account, and balance sheet with simple adjustments.

Financial analysis through ratios

Computation; Analysis and interpretation of liquidity ratios - current ratio, and quick ratio; Activity ratios - inventory turnover ratio, and debtor turnover ratio; Capital structure ratios – debt-equity ratio, and interest coverage ratio; Profitability ratios - gross profit ratio, net profit ratio, operating ratio, P/E ratio, and EPs.

TEXT BOOKS

1. Managerial Economics and Financial Analysis by Aryasri, 2009; *Publisher: Tata McGraw Hill.*
2. Managerial Economics by Varshney & Maheswari, 2009; *Publisher: Sultan Chand.*

REFERENCES

1. Financial Accounting for Management: An analytical perspective by Ambrish Gupta, 2010; *Publisher: Pearson Education.*
2. Managerial Economics by H. Craig Peterson & W. Cris Lewis; *Publisher: Prentice Hall of India.*

(5CE04) BUILDING MATERIALS, CONSTRUCTION AND PLANNING

Course Objectives:

Student shall be able to

- **List** the construction material.
- **Explain** different construction techniques
- **Understand** the building bye-laws
- **Accentuate** smart building materials

Course Outcomes:

After the completion of the course student should be able to

- **Define** the Basic terminology that is used in the industry
- **Categorize** different building materials , properties and their uses
- **Understand** the Prevention of damage measures and good workmanship
- **Explain** different building services

UNIT – I

Stones and bricks, tiles

Building stones – classification and quarrying – properties – structural requirements – dressing. Bricks – composition of Brick earth – manufacture and structural requirements.

UNIT – II

Cement & admixtures, wood, aluminium, steel, building components

Ingredients of cement – manufacture – field & lab tests ;Admixtures – mineral & chemical admixtures – uses, Wood – structure – types and properties – seasoning – defects; steel & aluminum, Lintels, Arches, walls, stair cases – types of floors, types of roofs – flat, curved, trussed; foundations – types; Damp Proof Course; Joinery – doors – windows

UNIT – III

Masonry and finishing, formwork

Brick masonry – types – bonds; Stone masonry – types; Composite masonry – brick – stone masonry; concrete, reinforced brick.; Finishes – Plastering, pointing, painting, claddings – types – tiles- ACP, Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT – IV

Building services

Plumbing Services, Water Distribution, Sanitary – Lines & Fittings; Ventilators: Functional requirements, systems of ventilators. Air conditioning – Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire hazards

UNIT – V

Building planning

Principles of Building Planning, classification of buildings and Building bye laws – Building Information System.

TEXT BOOKS

1. Building Materials by Duggal, New Age International, 5th edition, 2010.
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain- Laxmi Publications (P) Ltd, New Delhi., 10th edition, 2008.

REFERENCES

1. Elements of Civil Engineering by Anurag Kandya, Charotar publishing house, 2nd edition, 2011.
2. Building Construction-Arora & Bindra, Dhanpat Roy Publications, 5th edition, 2010
3. Building Construction by PC Varghese, PHI, 3rd edition, 2009.
4. Construction Technology by R.Chudley, 5th edition, 20011.

Codes:

1. National Building Code.
2. Building bye laws by State and Central governments and Municipal corporations.

(5CE05) FLUID MECHANICS

Course Objectives:

Student shall be able to

- **Identify** and obtain values of fluid properties and relationship between them.
- **Explain** the principles of continuity, momentum, and energy as applied to fluid motions.
- **Apply** these principles in the form of mathematical equations.
- To enable the students **to solve** these equations as applied to practical fluid mechanics problems.

Course Outcomes:

After the completion of the course student should be able to

- **Define** fundamental concepts of fluid mechanics as applied to civil engineering and environmental problems.
- **Discuss** and derive the fundamental mathematical equations of fluid mechanics
- **Solve** the fluid mechanics problems as related to practical civil engineering problems of water conveyance in pipes, orifices, mouth pieces, notches and weirs.
- **Evaluate** the various assumptions made in the application of equations to avoid the common pitfalls

UNIT – I

Properties of Fluid

Introduction; Properties of Fluid; Units of measurement; Fluid Continuum; Newtonian and Non-Newtonian fluids; Vapour pressure.

Fluid Statics

Variation of static pressure; Absolute and gauge pressure; Pressure measurement by mechanical gauges and manometers; Pressure on plane surfaces and curved surfaces.

UNIT - II

Kinematics of Fluid Motion

Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline Pathline; Streakline; Equation for acceleration; Convective acceleration; Continuity equation; Velocity potential and stream function; Flownet; Vortex flow – free vortex and forced vortex flow.

Dynamics of Fluid Flow

Euler's equation of motion; Bernoulli's equation; Energy correction factor; Momentum principle; Applications of momentum equation; Force exerted on a pipe bend.

UNIT - III

Flow Measurement

Measurement of velocity by Pilot tube. discharge through venture meter; discharge through orifice meter; Discharge through flow nozzle. Flow through orifices; Determination of coefficients for an orifice. Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

UNIT – IV

Analysis of Pipe Flow

Reynolds experiment – Classification of Laminar & Turbulent flows. Steady laminar flow through circular pipes. Energy losses in pipelines: Minor losses, Darcy – weisbach equation; Pipes in series and parallel; Total energy line and hydraulic gradient line.

UNIT – V

Theory of Boundary Layer

Boundary layer and its growth, Characteristics of Boundary layer along a thin flat plate, Laminar and Turbulent Boundary layers (no derivations), Boundary layer Separation and Control. Flow around submerged objects - Drag and Lift - Magnus effect.

TEXT BOOKS

1. Fluid Mechanics by Modi and Seth, Standard Book House, 2011.
2. Fluid Mechanics & Hydraulic Machines Problems and Solutions by K. Subramanya McGraw Education. (I) Pvt. Ltd., 2011.

REFERENCES

1. Fluid Mechanics by V.L.Streeter, E. Benjamin Wiley and W. Bedford, McGraw-Hill Companies, 1997.
2. Fluid Mechanics by Douglas, J.M. Gaserek and J.A.Swaffird, Longman Publishers, 1995.
3. Fluid Mechanics by Frank.M.White, Tata McGraw Hill Pvt. Ltd., 2011.
4. Fluid Mechanics by A.K.Mohanty, Prentice Hall of India Pvt. Ltd., 2002.

(5CE06) STRENGTH OF MATERIALS-I

Course Objectives:

Student shall be able to

- Analyze various forces, various supports, combination of various loads and deformation of the structures or member.
- Visualize the difference in strengthening a member by increasing the cross sectional dimensions or making it unnecessarily large and uneconomical. He will be able to realize that providing larger dimensions than optimum will make the members costly and inefficient too.
- Describe to predict the displacements or deformations of a member or a structure due to various Loads and Load combinations.
- Learn the difference between ductile and brittle materials.

Course Outcomes:

After the completion of the course student should be able to

- List the types of straining actions that occur due to different types of loading.
- articulate the geometry of the structure to avoid development of undesirable straining actions against which the material is weak.
- economize the structure by proper modification like making it composite member or pre-stressing it to introduce stresses of opposite nature.
- judge the suitability of a particular material for a particular situation, such as ductile materials for withstanding dynamic loads.

UNIT – I

Simple Stresses and Strains

Hooke's law – Stress and Strain– Stress-Strain diagram for mild steel – Elasticity and Plasticity –Types of Stresses and Strains – Comparison of stress-strain curves for ductile and brittle materials – Various types of 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.

UNIT – II

Statically Indeterminate Combinations

Members subjected to self-weight acting axially and their articulation for uniform stress – Equations of Equilibrium and Compatibility – Statically Indeterminate Combinations – Composite bars – Temperature Stresses – Strain Energy – Strain energy due to axial loads gradually applied, suddenly applied and impact loads.

UNIT – III

Shear Force and Bending Moment

Types of supports, loads, beams – Concept of shear force and bending moment – Relation between SF, BM and Rate of loading-SF and BM diagrams for statically determinate beams – Point of Contraflexure and its significance – Case of making maximum bending moment a minimum.

UNIT – IV

Flexural & Shear Stresses

Theory of Simple bending – Assumptions – Derivation of flexure formula – Neutral axis – Bending stresses – Section modulus for various sections, Design of simple beam sections – Advantages of hollow sections.

Derivation of Shear stress formula – Shear stress distribution across depth of various beam sections like rectangular, circular, triangular, I, T, and angle sections – Role played by the flanges and web of I section used as beams.

UNIT - V

Deflection of beams:

Slope, Deflection and Radius of curvature – Differential equation for the elastic line of a beam – Slope and Deflection of beams using Successive Integration method – Macaulay's Method – Mohr's Moment Area Method – Conjugate Beam Method – Application to Cantilever and Simply Supported Beams.

TEXT BOOKS

1. A Text book of Strength of materials by R.K. Bansal, Laxmi Publications (P) Ltd., 6th Edition, 2015
2. Mechanics of Structures – Vol.1 by S.B.Junnarkar, Charotar Publishing House, 31st Edition, 2014.

REFERENCES

1. Strength of Materials by Schaum's Outline Series, Mc. Graw Hill International Editions, 6th Edition, 2013.
2. Mechanics of Materials by Ferdinand P. Beer and others, Tata McGraw Hill, 6th Edition, 2013.
3. Strength of Materials by B.C.Punmia, , Laxmi Publications (P) Ltd., 10th Edition, 2013
4. Mechanics of materials by James M. Gere., Thomson Brooks/cole., 5th Edition, 2004

(5CE07) SURVEYING

Course Objectives:

Student shall be able to

- Learn and **understand** the basic methods of classifications and principles of surveying.
- **learn** how to differentiate the methods of area calculation used in surveying.
- **discriminate** the importance of horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance on ground profile.
- **articulate** on construction of setting out of simple curves and recite on modern instruments used in surveying.

Course Outcomes:

After the completion of the course student should be able to

- **appreciate** the importance of preparation of Map and Plan for required site with suitable scale.
- **prepare** contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
- **judge** on which type of instrument to be used for carrying out survey for a setting out curves and vertical elevations and horizontal distances.
- **describe** different modern instruments used in surveying.

UNIT – 1

Surveying & measurements

Surveying – History; Definition; Classification; Principles of surveying; Plan and map; Measurements – Basic Measurements and methods; Errors in surveying; Types of errors

Linear measurements

Different methods; Ranging out; Chaining a line on a flat and on uneven ground; Principles of chain surveying; Basic definitions; Equipment used for chain survey; Field work; Offsets; Obstacles in chain survey; Chain & Tape corrections; Degree of accuracy.

UNIT – II

Compass surveying

Prismatic compass; Local attraction; angular measurements Bearings: Azimuths; deflection angles;

Plane table and its accessories; setting up; Plane tabling methods, Radiation & Intersection method. Errors in plane tabling;

Simple leveling

Basic definitions; Curvature and Refraction; classification of methods of leveling; Sources of errors in leveling. Contour; contour interval; Characteristics of contours; Methods of plotting of contours –Uses of contour maps – Interpolation of contour.

UNIT – III

Areas & volumes

Introduction; Simpson's rule; Boundaries with offsets at irregular intervals; Coordinate method; Planimeter. Area of cross sections; two & multi level section; Trapezoidal rule; Prismoidal formula; Volume from spot levels- volume from contour plan; Capacity of a reservoir.

Theodolite & theodolite traverse

Vernier theodolite – basic definitions, fundamental lines, Measurement of a horizontal angle; repetition and reiteration methods of horizontal angle measurement. Measurement of vertical angle- Trigonometric Leveling - Base of the object accessible, base of an inclined object accessible, reduced level of the elevated points with inaccessible bases.

UNIT – IV

Tacheometric surveying

Basic systems of tacheometric measurements; Inclined sight with staff held vertical; inclined sight with staff held normal to the line of sight- Trigonometric Leveling.

Circular curves

Basic definitions; Designation of a curve; Relationship between radius and degree of curve; Elements of a simple circular curve; Methods of setting out.

UNIT – V

Electronic distance measurements

Basic concepts, principle of Electronic Distance Measurement

Modern surveying

Introduction to Geodetic surveying, Total station and Global positioning system, Introduction to Geographic Information System (GIS).

TEXT BOOKS

1. Surveying Vol I & II by K R Arora, Standard Book house Publications, 2010
2. Elementary Surveying by Charles D Ghilani, Paul R Wolf., Prentice Hall, 2012.

REFERENCES

1. Higher Surveying by Chandra A. M., , New Age International Publishers, 2007.
2. Surveying I & II by B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., , Laxmi Publications, 2005.
3. Elements of Plane Surveying by Arthur R Benton and Philip J Taety, Mc. Graw Hill – 2000
4. Surveying & Levelling by R. Subramanian, Oxford University Press, New Delhi, 2011

(5CE53) SURVEYING FIELD WORK - I

Course Objectives:

Student shall be able to

- **learn** the conduct of standard practices using instruments like chain, compass & plane table
- learn and **classify** various instrument used in surveying and **appreciate** calculation area and plotting
- **understand** the importance of leveling in surveying along with its applications
- **apprise** on generation contours and using elevations obtained through leveling instruments.

Course Outcomes:

After the completion of the course student should be able to

- **prepare** Map and Plan for required site with suitable scale.
- **performs** area determination for accessible and inaccessible points.
- **judge** which type of instrument should be used for carrying out survey for an area and its suitability.
- attempt in **construct** profile of given ground locations and **develop** contour maps.

CYCLE - I

Chain surveying

1. Chaining of a line using chain, measurements of area by cross staff survey.
2. Obstacles in chaining.

Compass survey

1. Traversing by compass and plotting after adjustments.
2. Measurement of distance between two inaccessible points by using compass.

Plane Table Surveying

1. Measurement of an area by Radiation method.
2. Intersection Method – Plane Table Survey.
3. Traverse by Plane table Survey.

CYCLE - II

Leveling

1. Measurement of elevation of various given points.
2. Fly Leveling.
3. Longitudinal Leveling
4. Cross – section Leveling
5. Plotting of Contours by Indirect Methods

(5CE54) MATERIAL TESTING LABORATORY

Course Objectives:

Student shall be able to

- The Student shall be able to study the uses of various types of testing machines and capacities.
- The Student shall be able to test various materials against various types of straining actions for assessing their strength against the respective straining actions.
- The At the end of the course student should be able toknow the nature of the material whether ductile or brittle.
- The Student shall be able to understand various implements to apply specific forces using the machine or to augment the utility of the same machine.

Course Outcomes:

After the completion of the course student should be able to

- clearly understands the concepts of deciding the shape or type of specimen for assessing different strengths against various straining actions.
- design the specimens for assessing a particular property of the material with the available machines.
- decide the suitability of the material to the particular situation e.g., dynamic loads, vibrations, impacts, fatigue, etc.,
- design the experiments making use of various techniques of load measuring or deformation measuring instruments.

1. Uni-axial Tension test on a specimen of Ductile Material.
 2. Bending test on Cantilever beam of steel or timber.
 3. Bending test on simply supported beam.
 4. Torsion test on a specimen of ductile material.
 5. Hardness test (Brinell and Rockwell)
 6. Compression and tensile tests on close coiled helical spring.
 7. Compression test on wood (Parallel & Perpendicular to grains) and/or concrete.
 8. Impact test-Izod and Charpy Impact Tests.
 9. Direct Shear test.
 10. Verification of Maxwell's Reciprocal theorem on beams.
 11. Bending test on continuous beam with point load on one span.
 12. Bending test on continuous beam with two point loads, one in each span.
- Additional Experiments:

- Use of electrical resistance strain gauges-Demonstration.

(5BS13) COMPUTATIONAL METHODS

Course Prerequisites: Elementary transformations of matrices, differentiation and integration.

Course Objectives:

- Understand the numerical methods for non linear systems, evaluating definite integrals and solving Ordinary Differential Equations.
- Understand various methods of interpolation and application.
- Understand the Echolen form and Normal form of a matrix and its applications in solving linear system of equations.
- Solving system of linear equations using Jacobi and Gauss-Seidal methods.

Course Outcomes:

After completion of the course the student is able to

- Apply the numerical methods to find a root of algebraic and transcendental equations.
- Apply the numerical methods to find the solutions of ordinary differential equations.
- Find the rank using Echelon form, Normal form and compute eigen values.
- Solve linear equations using Jacobi method and Gauss-Seidal method

UNIT I

Solutions of non-linear systems:

Introduction; Mathematical preliminaries; Solution of algebraic and transcendental equations –bisection method, the method of false position, Fixed point iterative method , Newton - Raphson method, and their order of convergence.

UNIT II

Interpolation:

Introduction; Errors in polynomial interpolation; Finite differences; Forward differences; Backward differences; Central differences; Symbolic relations and separation of symbols; Differences of a polynomial; Newton's formulae for interpolation; Central difference interpolation formulae; Gauss's central difference formulae and Lagrange's interpolation formulae.

UNIT III

Numerical differentiation and Integration:

Numerical differentiation based on interpolation, Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule, Gaussian quadrature 2 & 3 point formulae.

Numerical solutions of ordinary differential equations:

Solution of initial value problems by Taylor's series - Picard's method of successive approximations, Euler's method, and Runge - Kutta methods.

UNIT IV

Matrices:

Elementary Transformations, Rank of matrix, Echelon and Normal forms, Consistency of linear simultaneous equations, Eigen values and eigen vectors and their properties, Caley – Hamilton theorem (without proof), Quadratic forms - reduction of quadratic form to canonical form by linear (congruent) and orthogonal transformations.

UNIT V

Complex Matrices and Iterative Methods for Real Systems:

Unitary, Hermitian and skew – Hermitian matrices. Iterative methods for solving a system of linear equations (Jacobi method, Gauss-Seidal algorithm) and Power method to find largest and smallest eigen values.

TEXT BOOKS:

1. Numerical Methods in Engineering and Science–B.S. Grewal, 3rd edition Publisher: Khanna Publishers
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar; Narosa Publications.

REFERENCES:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition; Publisher: John Wiley and Sons.
2. Elementary Numerical Analysis – an algorithmic approach -Samuel D. Conte and Carl De Boor (2006); 3rd edition; Publisher: Tata McGraw Hill

(Beyond Syllabus: Types of errors and analysis)

(5CE08) HYDRAULICS AND HYDRAULIC MACHINES

Course Objectives:

Student shall be able to

- **Define** the fundamental principles of fluid mechanics for the solution of practical Civil Engineering problems of water conveyance in open channels.
- **Discuss** analysis and design of channels in uniform and Non-uniform flow conditions, operating characteristics of hydraulic machinery (pumps and turbines) and the factors affecting their operation and specifications, as well as their operation in a system.
- **Solve** problems on open channel flow and efficiency of pumps and turbine.
- Study and **Analyze** different types and elements of Hydro Electric Power plants.

Course Outcomes:

After the completion of the course student should be able to

- **Identify** fundamental principles of fluid mechanics in solving problems and making design of open-channel hydraulics under different flow conditions in Civil and Environmental Engineering.
- **Interpret** and apply dimensional analysis and similarity to develop hydraulic models and testing.
- **Solve** problems related to operation characteristics, specifications and efficiencies of hydraulic machines (pumps and turbines).
- **Compare and categorize** the design of appropriate hydraulic pumps and design of hydraulic turbines and their application in Hydro Electric Power plants.

UNIT-I

Open Channel Flow – I

Types of flows – Types 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.

UNIT-II

Open Channel Flow – II

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 – derivation - energy dissipation applications.

UNIT-III

Dimensional Analysis and Similitude

Dimensional analysis – Rayleigh's method and Buckingham's pi theorem – study of Hydraulic models – Geometric, Kinematic and Dynamic similarities – Dimensionless numbers – Model and Prototype relations.

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 – I

Elements 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 – Classification, functions and efficiency (Theory only).

Hydraulic Turbines – II

Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation.

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 – Cavitation.

Hydropower Engineering: Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

TEXT BOOKS

1. Open Channel Flow by K. Subramanya, Tata McGraw Hill Pvt. Ltd., 2008.
2. Hydraulic Machines by K. Subramanya, McGraw Education. (I) Pvt. Ltd., 2013

REFERENCES

1. Hydraulic and Hydraulic Machines by Modi & Seth, Standard Book House, 2013.
2. Fluid Mechanics and Hydraulic Machinery by CSP. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford university Press, 2012.
3. Open channel Hydraulics by V.T.Chow, McGraw-Hill, 1959.
4. Hydraulic Machines with Fluid Power Engineering by Banga & Sharma, Khanna Publishers, 1995.

(5CE09) STRENGTH OF MATERIALS-II

Course Objectives:

Student shall be able to

- define Principal Stresses and strains and different theories of failure.
- understand the concept of Pure torsion and different types of springs and their purposes
- understand Euler's formula, secant and straight line formulae and their application to long and short columns.
- analyze the stresses for the combined action of direct load and Bending Moment, determination of stresses for masonry structures.

Course Outcomes:

After the completion of the course student should be able to

- define Principal stresses and strains, solve the problems on an inclined section of a bar under axial load; understand why material fractures on planes other than the plane over which the tensile force is applied etc.
- define pure torsion, torsion equation, Polar Moment of Inertia, and they will be able to derive the Torsional moment of resistance for shafts and equations for open and close coiled helical springs; realize the advantage of hollow shafts in communicating power.
- define Columns and struts, Analyze columns and struts with different end conditions by using different theories; distinguish the failures by crushing and crippling.
- determine stresses for different masonry structures and avoid development of tension in masonry structures

UNIT-I

Thin & Thick Cylinders

Thin seamless cylindrical shells - Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and volumetric strains – changes in diameter, length and volume of thin cylinders – wire wound thin cylinders-Thin spherical shells.

Introduction to Thick Cylinders - Lamé's Theory for thick cylinders – Derivation of Lamé's equations- Distribution of hoop and radial stresses across the thickness – Radial deflection-Compound cylinders.

UNIT-II

Torsion of Circular Shafts

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

Springs-types of springs – Carriage or leaf springs-, helical springs-deflection of close and open coiled springs under axial pull and axial couple – Springs in series and parallel.

UNIT-III

Principal Stresses and Strains

Introduction - Stresses on an inclined plane at a section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular stresses accompanied by a state of simple shear –Mohr's Circle of stresses –Principal stresses and strains –Analytical and graphical solutions. Theories of Failures–Various Theories of failures like Maximum Principal stress theory - Maximum Principal strain theory –Maximum shear stress theory –Maximum strain energy theory –Maximum shear strain energy theory.

UNIT -IV

Columns and Struts

Introduction –Types of columns – Short , medium and long columns – Axially loaded compression members –Crushing load-points of Inflexion-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 formula – Rankine-Gordon formula –Long columns subjected to eccentric loading –Secant formula – Straight line formula –Prof Perry's formula.

UNIT -V

Direct and Bending Stresses

Stresses under the combined action of direct axial loading and B.M., core of a section – determination of stresses in the case of chimneys ,retaining walls and dams – Middle-third rule –conditions for stability –stresses due to direct loading and B.M about both axes.

TEXT BOOKS

1. A Text book of Strength of materials by R.K. Bansal, Laxmi Publications (P) Ltd., 6th Edition, 2015.
2. Mechanics of Structures – Vol. 2 by S.B.Junnarkar & H.J.Shah, Charotar Publishing House , 24th Edition, 2015.

REFERENCES

1. Mechanics of Materials by Ferdinand P. Beer and others, Tata McGraw Hill, 6th Edition, 2013.
2. Strength of Materials by B.C.Punmia, , Laxmi Publications (P) Ltd., 10th Edition, 2013.
3. Mechanics of materials by James M. Gere., Thomson Brooks/cole., 5th Edition,2004
4. Strength of Materials by Schaum's Outline Series, Mc. Graw Hill International Editions, 6th Edition, 2013.

(5ME20) MECHANICAL AND ELECTRICAL TECHNOLOGY

Course Objectives:

Student shall be able to

- Explain working principles of IC engines and refrigeration
- understand joining technologies and handling equipment
- Know the principles of DC machines and transformers
- Learn the applications of AC Machines & Instruments

Course Outcomes:

After the completion of the course student should be able to

- Classify working principles of IC engines and refrigeration
- define and explain different types of welding techniques
- apply principles of DC machines and transformers
- understand and apply principles of AC Machines & Instruments

UNIT – I

Thermal Engineering:

IC Engines- Classification working principles of petrol, Diesel engines- two stroke and four stroke engines- comparison

Refrigeration: Block diagram – working principle - Refrigerants and properties- Basic principles of Air conditioning.

UNIT – II

Metal Joining Technology

Welding : Introduction – classification – Arc welding – Gas welding – equipment and materials required Arc and Gas cutting, riveting, soldering, brazing

UNIT- III

Handling Equipment :

Earth moving equipment– bull dozers, power showels, excavators conveyors – screw, rollers, pneumatic, hydraulic concrete mixers.

ELECTRICAL:

UNIT – IV

Dc Machines and Transformers:

Principle of operation of DC Generator – emf equation – types – DC motor types – torque equation – applications – three point starter – Principles and Operation of single phase transformer – emf equation losses – efficiency & regulation.

UNIT – V

Ac Machines & Instruments:

Principles of operation alternators – regulation by synchronous impedance method – Principle of operation of Induction motor – slip – torque characteristics – Application – Basic principles of indicating instruments – Permanent magnet moving coil and moving iron instruments.

TEXT BOOKS:

1. Electrical Technology by Edward Hughes, ELBS Longman Publisher.

2. Introduction of Electrical Engineering by M S Naidu & S Kamakshaiah, TMH Publications.

REFERENCES:

1. Mechanical Technology by Khurmi
2. Mechanical Technology by Kodandaraman CP
3. Mechanical Technology by Mathur & Domukundawar
4. Construction, Planning, Equipment & Methods by Peurify
5. Fundamentals of Electrical Engineering – by Ashafaq Hussain, 2nd edition Dhanpat Rai & Co.
6. Theory and Problems of Basic Electrical Engineering – by DP Kothair & I J Nagrath, PHI Publishers.

(5CE10) CONCRETE TECHNOLOGY

Course Objectives:

Student shall be able to

- **Use** different types of cement as per their properties for different field applications.
- **Design** economic concrete mix proportion for different exposure conditions and intended purposes.
- **Supervise** various concreting operations.
- **Conduct** field and laboratory **tests** on concrete in plastic and hardened stage.

Course Outcomes:

After the completion of the course student should be able to

- **Determine** the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
- **Apply** the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
- **Use** advanced laboratory techniques to characterize cement-based materials.
- **Perform** mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

UNIT-I

Cement & Aggregates

Portland cement – chemical composition, hydration, setting of cement , structure of hydrated cement –Tests on physical properties – Different grades of cement – Classification of aggregates – Particle shape & texture – bond, strength & other Mechanical properties of aggregates – specific gravity, bulk density, porosity, adsorption & moisture content of aggregate– sieve analysis – fineness modulus - Grading curves - Grading of fine & coarse aggregates – gap graded aggregate –maximum aggregate size – alkali aggregate reaction – thermal properties.

UNIT-II

Admixtures

Types of Admixtures – Mineral and chemical admixtures – properties – dosages – effects - usage.

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 the manufacture of concrete - Quality of mixing water.

UNIT-III

Hardened concrete

Water/cement ratio - Abram's Law – Gel space ratio law- Maturity concept - strength in tension & compression - Factors affecting strength -Relation between compressive & tensile strengths

UNIT-IV

Testing of hardened Concrete

Compression test -Tension Test - Flexure Test - Splitting Test- Factors affecting strength- Non-Destructive Testing methods – Codal provisions for NDT - Modulus of Elasticity – Static and 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-V

Mix design

Factors in the choice of mix proportions - Durability of concrete – quality control of concrete - Statistical methods – Acceptance criteria –Proportioning of concrete mixes - BIS method of mix design for ordinary and pumpable concrete

Special concretes

Introduction to Light weight concrete – light weight aggregates – cellular concrete – No-fines concrete – fibre reinforced concrete – polymer concrete – High performance concrete – Self compacting concrete – Ready Mix concrete.

TEXT BOOKS

1. Concrete Technology by M.S.Shetty – S.Chand & Co. ;7th edition, 2006.
2. Properties of concrete by A.M.Neville – Low priced edition – 5th edition, 2012.

REFERENCES

1. Concrete Technology by A.R.Santha Kumar, Oxford university press, New Delhi, 3rd edition, 2006.
2. Concrete: Micro Structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers, 4th edition, 2013.
3. Special Structural concretes by Rafat Siddique, Galgotia Publications, 1st edition, 2000.
4. Concrete Technology by M.L.Gambhir – Tata Mc.Graw Hill press, New Delhi, 5th edition, 2013.

(5CE11) STRUCTURAL ANALYSIS - I

Course Objectives:

Student shall be able to

- **Differentiate** the statically determinate and indeterminate structures.
- **Solve** the statically indeterminate structures by applying the principles of equilibrium and compatibility in deformation pertaining to the structure.
- **Analyze** the statically determinate arches and find the deflections in beams, frames using energy principles.
- **Draw** the Influence line diagrams for reaction, SF and BM.

Course Outcomes:

After the completion of the course student should be able to

- **Understand** the advantage of statically indeterminate structure over the statically determinate structure.
- **Sketch** the SF and BM diagrams for determinate and indeterminate beams.
- **Calculate** the deflections in beams and pin jointed trusses.
- **Evaluate** the maximum SF and BM due to various types of moving loads.

UNIT - I

Propped cantilevers :

Analysis of propped cantilevers - shear force and bending moment diagrams - Deflection of propped cantilevers.

Fixed beams :

Introduction to statically indeterminate beams, shear force and bending moment diagrams - deflection of fixed beams, effect of sinking of support, effect of rotation of a support.

UNIT - II

Continuous beams :

Introduction- Clapeyron's theorem of three moments - analysis of continuous beams of constant moment of inertia with one or both ends fixed - continuous beams with overhang, continuous beams with different moments of inertia for different spans - effect of sinking of supports - shear force and bending moment diagrams. Analysis of Fixed beams using Clapeyrons theorem.

UNIT - III

Three hinged Arches :

Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

UNIT-IV

Energy theorems :

Strain energy due to bending moment and shear forces – Castigliano's first theorem – deflection of simple beams and pin jointed trusses.

Indeterminate Structural Analysis — Castigliano's second theorem - Trusses with one degree of internal or external indeterminacy.

UNIT-V

Influence lines :

Definition of influence line for SF, influence line for BM - load position for maximum SF at a section - load position for maximum BM at a section - single point load, udl longer than the span udl shorter than the span.

Moving loads :

Introduction, maximum SF and BM at a given section and absolute maximum S.F. and B.M. due to single concentrated load, udl longer than the span, udl shorter than the span, two points loads with fixed distance between them and several point loads - Equivalent uniformly distributed load - focal length.

TEXT BOOKS :

1. Analysis of Structures – Vol. I by Prof. V.N.Vazirani, Dr. M.M. Ratwani & Dr. S.K. Duggal, Khanna Publishers, 17th Edition.
2. Theory of Structures by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, 12th Edition.

REFERENCES :

1. Theory of Structures by S.P.Timoshenko, D.H.Young, McGraw-Hill International Edition, 2nd Edition, 1965.
2. Structural Analysis by Devdas Menon, Narosa Publishers, 2008.
3. Theory of Structures – Vol. I by G.S. Pandit, S.P.Gupta, R.Gupta, Tata McGraw-Hill Publishers, 2014.
4. Basic Structural Analysis by K. U. Muthu, Azmi Ibrahim, M.Vijayanand and M. Janardhana, I K International Publishing House, 1st Edition, 2011.

(5CE55) FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

Course Objectives:

Student shall be able to

- To **identify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To **explain** the standard measurement techniques of fluid mechanics and their applications.
- To **illustrate** the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To **analyze** the laboratory measurements and to documents the results in an appropriate format.

Course Outcomes:

After the completion of the course student should be able to

- **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
- **Interpret** the results obtained in the laboratory for various experiments.
- **Discover** the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.

List of Experiments

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Trapezoidal Notch
5. Study of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Impact of jet on vanes
8. Study of Hydraulic jump
9. Main characteristics of Pelton wheel turbine
10. Performance test on Francis turbine
11. Main characteristics of a single stage / multi stage Centrifugal Pump
12. Operating characteristics of Reciprocating Pump

(5CE56) SURVEYING FIELD WORK – II

Course Objectives:

Student shall be able to

- **understand** concepts and principles of theodolite and tacheometric surveying.
- gain **knowledge** in measuring angles using theodolite surveying.
- **expedite** the process of setting out of a simple circular curve.
- **appreciate** the applications of modern instruments in measurement of area determination, distance between inaccessible points contouring.

Course Outcomes:

After the completion of the course student should be able to

- **Perform** heights and distance measurement using theodolite surveying.
- **Practice** heights and distance measurement using tacheometric surveying and set out curve using theodolite instrument.
- **Apprise** the importance of modern instruments in determination of area and plotting the same accurately and precisely.
- To **critic** in generation of contour map using total station instruments

CYCLE - I

Theodolite surveying:

1. Measurement of horizontal angles and vertical angles.
2. Determination of tachometer constants.
3. Distance between two inaccessible points using the principles of tachometer surveying.
4. Distance between two inaccessible points using the principles of trigonometric surveying
5. Setting out of simple circular curve.

CYCLE - II

Total Station.

1. Area Measurement
2. Stake Out
3. Remote Elevation Measurement
4. Missing Line Measurement
5. Longitudinal & Cross Section Profile
6. Contouring – Indirect method
7. Setting out of a compound curve.

(5BS04) GENDER SENSITIZATION

(Common to All Branches)

Course Objectives:

- To develop students sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of students and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Unit-I:

UNDERSTANDING GENDER:

Gender: Why Should We Study It? (Towards a world of Equals: Unit-1)

Socialization: Making Women, Making Men (Towards a world of Equals: Unit-2)

Introduction, Preparing for Womanhood. Growing up Male. First lessons in Caste.

Different Masculinities.

Just Relationships: Being Together as Equals (Towards a world of Equals: Unit-12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters, Mothers and

Fathers. Further Reading: Rosa Parks-The Brave Heart.

Unit-II:

GENDER AND BIOLOGY:

Missing Women: Sex Selection and Its Consequences (Towards a world of Equals: Unit-4)

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (Towards a word of Equals: Unit-10)

Two or Many? Struggles with Discrimination.

Additional Reading: Our Bodies, Our health (Towards a word of Equals: Unit-13)

Unit-III:

GENDER AND LABOUR:

Housework: the Invisible Labour (Towards a word of Equals: Unit-3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (Towards a word of Equals: Unit-7)

Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

Unit-IV:

ISSUES OF VOILENCE:

Sexual Harassment: Say No! (Towards a word of Equals: Unit-6)

Sexual Harassment: not Eve-Teasing-Coping with Everyday Harassment-Further Reading: "Chupulu".

Domestic Violence: Speaking Out (Towards a word of Equals: Unit-8)

Is Home a Safe Place?-When Women Unite [Film]. Rebuilding Lives. Further Reading: New Forums for Justice.

Thinking about Sexual Violence (Towards a word of Equals: Unit-11)

Blaming the Victim-"I fought for my Life..."- Further reading: The Caste Face of Violence.

Unit-V:

GENDER AND STUDIES:

Knowledge: Through the Lens of Gender (Towards a word of Equals: Unit-5)

Point of View. Gender and the Structure of Knowledge. Further Reading:

Unacknowledged Women Artists of Telangana.

Whose History? Questions for Historians and Others (Towards a word of Equals: Unit-9)

Reclaiming a Past. Writing Other Histories. Further Reading. Missing Pages from Modern Telangana History.

Essential Reading: all the Units in the Textbook, "Towards a word of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Malkote, Vasudha Nagaraj, Asma rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Note: Since it is Interdisciplinary Course, Resouse Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

REFERENCE BOOKS:

1. Sen, Amartya. "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making History...' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at : <http://blogs.wsj.com/India/real-time/2012/11/14/by-the-numbers-where-India-women-work/>>

3. K. Satyanarayana and Susie Tharu (Ed) *Steel Nibs are Sprouting: New Dalit Writing from South India Dossier 2: Telugu and Kannada*
<http://harpercollins.co.in/BookDetail.asp?Book Code =3732>
4. Vimala . "Vantillu (The Kitchen)". *Women Writing in India: 600 BC to the Present. Volume II: The 20th Century*. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrughna, Veena et al. *Women's Work and its Impact on Child Health and Nutrition*, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. "We Were Making History....." *Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. *Seeing like a Feminist*. New Delhi: Zubaan-Penguin Books, 2012.
8. Jayaprabha, A. "Chupulu (Stares)", *Women Writing in India: 600 BC to the Present. Volume II: The 20th Century*. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayan and Anupam Manuhaar. "Women and wage Discrimination in India: A Critical Analysis." *International Journal of Humanities and Social Science Invention* 2.4 (2013).
10. Gautam , Liela and Gita Ramaswamy. "A 'conversation' between a Daughter and a Mother." *Broadsheet on Contemporary Politics, Special issue on Sexuality and Harassment: gender Politics on Campus Today*. Ed. Madhumeeta Sinha and Asma rasheed. Hyderabad: Anveshi Research Center for Women's Studies, 2014.
11. Abdulali Sohaila "I Fought For My Life ...and Won." Available online at: <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/>
12. Jeganathan Pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI" Permanent Black and ravi Dayal Publishers, New Delhi, 2000.
13. K. Kapadia. *The Violence of Development: the Politics of Identity, Gender and Social Inequalities in India*. London: Zed Books, 2002.
14. S. Benhabib. *Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics*, London: Routledge, 1992.
15. Virginia Woolf. *A Room of One's Own*. Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Face*, Karachi: Oxford University Press, 1997

(5CE12) ENGINEERING HYDROLOGY

Course Objectives:

Student shall be able to

- To **describe** the fundamentals concepts of Engineering Hydrology.
- To **explain** and derive various formula used in Engineering Hydrology
- To enable the students to **solve** basic hydrology problems
- To enable the students to **connect** the knowledge gained to real life hydrology related problems

Course Outcomes:

After the completion of the course student should be able to

- At the end of the course student should be able to **describe** different concepts and terms used in engineering hydrology
- At the end of the course student should be able to **discuss** and explain various common formulae used
- At the end of the course student should be able to **relate** and explain fundamental principles and theories as applied to engineering hydrology
- Students will be able **solve** analytical problems applying appropriate formulae.

Unit I

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering.

Precipitation

Forms of Precipitation, Measurement of Precipitation: Recording and non recording types, Mass rainfall curves, Characteristics mean rainfall on a basin – Arithmetic, Thiessen and Isohyetal methods, Intensity – Duration Analysis, PMP, Missing Rainfall Data – Estimation, Consistency of Rainfall records, Double mass curve, Rain gauge network analysis.

Unit II

Evaporation

Evaporation process, Estimation of evaporation, Measurement of evaporation – Evaporation pans, Transpiration, Evapo-transpiration, PET, Estimation of Evaporation- Blaney- Criddle, Thornthwaite formula.

Infiltration

Infiltration process, Factors affecting infiltration, Measurement of infiltration, Infiltrometer, Infiltration capacity curve, Horton's relation, Infiltration Indices, Φ -Index, W-Index and W_{min} Index.

Unit III

Runoff

Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

Hydrographs

Hydrograph – components, separation of hydrograph into base flow and DRO – Methods, Unit hydrograph – principles, derivation of UH of Isolated unit storms, UH for various durations – S-curve technique, Estimation of runoff from UH, Average UH, Limitations of UH theory, Synthetic UH, IUH.

Unit IV

Groundwater Hydrology

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law.

Well Hydraulics

Steady radial flow into well for confined and unconfined aquifers, Recuperation tests.

Unit V

Design Floods

Rational methods, Empirical Formulae, Unit Hydrograph Method, Flood Frequency Studies-Gumbel's Method, Log-Pearson Type III Distribution, Risk, reliability and safety factor.

Flood Routing

Basic Equations, Hydrologic Storage Routing, Hydrologic Flood Routing, Flood control.

TEXT BOOKS

1. Engineering Hydrology by K. Subramanya , Tata McGraw-Hill Publishers, 4th Edition, 2013
2. A Text Book of Hydrology by Dr P. Jaya Rami Reddy, Laxmi Publications, 3rd edition

REFERENCES

1. Hydrology by Madan Mohan Das and Mimi Das Saikia, PHI Publishers, 2009
2. Ground water Hydrology by David Keith Todd, John Wiley & Son, 2nd Edition 2005.
3. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni, New Age International, 2008
4. Engineering Hydrology by C.S.P. Ojha, P. Bhunya, R. Berndtsson, Oxford Higher Education, 2008

(5CE13) DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Objectives:

Student shall be able to

- **Describe** the salient features of Limit State Method of design of RC structures.
- **Identify and tell** the various codal provisions given in IS. 456
- **Analyze** the behaviour of RC beams under flexure, shear and compression.
- **Describe** the concepts of limit state of collapse and limit state of serviceability.

Course Outcomes:

After the completion of the course student should be able to

- **Compare** and **Design** the singly reinforced, doubly reinforced and flanged sections.
- **Design** the axially loaded, uniaxial and biaxial bending columns.
- **Classify** the footings and **Design** the isolated square, rectangular and circular footings
- **Distinguish** and **Design** the one-way and two-way slabs.

UNIT – I

Limit state design, Basic statistical principles, Characteristic loads, Characteristic strength, Partial load & safety factors, Representative stress- strain curves for cold worked deformed bars and mild steel bars, Assumptions in limit state design, Stress block parameters, I.S. 456 Codal provisions

Limit state design of Singly reinforced, Doubly reinforced, T and L beam sections

UNIT – II

Limit state design of beams for shear and torsion, Concept of bond, Anchorage & Development length, Design examples in simply supported and continuous beams, Detailing.

UNIT-III

Design of one-way slabs, Design of continuous slabs using IS coefficients, Design of two-way simply supported and restrained slabs.

UNIT – IV

Design of axially loaded columns of different cross sections, Design of columns under uni-axial bending and bi-axial bending using SP-16 charts

UNIT – V

Different types of footings, Design of flat type isolated square, rectangular and circular footings.

Limit state of serviceability for deflection and cracking

TEXT BOOKS

1. Limit state design of reinforced concrete by P.C. Varghese, PHI, New Delhi.2nd Edition 2011
2. Fundamentals of Reinforced concrete design by M.L.Gambhir, PHI, New Delhi.2nd Edition 2010

3. Limit State Design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, Publications Pvt. Ltd., New Delhi.3rd Edition 2007

REFERENCES

1. Reinforced Concrete Design by S.Unnikrishna Pillai & Devdas Menon, TMH, New Delhi. 3rd Edition 2009
2. Reinforced Concrete Design by N.Krishna Raju and R.N.Pranesh, New age International Publishers, New Delhi. 8th Edition 2004
3. N.C. Sinha and S.K Roy, "Fundamentals of Reinforced Concrete", 4th Edition, S. Chand publishers, 2004

CODE BOOKS

1. IS 456 : 2000 Plain and Reinforced Concrete-Code of Practice
2. SP-16 Design Aids for Reinforced Concrete

Note:

Question paper pattern for Final Examination:

The end examination paper should consist of Part-A and Part-B. Part-A consists of two questions in Design and Drawing out of which one question is to be answered for 24 marks. Part-B consists of Five questions on design out of which three are to be answered for 36 marks (12 x 3).

(5CE14) ENGINEERING GEOLOGY

Course Objectives:

Student shall be able to

- To **define** basic geological concepts from civil engineering point of view
- To **identify** the various physical properties of minerals and rocks and to understand the concept of structural geology
- To **understand** the significance of Geology as applied to Civil Engineering
- To **apply** this knowledge in Civil Engineering projects such as dams, roads, tunnels and slopes

Course Outcomes:

After the completion of the course student should be able to

- **Describe** different concepts and terms used in Engineering Geology
- **Identify** and explain various types of minerals and rocks
- **Apply** the various concepts of Engineering Geology to civil engineering field
- **Examine** and **select** the sites related to dams, roads, tunnels and slopes

UNIT – I

Introduction

Definition of Geology, Engineering Geology. Importance of geology from Civil Engineering point of view. Importance of physical geology, petrology and structural geology. Case studies of failures of few civil engineering constructions, weathering of rocks and its effect on the properties of rocks, importance of weathering with reference to dams, reservoirs and tunnels.

UNIT – II

Mineralogy

Definition of mineral, mineralogy, Importance of study of minerals: rock forming and ore forming minerals. Different methods of study of minerals. Study of minerals by physical identification method and their physical properties. Determination of Physical properties of following minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of ore forming minerals such as Pyrite, Hematite, Magnetite, Amethyst, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite, Coral reefs.

UNIT – III

Petrology

Definition of a rock, petrology. Classification of rocks-Geological classification of rocks. Rock Cycle. Classification of igneous Forms, structures and textures of igneous rocks. Classification of sedimentary rocks, and its structures and textures. Classification of metamorphic rocks, its structures and textures.

Megascopic Study of Granite, Dolerite, Basalt, Pegmatite, Charnockite, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT – IV

Structural Geology

Out Crop, Study of geological structures associated with rocks such as folds, faults, joints, unconformities-their important types. Significance of Strike and dip in geological structures,

Earthquakes, their causes and effects, shield areas and seismic belts, seismic waves Richter scale, Precautions to be taken for building construction in seismic areas. Landslides, their causes and effects, measures to be taken to prevent their occurrence, Ground Water, water table, common types of ground water, springs, geological controls of ground water movement, ground water exploration.

UNIT – V

Importance of Geophysical investigations, Principles of geophysical methods. Importance of Electrical resistivity method and seismic refraction method from civil engineering point of view.

Geology of Dams, Reservoirs, Tunnels

Types of Dams, Importance of geological considerations in the site selection of dams, reservoirs and tunnels. Case histories of dams, geological factors affecting the water tightness and life of a reservoir. Purpose of tunneling, types of tunnels, overbreak, lining of tunnels.

TEXT BOOKS

1. Engineering Geology by N.Chennakesavulu, Mc-Millan, India Ltd.
2. Principles of Engineering Geology by K.V.G.K.Gokhale, B.S publications

REFERENCES

1. Engineering Geology by S K Duggal, H K Pandey and N Rawal, McGraw Hill Education
2. Engineering Geology by D Venkat Reddy, Vikas publications, New Delhi.
3. Geology for Civil Engineers by A.C. Mclean and C.D. Gribble ,Second Edition
4. Engineering and General Geology by Parbin Singh, S.K.Kataria & Sons, 2009

(5CE15) STRUCTURAL ANALYSIS – II

Course Objectives:

Student shall be able to

- **Identify** the various straining actions in arches.
- **Understand** displacement methods of analysis for statically indeterminate structures.
- **Differentiate** the various methods of analysis for indeterminate structures.
- **Find** the degree of static and kinematic indeterminacies of the structures.

Course Outcomes:

After the completion of the course student should be able to

- **Analyze** the two hinged arches.
- **Solve** statically indeterminate beams and portal frames using classical methods
- **Sketch** the shear force and bending moment diagrams for indeterminate structures.
- **Formulate** the stiffness matrix and analyze the beams by matrix methods.

UNIT-I

Two Hinged Arches :

Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening – effect of temperature.

Cables :

Introduction, Properties of a suspended cable, Equilibrium of a loaded cord, Cable carrying a udl, Temperature stresses in the cable.

UNIT-II

Slope Deflection Method :

Introduction, derivation of slope deflection equations, application to continuous beams with and without settlement of supports, application to portal frames

UNIT – III

Moment Distribution Method :

Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports, Application to portal frames – Non-sway, Sway.

UNIT-IV

Kani's Method :

Analysis of continuous beams including settlement of supports and single bay single storey portal frames with and without side sway.

UNIT-V

Matrix Methods :

Stiffness Method - Determination of kinematic indeterminacy, Formulation of stiffness matrix, Application to continuous beams.

Flexibility Method - Determination of static indeterminacy, Formulation of flexibility matrix, Application to continuous beams.

TEXT BOOKS

1. Analysis of Structures – Vol. II by Prof. V.N.Vazirani, Dr. M.M. Ratwani & Dr. S.K. Duggal, Khanna Publishers, 16th Edition.
2. Theory of Structures by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, 12th Edition.

REFERENCES

- 1.Theory of Structures by S.P.Timoshenko, D.H.Young, McGraw-Hill International Edition, 2nd Edition, 1965.
2. Structural Analysis by Devdas Menon, Narosa Publishers, 2008.
- 3.Theory of Structures – Vol. II by S.P.Gupta, G.S. Pandit, R.Gupta, Tata McGraw-Hill Publishers, 1st Edition.
3. Indeterminate Structural Analysis by K. U. Muthu, H.Narendra, M. Janardhana, M.Vijayanand, I K International Publishing House, 1st Edition, 2014.

(5CE71) DISASTER MANAGEMENT

Course Objectives:

Student shall be able to

- Understand the difference between a hazard and disaster
- Know about various disasters and their impacts
- Understand Different approaches of disaster risk reduction
- Understand Disaster risks in India

Course Outcomes:

On successful completion of this course, it is expected that students should be able to

- Acquire the knowledge disaster Management
- Understand the vulnerability of ecosystem and infrastructure due to a disaster
- Acquire the knowledge of Disaster Management Phases
- Understand the hazard and vulnerability profile of India

UNIT-1

Introduction to disaster

Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)

UNIT-II

Disasters: Classifications, Causes, Impacts (including social, economic, political, environment, health, psychosocial, etc.)

Differential impacts-in terms of caste, class, gender, age, location, disability Global trends in disasters. Urban disaster, pandemics, complex emergencies, Climate change

UNIT-III

Approaches to disaster Risk reduction

Disaster cycle-its analysis, phase, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural measures, roles and responsibilities of community. Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, center and other stake-holders.

UNIT-IV

Inter-relationship between Disaster and Development

Factors affecting Vulnerabilities, differential impacts, impact of development projects such as dams, embankments, change in land-use etc. Climate change Adaption. Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT-V

Disaster Risk Management in India

Hazard and vulnerability profile of India Components of Disaster relief: Water, food, sanitation, shelter, health, waste management Institutional arrangements (Mitigation, Response and Preparedness, DM Act Policy, Other related polices, plan, programmes and legislation)

Project Work :(Field Work, Case Studies):

The project/fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard.

Suggested Reading list:

1. Alexander David, Introduction in 'Confronting Catastrophe', oxford University press, 2000
2. Andharia J. Vulnerability in disaster Discourse, JTCDM, Tata Institute of Social Sciences working paper no.8, 2008
3. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disaster, Rutledge.
4. Coppola P Damon, 2007. Introduction to International Disaster Management.
5. Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
6. Cuny, F. 1983. Development and Disasters, Oxford University Press
7. Govt. of India; Disaster Management Act 2005, Government of India, New Delhi.

(5EE71) RENEWABLE ENERGY TECHNOLOGIES

Course Objectives:

- To provide necessary knowledge about the modeling, design and analysis of various PV systems
- To show that PV is an economically viable, environmentally sustainable alternative to the world's energy supplies
- To understand the power conditioning of PV and WEC system's power output

Course Outcomes:

After Completion of the course the student is able to

- Model, analyze and design various photovoltaic systems
- Know the feasibility of various storage systems
- Design efficient stand alone and grid connected PV and WEC power systems

UNIT I

Introduction to photovoltaic (pv) systems:

Historical development of PV systems- Overview of PV usage in the world Photovoltaic effect-conversion of solar energy into electrical energy.

Solar cells and arrays

Behavior of solar cells-basic structure and characteristics: types - equivalent circuit-modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit current Solar cell arrays- PV modules-PV generators- shadow effects and bypass diodes- hot spot problem in a PV module and safe operating area- Terrestrial PV module modeling Interfacing PV modules with different loads.

UNIT II

Energy storage alternatives for pv systems

Methods of Energy storage –Pumped Energy Storage – Compressed Energy Storage – Storage batteries- lead-acid- nickel cadmium-nickel-metal-hydride and lithium type batteries. Small storage systems employing ultra capacitors- properties- modeling of batteries.

UNIT-III

Wind Energy Conversion systems (WECS)

Basic Principle of WECS, Nature of Wind, Wind survey in india, Components of WECS, Power Vs Speed, TSR, Maximum Power operation, WECS- Trade off- Control Requirements, Basic Principle of Induction generator for WECS

UNIT-IV

Converters for PV and Wind

AC-DC Rectifier, DC-AC inverter (Basic operation) Grid interface voltage and frequency control, Battery charger (Basic operation)

Power conditioning of PV systems

Array Design, Sun Tracking, Single axis-Dual Axis, Maximum Power point Tracking- PO method- IC method

UNIT-V

Stand Alone systems:

PV Stand Alone, Electric Vehicle, Wind stand Alone, Standalone Hybrid systems- Hybrid with diesel, Hybrid with Fuel cell- Mode controller- Load sharing, systems sizing, wind farm sizing- Power and Energy estimates, , Residential systems, PV water pumping, PV powered lighting-

TEXT BOOKS

1. Patel M. R., "Wind and Solar Power Systems Design, Analysis, and Operation", CRC Press, New York, 2nd Edition, 2005
2. Goetzberger, Hoffmann V. U., "Photovoltaic Solar Energy Generation", SpringerVerlag,Berlin, 2005.

REFERENCES

1. Komp R.J., "Practical Photovoltaics: Electricity from solar cells", Aatec Publications,Michigan, 3rd Edition, 2001.
2. Castaner L., Silvestre S., "Modeling Photovoltaic Systems Using PSpice", John Wiley & Sons, England, 2002.
3. Jenny Nelson, "The physics of solar cells", Imperial College Press, London, 2004.

(5ME71) DIGITAL FABRICATION

Course Objectives:

- Understand the need of digital fabrication
- Understand about Two dimensional layer by layer techniques
- Know about extrusion based systems, post processing and the software issues involved in digital fabrication
- Know the applications of digital fabrication

Course Outcomes:

After going through this course the student will be able to

- Understand the importance of digital fabrication
- Identify different techniques involved in two dimensional layering
- Analyze the software issues involved in digital fabrication and know about extrusion based systems and post processing
- Apply the knowledge gained in the digital fabrication

UNIT I

INTRODUCTION TO ADDITIVE MANUFACTURING: Introduction to AM, AM evolution, Classification of Additive Manufacturing, Distinction between AM & CNC Machining, Advantages of AM

UNIT II

TWO- DIMENSIONAL LAYER- BY LAYER TECHNIQUES: Stereolithography (SL), Solid Foil Polymerization (SFP), Selective Laser Sintering (SLS), Selective Powder Building (SPB), Ballistic Particle Manufacturing (PM).

UNIT III

EXTRUSION BASED SYSTEMS: Introduction, basic principles, Fused Deposition Modeling, Materials, Limitations of FDM

POST PROCESSING: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements.

UNIT IV

SOFTWARE ISSUES FOR ADDITIVE MANUFACTURING: Introduction, Preparation of CAD Models: The STL file, Problems with STL files, STL file manipulation, Beyond the STL file, Additional software to assist AM

UNIT V

AM APPLICATIONS

Applications in design, Applications in Engineering Analysis and Planning

Medical Applications: Customized Implants and Prosthesis
Aerospace applications and Automotive Applications
Other Applications: Jewelry Industry, Coin Industry, Tableware Industry.

TEXT BOOKS:

1. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer 2010.
2. Chuaa Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2010.

REFERENCES:

1. Ali K.Karmani, Emand Abouel Nasr, "Rapid Prototyping: Theory and Practice", Springer 2006.
2. Andreas Gebhardt, Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Hanser Publishers, 2013.
3. Hopkinson, N.Haque, and Dickens Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Taylor and Francis, 2007.

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L T/P/D C

Open Elective - I

3 0 3

**(5EC71) PRINCIPLES OF ELECTRONIC COMMUNICATIONS
(Qualitative Analysis only)**

Course Objectives:

- To make students understand different types of communication.
- To make students understand different modulation technique
- To make students understand basics of wireless communications.
- To make students understand basics of cellular communications.

Course Outcome:

After Completion of the course the student is able to

- Analyze the techniques used for signal modulation and demodulation.
- Distinguish the need for PPM, PWM, Multiplexing.
- Understand the fundamental concepts of Cellular & Mobile communications

UNIT I

Introduction

Block diagram of Electrical communication system, Radio communication, Types of communications: Analog, pulse and digital.

Analog Modulation

Need for modulation, Types of Analog modulation, Amplitude Modulation, Angle Modulation: Frequency & Phase modulations. Generation and Demodulation techniques. Advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT II

Pulse Modulations

Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

UNIT III

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, QPSK demodulation, offset and non-offset QPSK, coherent and incoherent reception, Modems.

UNIT IV

Introduction to Wireless Networking

Introduction, Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks.

UNIT V

Cellular Mobile Radio Systems

Introduction to Cellular Mobile System, concept of frequency reuse, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems. Cell splitting.

Handoffs and Dropped Calls

Handoff, dropped calls and cell splitting, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assisted handoff, Intersystem handoff, micro cells, vehicle locating methods, dropped call rates and their evaluation.

TEXT BOOKS

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.

REFERENCES

1. Wireless Communication and Networking – William Stallings, 2003, PHI.
2. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
3. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2ndEd. 2004.

(5CS71) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

Understand fundamental concepts and constructs of Java

- Implement Different object-oriented Concepts in Java.
- Develop the concepts of Multi-Threading and IO-Streams
- Construct GUI models.

Course Outcomes:

After completion of the course the student is able to:

- Write Java programs using various programming constructs using java.
- Solve different mathematical problems using OOP Paradigm
- Design and analyze the solutions for Thread and I/O management Concepts.
- Implement the Applications involving GUI models and Events.

UNIT I

Fundamentals of Object Oriented programming:

Object oriented paradigm - Basic concepts of Object Oriented Programming - Benefits of OOP - Applications of OOP

Java Evolution: Java Features - How Java differs from C and C++ - Java and Internet - Java and World Wide Web - Web Browsers - Hardware and Software Requirements - Java Environment. Overview of Java Language: Simple Java Program - Java Program Structure - Java Tokens- Java Statements - Implementing a Java Program - Java Virtual Machine - Constants - Variables - Data types - Scope of Variables-Symbolic Constants-Type Casting and type promotions – Operators, Operator Precedence and Associativity - Control Statements – break - continue- Arrays-Multi dimensional arrays, Wrapper Classes - Simple examples.

UNIT II

Classes:

Classes and Objects - Constructors – methods - this keyword – garbage collection-finalize - Overloading methods and constructors - Access Control- Static members – nested and inner classes – command line arguments - variable length arguments.

Inheritance: Forms of inheritance – specialization, specification, construction, extension, limitation, combination, benefits and costs of inheritance. Super uses- final - polymorphism, method overriding - dynamic method dispatch –abstract classes – exploring String class.

UNIT III

Packages and Interfaces:

Defining and accessing a package – understanding CLASSPATH – access protection importing packages – Interfaces - Defining and implementing an interface, Applying interfaces, Variables in interfaces and extended interfaces. Exploring java.lang and java.util packages.

Exception Handling-Fundamentals, usage of try, catch, multiple catch clauses, throw, throws and finally. Java Built in Exceptions and creating own exception subclasses.

UNIT IV

Multithreaded Programming:

Java Thread life cycle model – Thread creation - Thread Exceptions - Thread Priority – Synchronization - Messaging - Runnable Interface - Interthread Communication - Deadlock - Suspending, Resuming and stopping threads.

I/O Streams: File – Streams – Advantages - The stream classes – Byte streams – Character streams.

UNIT V

Applet Programming:

How Applets differ from Applications - Applet Life Cycle - Creating an Applet - Running the Applet- Designing a Webpage - Applet Tag - Adding Applet to HTML file - More about Applet Tag - Passing parameters to Applets - Aligning the display.

Event handling: basics of event handling, Event classes, Event Listeners, delegation event model, handling mouse and keyboard events, adapter classes, AWT Class hierarchy - AWT Controls - Layout Managers and Menus, limitations of AWT.

TEXT BOOKS:

1. The Complete Reference Java J2SE 5th Edition, Herbert Schildt, TMH Publishing Company Ltd, NewDelhi.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons

REFERENCES:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
3. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

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L T/P/D C

Open Elective I

3 0 3

(5EI71) PRINCIPLES OF MEASUREMENTS AND INSTRUMENTATION

Course Objectives:

- To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
- To provide better familiarity with the concepts of Sensors and Measurements.
- To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, force, pressure and viscosity.

Course Outcomes:

After completion of the course the student is able to:

- Able to identify suitable sensors and transducers for real time applications.
- Able to translate theoretical concepts into working models.
- Able to understand the basic of measuring device and use them in relevant situation.
- Able to estimate the errors in measurement by means of calibrating the different instruments against the standards.

UNIT I

Introduction to measurements. Physical measurement. Forms and methods of measurements. Measurement errors. Statistical analysis of measurement data. Probability of errors. Limiting errors. Standards. Definition of standard units. International standards. Primary standards. Secondary standards. Working standards. Voltage standard. Resistance standard. Current standard. Capacitance standard. Time and frequency standards.

UNIT II

PASSIVE SENSORS:

RESISTIVE SENSORS: Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers, **Capacitive SENSORS:** Variable capacitor, Differential capacitor, **Inductive Sensors:** Reluctance variation sensors, Eddy current sensors

UNIT III

METROLOGY

Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge blocks. Optical Methods for length and distance measurements.

VELOCITY AND ACCELERATION MEASUREMENT

Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods.

Accelerometers- different types, Gyroscopes-applications.

UNIT IV

FORCE AND PRESSURE MEASUREMENT

Gyroscopic Force Measurement – Vibrating wire Force transducer.

Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement

UNIT V

FLOW, DENSITY AND VISCOSITY MEASUREMENTS

Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, Density measurements – Strain Gauge load cell method – Buoyancy method.

Units of Viscosity, Two float viscorator –Industrial consistency meter

TEXT BOOKS:

1. Measurement Systems – Applications and Design – by Doebelin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

REFERENCES:

1. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
2. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P.Neubrat, Oxford University Press.
3. Measurement system: Applications and Design – by E.O.Doeblin, McGraw Hill Publications.
4. Electronic Instrumentation by H.S.Kalsi.

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L T/P/D C

Open Elective - I

3 0 3

(5IT71) CYBER SECURITY

Course Objectives:

- **Identify** the key components of cyber security in network
- **Describe** risk management processes and practices
- **Define** types of service delivery process and storage management process
- **Access** additional external resources to supplement knowledge of cyber forensics and laws

Course Outcomes:

After completion of the course the student is able to

- **Categorization** of cyber-crime and an understanding social, political, ethical and psychological dimensions cyber security
- **Demonstrate** cyber offenses tools, methods used in cyber crime
- **Document** an appropriate procedure of Risk Management and Security Standards
- **Understanding** computer forensics and analyzing them

UNIT-I

INTRODUCTION TO CYBER CRIME: Introduction Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/ Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/ Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, Hacking and the Indian Law(s), A Global Perspective on Cybercrimes, Cybercrime and the Extended Enterprise.

UNIT-II

CYBER OFFENSES: HOW CRIMINALS PLAN THEM: Introduction, Categories of Cybercrime, How Criminals Plan the Attacks, Reconnaissance, Passive Attacks, Active Attacks, Scamming and Scrutinizing Gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Classification of Social Engineering, Cyber stalking, Types of Stalkers, Cases Reported on Cyber stalking, How Stalking Works?, Real-Life Incident of Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The fuel for Cybercrime, Botnet, Attack Vector, Cloud Computing, Why Cloud Computing?, Types of Services, Cybercrime and Cloud Computing.

UNIT-III

TOOLS AND METHODS USED IN CYBER CRIME: Introduction, Proxy Servers and Anonymizers, Phishing, How Phishing Works, Password Cracking, Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, Keyloggers and Spywares, Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares, Virus and Worms, Types of Viruses, Trojan Horses and Backdoors, Backdoor, How to Protect from Trojan and Backdoors, Steganography, Steganalysis, Dos and DDos Attacks, Dos Attacks, Classification of Dos Attacks, Types of Levels of Dos Attack, Tools Used to Launch Dos Attacks, DDos Attacks, How to protect from Dos/DDos Attacks, SQL Injection, Steps for SQL Injection Attack, How to Prevent SQL Injection Attacks.

UNIT-IV

UNDERSTANDING COMPUTER FORENSICS: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, The Rules of Evidence, Forensics Analysis of E-Mail, RFC2822, Digital Forensics Life Cycle, The Digital Forensics Process, The Phases in Computer Forensics/Digital Forensics, Precautions to be Taken when Collecting Electronic Evidence, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Typical Elements Addressed in a Forensics Investigation Engagement Contract, Solving a Computer Forensics Case, Computer Forensics and Steganography, Rootkits, Information Hiding, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Technical Challenges: Understanding the Raw Data and its Structure, The Legal Challenges in Computer Forensics and Data Privacy Issues, Special Tools and Techniques, Digital Forensics Tools Ready Reckoner, Special Technique: Data Mining used in Cyber forensics, Forensics Auditing.

UNIT-V

CYBERCRIME AND CYBERTERRORISM: SOCIAL, POLITICAL, ETHICAL and PSYCHOLOGICAL DIMENSIONS: Introduction, Intellectual Property in the Cyberspace, Copyright, Patent, Trademarks, Trade Secret, Trade Name, Domain Name, The Ethical Dimension of Cybercrimes, Ethical Hackers: Good Guys in Bad Land, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals, Inside the Minds and Shoes of Hackers and Cybercriminals, Hackers and Cybercriminals: Evolution of Technical prowess and Skills, Ethical Hackers, Sociology of Cybercriminals, Personality Traits of Cybercriminals and Younger Generation's views about Hacking, Information Warfare: Perception or An Eminent Reality?, Cyberwar Ground is HOT, Cyber Jihadist on the Rise.

TEXT BOOKS:

1. Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.

REFERENCES:

1. Management of Information Security, M. E. Whitman, H. J. Mattord, Nelson Education, CENGAGE Learning, 2011, 3rd Edition.
2. Guide to Computer Forensics and Investigations, B. Nelson, A. Phillips, F. Enfinger, C. Steuart, Nelson Education / CENGAGE Learning, 2010, 4th Edition

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III Year B.Tech I Semester

L T/P/D C

Open Elective- I

3 0 3

(5AE71) PRINCIPLES OF AUTOMOBILE ENGINEERING

Course Prerequisites: Physics

Course Objectives:

- Understand the layout of an automobile and functionalities subsystems
- Provide overview on concepts of engine, cooling, lubrication and fuel systems
- Present constructional features and working of automotive driveline and running systems
- Study the fundamentals and principles of automotive electrical systems

Course Outcomes:

After completion of the course the student is able to:

- Explain the functionalities of automotive systems and subsystems
- Give an overview on engine and engine subsystems.
- Describe working of automotive driveline and running systems
- Discuss the concepts of automotive starting, ignition and charging systems

UNIT I

INTRODUCTION: Classification of automobiles, layout of an automobile, automobile sub systems and their role. Types of chassis, role and requirement of a chassis frame, types of frames, materials, loading points and types of bodies.

UNIT II

ENGINE: Classification and components of an engine, principle and working of four stroke and two stroke SI and CI engines. Carburetor, diesel fuel injection and introduction to electronic fuel injection system. Cooling - Necessity of cooling, air-cooling and water cooling. Lubrication – Mist, splash and forced system.

UNIT III

DRIVE LINE: Clutches, principle, single plate clutch, multi plate clutch and centrifugal clutch. Gear box - Need, sliding mesh, constant mesh and synchromesh gear box. Propeller shaft, universal joint, differential, wheels and tyres.

UNIT IV

RUNNING SYSTEMS: Suspension systems – Objective, rigid axle and independent suspension system and torsion bar. Steering system – Layout, steering mechanism, steering geometry and steering gearboxes. Brake system – Principle, stopping distance, types of brakes and actuation.

UNIT V

ELECTRICAL SYSTEMS: Starting system - Principle, working of different starter drive units and solenoid switches. Ignition system - Conventional ignition system types, ignition advance and retarding mechanisms. Charging system - Alternator principle, construction and working, cut-outs and regulators.

TEXT BOOKS:

1. Heinz Heisler, "Advanced Vehicle Technology". Butterworth Heinemann Publishers, 2002.
2. Crouse W H, "Automobile Electrical Equipment" , McGraw Hill Book Co., Inc., New York 3rd edition,1986.

REFERENCES:

1. Garrett T K, Newton K. and Steeds W. "Motor Vehicle", Butter Worths & Co. Publishers Ltd., New Delhi, 2001.
2. Kholi P L, "Automotive Electrical Equipment", Tata McGraw Hill Co., Ltd., New Delhi, 1975.
3. Crouse W H, "Automotive Chassis and Body," McG raw Hill Book Co., 5th edition, 1976.
4. .Giri N K, Automotive Mechanics, Khanna Publications, 2006.

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III Year B.Tech I Semester

L T/P/D C

Open Elective- I

3 0 3

(5BS71) PROFESSIONAL ETHICS AND HUMAN VALUES

Introduction:

Human values and ethics have a significant role to play in the betterment of our society. Ethics and values are a liberating force, enabling higher performance, better quality relationships and an expanded sense of purpose and identity. This syllabus aims to present a framework for understanding human values and their role in life, work, business and leadership. It aims to transform individuals from having self-focused, survivalist mindset that has scant regard for ethics, through to compliance with laws and conventions, and then to the aspiration to live a higher ethical and spiritual life.

It mainly focuses on improving the capacities of leadership /management through training in human values and professional ethics. It serves to contribute to good governance in the organizations and foster an environment that supports and encourages just practices and fair play.

Course Objectives:

- **Create** an awareness on Engineering Ethics and Human Values
- **Study** the moral issues and decisions confronting individuals and organizations engaged in engineering profession
- **Study** the related issues about the moral ideals, character, policies, and relationships of people and corporations involved in technological activity

Course Outcomes:

After completion of the course the student is able to:

- **Learn** the moral issues and problems in engineering; find the solution to those problems
- **Learn** the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment
- **Gain** exposure to Environment Ethics & computer ethics; know their responsibilities and rights

UNIT I

Introduction to Human Values and Ethics Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing –Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

Introduction to Ethical Concepts: Definition of industrial ethics and values, Ethical rules of industrial worker- Values and Value Judgments -- Moral Rights and Moral rules 121 -- Moral character and responsibilities -- Privacy, confidentiality, Intellectual property and the law -- Ethics as law.

UNIT II

Understanding Engineering Ethics: Action Oriented- Ethical Vision- Indian Ethos- Ethics Defined-Engineering Ethics: Various Connotations of Engineering Ethics, Why Study Engineering Ethics?, Personal and Business Ethics-Ethics and the Law-Senses of 'Engineering Ethics' – Variety of moral issues –Types of inquiry – Moral dilemmas –

Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Theories about right action – Selfinterest – Customs and Religion – Uses of Ethical Theories – Engineering as a Profession -- Professional Societies -- Core Qualities of Professional Practitioners -- Professional Institutions, Operating in a Pluralistic Society – Environments and Their Impact - Economic Environment -- Capital Labor-- Price Levels -- Government Fiscal and Tax Policies – Customers – Technology.

UNIT III

Engineering as Social Experimentation– Comparison with Standard Experiments, Knowledge Gained Conscientiousness, Relevant Information, Learning from the Past, Engineers as managers, consultants, and Leaders, Accountability, Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law. Engineers and Managers -- Organizational complaint procedures - Government agencies Resolving Employee concerns – Limits on acceptable behavior in large corporations -- Ethical and legal considerations, Organizational responses to offensive behaviour and harassment.

UNIT IV

Workplace Rights and Responsibilities Professional Responsibility: The basis and scope of Professional Responsibility -- Professions and Norms of Professional Conduct -- Ethical Standards versus Profession -- Culpable mistakes -- the Autonomy of professions and codes of ethics - - Employee status and Professionalism -- Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, Hazards and Risks. Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and reducing risk - Ethical standards vs. Professional conduct - Collegiality and Loyalty – Respect for Authority – Collective Bargaining –Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights – Intellectual Property Rights (IPR) – Discrimination - Organizational complaint procedures - Government agencies - Resolving Employee concerns.

UNIT V

Ethics in Global Context and Global Issues: Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers (IETE), India, etc.122.

TEXT BOOKS:

1. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill. New York 1996.
2. Ethics in Engineering Practice and Research, Caroline Whitbeck, Elsevier.
3. Engineering Ethics, Govindarajan. M, Natarajan. S, Senthilkumar. V.S, Prentice Hall of India, 2004.

REFERENCES:

1. Engineering Ethics, Charles D Fleddermann, Prentice Hall, New Jersey, 2004 (Indian Reprint).
2. Engineering Ethics Concepts and Cases, Charles E Harris, Michael S Pritchard and Michael J Rabins, Thompson Learning, United States, 2000

(Indian Reprint now available).

3. Ethics and the Conduct of Business, John R Boatright, Pearson Education, New Delhi, 2003.
4. Fundamentals of Ethics for Scientists and Engineers, Edmund G Seebauer and Robert L Barry, Oxford University Press, Oxford, 2001.
5. Ethics in Engineering, Fourth Edition, Mike W. Martin, Rolan Schinzinger, Mc Graw Hill publishers.
6. Engineering Ethics-An industrial Perspective, Gail Dawn Baura.
7. Ethics and Values in Industrial-Organizational Psychology, Joel Lefkowitz.

(5CE57) ENGINEERING GEOLOGY LABORATORY

Course Objectives:

Student shall be able to

- To **identify** the minerals by studying its physical properties
- To **classify** various types of rocks
- To **understand** the various concepts of Structural Geology
- To **interpret** geological maps

Course Outcomes:

After the completion of the course student should be able to

- **Describe** and **identify** various Minerals
- **Distinguish** and **identify** the rocks
- **Recognize** various types of folds ,faults and joints
- **Interpret** and draw the sections from geological maps showing horizontal beds, vertical beds, inclined beds, folds, faults, unconformities.

List of Experiments:

1. Study of physical properties and identification of minerals referred under theory. Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of ore forming minerals such as Pyrite, Hematite, Magnetite, Amethyst, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite,
2. Megascopic description and identification of rocks referred under theory. Granite, Dolerite, Basalt, Pegmatite, Charnockite, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.
3. Drawing of sections for geological maps showing horizontal beds, vertical beds, inclined beds, folds, faults, unconformities and their interpretation.

(5CE58) COMPUTER AIDED DRAFTING OF BUILDINGS LABORATORY

Course Objectives:

Student shall be able to

- **Practice** different Brick bonds.
- **Apply** the AutoCAD tools to **create** building plans, sections and elevations from a given line drawing and specifications.
- **Draw** different components of Doors and Windows.
- **Generate** the structural drawings of structural elements.

Course Outcomes:

After the completion of the course student should be able to

- **Use** different AutoCAD Commands to develop Plan, Section and elevation of Buildings.
 - **Draw** and **detail** different Components of different types of doors and windows.
 - **Develop** Working Drawings of Residential Buildings.
 - **Prepare** structural drawings with details of Beam, Slab and Footing.
1. Brick Bonds: English bond & Flemish bond – Odd & even courses for one, one and half, two, two and half brick walls.
 2. Drawing of plans of single storied Residential buildings.
 3. Developing sections and elevations of single storied residential buildings.
 4. Detailing of building components: Doors – Panelled and Glazed, Window - Panelled and Glazed.
 5. Exercise on development of working drawings of buildings – Electrical Layout, Water supply layout, Plumbing layout of Residential Buildings.
 6. Introduction to Structural Drawings of Beam, Slab and Footing.

TEXT BOOKS:

1. Civil Engineering Drawing-I by N.Sreenivasulu, S.Rama Rao – Radiant Publishing house, 2nd edition, 2013.
2. Civil Engineering Drawing-II by N.Sreenivasulu – Radiant Publishing house, 2nd edition, 2013.

REFERENCES:

1. Engineering Graphics by P.J.Sha-S.Chand & Co, 2nd edition, 2013.
2. Civil Engineering Drawing-I by S.Mahaboob Basha – Falcon Publishers, 2nd edition, 2013.
3. Building drawing by M G Shah - Tata McGraw-Hill Education, 5th edition, 2012
4. Structural Engineering Drawing by S.Mahaboob Basha – Falcon Publishers, 2nd edition, 2013.

(5CE59) CONCRETE LABORATORY

Course Objectives:

Student shall be able to

- **Perform** the test procedures to find Physical properties of Cement
- **Understand** the test procedures to find Specific Gravity, Bulking of Aggregates.
- **Evaluate** fresh concrete properties
- **Understand** the test procedures to find properties of Hardened Concrete

Course Outcomes:

After the completion of the course student should be able to

- Test Fineness, Specific Gravity, Setting Time, Soundness and Compressive Strength of Cement
- Test Specific Gravity of Coarse Aggregate and Fine Aggregate, Bulking of Fine Aggregate.
- Design Concrete Mix Proportioning by Using Indian Standard Method.
- Test Workability of Fresh Concrete and Compressive strength, Split Tensile Strength of Hardened Concrete.

LIST OF EXERCISES

Cycle -I

- I. Tests on Cement:
 - a) Standard Consistency
 - b) Initial & final Setting Time
 - c) Specific Gravity
 - d) Fineness
 - e) Soundness
 - f) Compressive Strength
- II. Tests on Aggregates:
 - a) Specific Gravity of Fine Aggregate
 - b) Specific Gravity of Coarse Aggregate.
 - c) Bulking of Fine Aggregate.

Cycle –II

- III. IS method of mix design of Normal Concrete.
- IV. Tests on Fresh Concrete:
 - a) Slump cone Test
 - b) Compaction factor Test
 - c) Vee Bee Test
- V. Tests on Hardened Concrete:
 - a) Compressive & Split Tensile strength Tests.
 - b) Modulus of Elasticity of Concrete.
 - c) Non Destructive Testing of concrete (for Demonstration

(5CE16) DESIGN OF STEEL STRUCTURES

Course Objective:s

Student shall be able to

- **Describe** the salient features of Limit State Method of design of Steel structures.
- **Identify** and **tell** the various codal provisions given in IS. 800.
- **Analyze** the behaviour of steel structures under tension, compression and flexure.
- **Design** the tension, compression , flexural members and welded plate girder

Course Outcomes:

After the completion of the course student should be able to

- **Analyze** the tension members, compression members.
- **Design** the tension members, compression members and column bases
- **Analyze** and **Design** the beams including built-up sections.
- **Identify** and **Design** the various components of welded plate girder including stiffeners.

UNIT-I :

Introduction to Limit State Design & Connections

Concept of limit state design-Bolted connections-IS:800-2007 specifications-Design strength-efficiency of joint-prying action-welded connections-Types of welded joints-specifications-design requirements.

UNIT-II:

Tension Members & Compression Members

Design of tension members-Design strength-Design procedure- splice-lug angles
Design of compression members - buckling - slenderness ratio – Load carrying capacity-laced columns-battened columns-splice-column base
Slab base-Gusseted base

UNIT-III :

Design of Beams

Design of beams-plastic moment-bending and shear strength/buckling- built up sections-laterally supported beams

UNIT-IV:

Welded Plate girders

Design of welded plate girder-elements-economical depth-design of main section-connections between web and flange-design of bearing stiffener-intermediate stiffeners

UNIT –V:

Industrial Buildings

Gantry girder impact factors – longitudinal forces , Design of Gantry girders

TEXT BOOKS

1. Limit state Design of Steel Structures by S K Duggal, TMH, and New Delhi.1ST Edition 2011
2. Design of Steel Structures by N Subramanian, Oxford University Press. 1ST Edition 2011

REFERENCES

1. Design of Steel Structures by S.S.Bhavikatti, I.K. International Publishing House Pvt Ltd. 1ST Edition 2011
2. Limit state Design of steel structures by Dr.V L Shaw, Structures Publications, Pune. 1ST Edition 2010

CODE BOOKS

1. IS: 875 (Part III)
2. IS 800: 2007 - Indian Code of Practice for Construction in Steel
3. Hand book of Steel Tables.

Note:**Question paper pattern for Final Examination :**

The end examination paper should consist of Part-A and Part-B. Part-A consists of two questions in Design and Drawing out of which one question is to be answered for 24 marks. Part-B consists of Five questions on design out of which three are to be answered for 36 marks (12 x 3).

(5CE17) IRRIGATION ENGINEERING

Course Objectives:

Student shall be able to

- To **describe** and explain the fundamental principles and terminologies used in Irrigation Engineering.
- To **explain** different Irrigation System components and their significance
- To **apply** the Engineering Hydrology knowledge for the design of a irrigation system
- To enable the students to **design** main components of a Irrigation System

Course Outcomes:

After the completion of the course student should be able to

- Students will be able **enumerate** the fundamental principles and concepts of Irrigation Engineering.
- At the end of the course student should be able to **identify** and explain different components of a irrigation system.
- At the end of the course student should be able to practically **apply** the Engineering Hydrology knowledge in the design of a irrigation system.
- At the end of the course student should be able to **design** main components of a Irrigation system.

UNIT- I

Introduction to Irrigation Engineering

Necessity and importance of irrigation, Advantages and ill effects of irrigation, Types of irrigation, Methods of application of irrigation water, Indian agricultural soils, Standards of quality for irrigation water.

Water Requirements of Crops

Soil-water-plant relationship, Vertical distribution of Soil moisture, Soil moisture constants, Soil moisture tension, Consumptive use, Estimation of consumptive use, Duty and delta, factors affecting duty, Depth and frequency of Irrigation, Irrigation efficiencies.

UNIT- II

Reservoir Planning

Selection of Sites for Reservoir, Zones of storage of a reservoir, Reservoir yield, Estimation of capacity of reservoir using mass curve. Reservoir sedimentation- control, Useful life of reservoir, Water losses from reservoir

Dams: Gravity Dams

Types of dams, Factors affecting selection of type of dam, Forces acting on a gravity dam, Causes of failure of a gravity dam, Elementary profile and practical profile of a gravity dam, Limiting height of a low gravity dam, Stability analysis, Drainage galleries

UNIT- III

Earthen Dams

Types of Earth dams, Causes of failure of earth dam, Criteria for safe design of earth dam, Seepage through earth dam-graphical method, Measures for control of seepage

Spillways

Necessity of Spill Ways, Location of Spill Ways, Types of spillways, Design principles of Ogee spillways, Energy Dissipation, Types of spillway gates.

UNIT- IV

Diversion Head works

Types of Diversion head works-diversion and storage head works, Weirs and barrages, Layout of diversion head works, Components, Causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory, Khosla's theory, Determination of uplift pressure, Thickness of impervious floors using Bligh's and Khosla's theory, Exit gradient, Functions of u/s and d/s sheet piles.

Canal Structures

Canal Falls: Necessity of canal falls, Types of falls and their location, Types of falls and their location of Sarda type fall, Trapezoidal notch fall and straight glacis fall
Cross drainage works – Types, Selection of suitable type of CD works.
Outlets and Escapes

UNIT- V

Design of Irrigation Canals

Canal Section, Silt Theories –Kennedy's Theory, design procedure of canals, Silt supporting capacity, drawbacks, Lacey's regime theory – design procedure of canals, Comparison of Kennedy's and Lacey's regime theory, Tractive Force Theory

Canal Lining and Water Logging

Causes of Water Logging, Control of Water Logging, Types of canal lining, Design of Lined Canal

TEXT BOOKS

1. Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, 2006
2. Irrigation Engineering and Water Power Engineering by by Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publishers, 16th Edition, 2009

REFERENCES

1. Irrigation and Water Resources Engineering by G.L.Asawa, New Age Publishers, 2008
2. Irrigation Engineering by S K Mazumdar, Galgotia Publications Pvt Ltd, 2006
3. Irrigation Engineering by N N Basak, McGraw Hill Education, 1st Edition, 1999
4. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S.Chand Publishers, Revised Edition 2007

(5CE18) HIGHWAY ENGINEERING

Course Objectives:

The student shall be

- **Introduced** to classification of highways, urban roads and its related planning process.
- **Analyze** different elements used in design of road geometrics.
- **Formulate** the fundamental principles of traffic flow, traffic characteristics, its measurements and their interpretation for infrastructure changes or development.
- **Recognize** the importance of road materials used in **design** of rigid and flexible pavements.

Course Outcomes:

After the completion of the course student should be able to

- The student should **classify** the roads based on functional classification, describe design elements as sight distance, horizontal curvature, super elevation, grades, visibility on vertical curves, cross section elements
- The student should use fundamental of physics and mathematical knowledge in **deriving** geometric design equations; Plan surveys, preparation of survey forms and data collection from field for highway geometrical design
- The Student shall be able to **estimate** the basic characteristics of traffic stream conduct traffic studies and analyze traffic data for improvement of intersections.
- The student should **explain** factors considered for design of pavements and materials used.

UNIT – I

Highway Development and Planning: Importance of transportation – History of Planned Highway Development in India- Twenty Year Road development plans - Classification of roads – Road patterns

Highway Alignment: Highway alignment – Basic requirements – Controlling factors – Engineering surveys for highway location –Points considered in a new highway project

UNIT – II

Geometric Design of Streets and Highways: Introduction – Factors controlling geometric design – Cross sectional elements – Sight distances: Stopping sight distance, Overtaking sight distance – Definitions and derivation of equations for computing sight distances – Horizontal alignment – Super elevation – Design of super elevation – Extra-widening on curves - Transition curve – Objectives of providing transition curves – Methods of computing the length of transition curve – Vertical curves - Intersections – Rotary intersection – Grade separated intersections (interchanges).

UNIT –III

Traffic Engineering: Introduction – Basic parameters of traffic - Speed, flow and density – Definitions and their inter-relationship- – Traffic studies – Traffic volume counts: Objectives, methods and presentation of volume data - Speed studies: Objectives, types of speeds – Parking parameters and parking studies – Accident studies.

Traffic Control and Management: Introduction – Traffic control devices – Signs; Classification of road signs and their design specifications- Road markings – Different types of road markings – Channelization: Objectives of channelization – Traffic signal design by Webster method.

UNIT – IV

Highway materials -Pavement types – Components and their functions – CBR test, Plate bearing test, tests on aggregate - test on bitumen – Mix design by marshal method.

UNIT – V

Pavement Design: Design factors – Flexible pavement design – IRC method based on CBR only – Rigid pavement, types of stresses - Calculation of stresses – Design of joints, dowel bars, tie bars.

TEXT BOOKS:

1. Highway Engineering, by C.E.G.Justo and S.K. Khanna, 10th Ed, Nemchand & Bros, 2013.
2. Principles of Transportation and Highway Engineering, by G.V. Rao, Tata McGraw Hill, 2010.

REFERENCES:

1. Introduction to Transportation Engineering, by Jotin Khisty, Prentice Hall Publications, India, 2008.
2. Principles of Transportation Engineering, by Partha Chakroborty and Animesh Das, Prentice Hall Publications, New Delhi, 2010.
3. Principles, Practice and design of Highway Engineering, by S.K. Sharma, Prentice Hall Publications, New Delhi, 2012.
4. Traffic Engineering and Transportation Planning, by L.R.kadiyali, Khanna Publishers, 2009.

(5CE19) GEO-TECHNICAL ENGINEERING-I

Course Objectives:

The student shall be able

- To **improve** the basic knowledge of the index and Engineering properties.
- To **understand** the basic principles of Soil Mechanics and their applications to solve problems related to Geotechnical Engineering.
- To **analyze** the student to study the behavior of soils under various stress conditions.
- To **evaluate** and determine the strength parameters using standard tests.

Course Outcomes:

After the completion of the course student should be able to

- **Identify** the type of soil and check the suitability for civil Engineering applications.
- **Solve** and formulate Geotechnical Engineering problems
- **Predict** probable problems that may be encountered and take precautionary measures.
- **Examine** the classical concepts of Soil Mechanics and its necessity.

UNIT – I

Properties of Soil

Historical development-Physical properties of soil-Void ratio-Porosity, Degree of saturation, Water content, Unit Weights, Specific Gravity-their relationships, Relative density. Consistency limits-determination and various indices-Plasticity index, Liquidity index-Significance and Importance, Activity. Classifications: Mechanical analysis-Sieve analysis, Stoke's law, hydrometer Analysis, Textural Classification, Structural Classification based on size – unified soil classification and modification by Bureau of Indian Standards.,Basics of Clay minerals, mineralogy.

UNIT – II

Permeability and Seepage

Soil water-types, Darcy's law-Factors affecting permeability, Determination of permeability by constant head and falling head method as per IS – 2720, field test as per IS – 5529 (part I)- pumping in test and pumping out test. Permeability of layered soils, Seepage forces, General flow equation (Laplace equation). Flow net construction and applications, anisotropic soil conditions, quick sand condition. Uplift pressure, exit gradient, failure due to piping, Criteria for design of filters.

UNIT – III

Compaction and Consolidation:

Compaction-Factors affecting compaction. Dry density and moisture content relationship. Zero air voids line. Engineering behavior of compacted soils. Standard Proctor test and Modified Proctor test as per IS – 2720. Field compaction equipment, Field control of compaction.

Consolidation: Primary compression and secondary compression, determination of preconsolidation pressure, Normally consolidated, over consolidated and under consolidated clays, Oedometer Test, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume

Decrease, Terzaghi's one dimensional consolidation theory, assumptions, derivation and application, coefficient of consolidation, time curve fitting methods, initial compression.

UNIT – IV

Stress Distribution in Soils

Effective stress concept, Nature of effective stresses, Effect of water table fluctuations on effective stress, Effective stress in a soil mass under hydro static condition, capillarity effect on effective stress. Effective stress under steady seepage condition, failure of structures by piping, Boussinesq's theory- point load, line load, strip load, circular and rectangular loaded areas. Pressure distribution diagram on a horizontal and vertical plane, pressure bulb, Westergaard's theory, equivalent point load method, Newmark's chart, Fadum's chart, contact pressure, approximate stress distribution method.

UNIT – V

Shear Strength of Soil

Stress strain curve, stress at a point-Mohr circle of stress, Mohr-coulomb failure criteria, pore pressure, total and effective stress. Peak and residual shear strength. Factors affecting shear strength. Laboratory measurement of shear strength by direct, unconfined, Vane shear test and triaxial tests under different drainage conditions. Shear strength characteristics of sands. Sensitivity and thixotropy of cohesive soils. Shear strength of sands, critical void ratio and dilatancy, shear strength of clays, total stress analysis and effective stress analysis

TEXT BOOKS

1. Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao. New age International Publishers, Second Edition, 2012
2. Soil Mechanics, Foundation Engineering by V.N.S. Murthy., CBS Publishers & Distributors Pvt. Ltd. First Edition, 2013

REFERENCES

1. Soil Mechanics & Foundation Engineering by Dr. B C Punmia, Dr.Ashok.K.Jain, Dr.Arun K.Jain, Laxmi Publications (P) Ltd., 16th Edition,2005.
2. Soil Mechanics by Craig R.F., Chapman & Hall Edition, Laxmi Publications, 8th Edition, 2012.
3. An Introduction to Geotechnical Engineering, by Holtz R.D., Prentice Hall, NJ, 2nd Edition, 2010.
4. Soil Mechanics and Foundation Engineering by Dr. K.R. Arora, Standard Publishers distributors, Seventh Edition 2011
5. Problems in Soil Mechanics and Foundation Engineering by Dr.B.P.Verma, Khanna Publications, 10th Edition, 2010.

(5CE72) INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEM

Course Objectives:

Student shall be able

- To **describe** and **define** various concepts of Remote Sensing and GIS.
- To enable the students to **analyze** data using GIS.
- To make the students **appraise** the importance of accuracy in GIS.
- To enable the students to **apply** GIS knowledge in solving various problems in real world scenario.

Course Outcomes:

After the completion of the course student should be able to

- At the end of the course student should be able to **describe** different concepts and terms used in GIS
- At the end of the course student should be able to **compare** and process different data sets
- At the end of the course student should be able to **evaluate** the accuracy and **decide** whether a data set can be used or not.
- Students will be able to **demonstrate** various applications GIS.

UNIT- I:

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing,

UNIT- II:

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

UNIT- III:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

UNIT- IV: Implementing a GIS and Advanced GIS

Implementing a GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS

Advanced GIS: WebGIS concept, webGIS fundamentals, Potential of web GIS, Server side strategies, client side strategies, mixed strategies, webGIS applications

UNIT- V:**Applications of GIS**

GIS based road network planning, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications, Mineral mapping using GIS.

TEXT BOOKS

1. Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7th Edition, 2015.
2. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

REFERENCES

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Revised Edition, 2011.
2. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy, B.S.Publications, 4th Edition, 2012.
3. Textbook of Remote Sensing and Geographical Information systems by Kali Charan Sahu, Atlantic Publishers and Distributors, 1st Edition, 2007.
4. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.

(5EE72) ENERGY AUDITING CONSERVATION AND MANAGEMENT

Course Objectives:

- To understand the necessity of conservation of Energy.
- To know the methods of Energy management.
- To identify the factors to increase the efficiency of electrical equipment.
- To know the benefits of carrying out energy Audits.

Course Outcomes:

After completion of the course the student is able to:

- To conduct Energy Audit of industries.
- To manage energy Systems
- To specify the methods of improving efficiency of electric motor.
- To improve power factor and to design a good illumination system
- To calculate pay back periods for energy saving equipment.

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- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

UNIT II

ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manager, Qualities and functions, language, Questionnaire - check list for top management

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, p.f with non-linear loads, effect of harmonics on p.f. , p.f motor controllers - Good lighting system design and practice, lighting control, lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, flux meters, tongue testers ,application of PLC's

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- Energy efficient

motors- calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

TEXT BOOKS

- 1) Energy management by W.R. Murphy & G. McKay Butter worth, Heinemann publications.
- 2) Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998

REFERENCES:

- 1) Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd- 2nd edition, 1995-
- 2) Energy management handbook by W.C.Turner, John wiley and sons
- 3) Energy management and good lighting practice: fuel efficiency- booklet12-EEO

VNR Vignana Jyothi Institute of Engineering and Technology

III Year B.Tech II Semester

L T/P/D C

Open Elective- II

3 0 3

(5ME72) OPTIMIZATION TECHNIQUES

Course Prerequisites: Mathematics, Operation Research

Course Objectives:

- To understand the classification of optimization techniques and its practical use.
- To understand about the optimization of one dimensional optimization methods.
- To know about constrained minimization methods.
- To understand Geometric and dynamic programings.

Course Outcomes:

After completion of the course the student is able to:

- Apply the different types of optimization techniques for different purposes.
- Formulates and solve the problems by using one dimensional unconstrained minimization methods.
- Formulates and solve the problems (industrial/research) by using the geometric programming.
- Formulate and solve the industrial problems by using the dynamic programming methods.

UNIT I

Introduction: Engineering Applications; Statement of the Optimal Problem: Classification; Optimization Techniques. Classical Methods: Single Variable Optimization; Multivariable Optimization without any Constraints with Equality and Inequality Constraints.

UNIT II

One-Dimensional Minimization Methods: Uni-model Function; Elimination Methods – Dichotomous Search, Fibonacce and Golden Section Methods; Interpolation Methods – Quadratic and Cubic Interpolation Methods.

UNIT III

Unconstrained Minimization Methods: Univariate, Conjugate Directions, Gradient and Variable Metric Methods. Constrained Minimization Methods: Characteristics of a constrained problem; Direct Methods of feasible directions; Indirect Methods of interior and exterior penalty functions.

UNIT IV

Geometric Programming: Formulation and Solutions of Unconstrained and Constrained geometric programming problems.

UNIT V

Dynamic Programming: Concept of Sub-optimization and the principle of optimality; Calculus, Tabular and Computational Methods in Dynamic Programming; An Introduction to Continuous Dynamic Programming.

TEXT BOOKS:

1. Optimization (Theory & Applications) – S.S. Rao, Wiley Eastern Ltd., New Delhi.
2. Optimization Concepts and Applications in Engineering - Ashok D.Belegundu and Tirupathi R Chandrupatla -- Pearson Education.

REFERENCES:

1. Optimization: Theory and Practice, C.S.G. Beveridge and R.S. Schechter, MGH, New York.
2. Genetic Algorithms in search, Optimization and Machine, Goldberg D. E., Addison-Wesley-NewYork.
3. Optimization for Engineering Design Algorithms and Examples, Kalyanamoy Deb, Prentice Hall of India.

(5EC72) INTRODUCTION TO MICRO PROCESSORS AND CONTROLLERS

Course Objectives:

- Differentiate various number systems
- Develop simple application using 8085 microprocessors
- Develop simple applications using 8051 microcontrollers

Course Outcomes:

After completion of the course the student is able to:

- Understand basic computing concepts
- Know architecture of 8085 micro processors and 8051 Microcontrollers
- Interface peripherals to microprocessor
- Program internal resources of 8051 microcontroller

UNIT I

Introduction to Computing

Numbering and Coding Systems: Binary, Decimal, Hexadecimal and conversions, Binary and Hexadecimal Arithmetic, Complements, Alphanumeric codes. Digital Premier, Inside the Computer

UNIT II

8085 Microprocessor

Features, Architecture and operation of 8085, Programming Model, External Memory for 8085

UNIT III

Programmable Peripheral Devices

Programmable Peripheral Interface (8255), USART (8251), Programmable Interval Timer (8253) and interfacing.

UNIT IV

8051 Microcontrollers

Microcontrollers and Embedded Processors, Overview of the 8051 family, Architecture and Programming Model of 8051, Timers and Counters, parallel and serial ports, Interrupts, Special Function Register formats, Internal Memory Organization

UNIT V

Applications

8051 Programming in C: Data types for the 8051, programs for IO operations, programs on Timer operations, Serial IO ports, and interrupts, Case Study: DC Motor Control

TEXT BOOKS:

1. Microprocessor Architecture, Programming and Applications with the 8085/8080A, Gaonkar

2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, 2nd Edition, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay

REFERENCES:

1. The 8051 Microcontroller : programming, architecture by Ayala & Gadre, Cengage Publications
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

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Open Elective - II

3 0 3

(5EC95) WIRELESS COMMUNICATIONS AND NETWORKS

Prerequisite: Computer Networks

Course Objectives:

- Understand fundamentals of wireless communications
- Know basics of wireless networks
- Differentiate fixed IP and Mobile IP
- Learn design of basic wireless LAN network

Course outcomes:

After Completion of the course the student is able to

- Understand the fundamental concepts of Cellular communications
- Differentiate various multiple access techniques
- Learn wireless protocols used in wireless Networks
- Understand mobile IP requirements

UNIT I

WIRELESS COMMUNICATIONS & SYSTEM FUNDAMENTALS:

Introduction to wireless communications systems, examples, comparisons & trends. Cellular concepts-frequency reuse, strategies, interference & system capacity, trunking and grade of service, improving coverage & capacity in cellular systems.

UNIT II

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION:

FDMA, TDMA, SSMA (FHMA/CDMA/Hybrid techniques), SDMA technique (AS applicable to wireless communications). Packet radio access-protocols, CSMA protocols, reservation protocols, capture effect in packet radio, capacity of cellular systems.

UNIT III

WIRELESS NETWORKING:

Introduction, differences in wireless & fixed telephone networks, traffic routing in wireless networks –circuit switching, packet switching X.25 protocol. Wireless data services – cellular digital packet data (CDPD), advanced radio data information systems, RAM mobile data (RMD). Common channel signaling (CCS), ISDN-Broad band ISDN & ATM, Signalling System no. 7(SS7)-protocols, network services part, user part, signaling traffic, services and performance.

UNIT IV

MOBILE IP AND WIRELESS APPLICATION PROTOCOL:

Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling, WAP Architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, Wireless datagram protocol.

UNIT V

WIRELESS LAN TECHNOLOGY:

Infrared LANs, Spread spectrum LANs, Narrow band microwave LANs, IEEE 802 protocol Architecture, IEEE802 architecture and services, 802.11 medium access control, 802.11 physical layer.

BLUE TOOTH: Overview, Radio specification, Base band specification, Links manager Specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

TEXTBOOKS:

1. Wireless Communication and Networking – William Stallings, PHI, 2003.
2. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn.,2002.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.

REFERENCES:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999Page 26 of 38

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Open Elective II

3 0 3

(5CS72) OPEN SOURCE TECHNOLOGIES

Course Objectives:

1. Understand Perl, Python, PHP and Ruby to new situations and learn from the experience.
2. Assist Perl programmer or database administrator to compile large programming set.
3. Incorporate PHP into HTML files, Write basic PHP scripts, Process form input, Write and use functions.
4. Apply advanced techniques, tools, and methodologies that can be used to build complex, scalable, PHP applications.

Course Outcomes:

After completion of the course the student is able to:

1. Apply regular expressions to tokenize and validate data in a variety of languages
2. Utilize Ruby to solve a wide range of text processing problems
3. Understand the nuances and differences in a web based environment as compared to more traditional environments
4. Distinguish variety of languages to develop interactive web applications

UNIT I

Introduction to PERL

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines, advance Perl - finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT II

PHP Basics

PHP Basics- Features Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures . Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III

Advanced PHP Programming

PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Merypt package, Building Web sites for the World - Translating Websites- Updating Web sites Scripts, Creating the Localization Repository, Translating Files, text. Generate Binary Files, Set the desired language within your scripts. Localizing Dates, Numbers and Times.

UNIT IV

Python

Introduction to Python language, python-syntax,statements,functions,Built-in-functions and Methods, Modules in python, Exception Handling, Integrated Web Applications in Python - Building Small, Efficient Python Web Systems ,Web Application Framework.

UNIT V

Ruby

Basics of Ruby, classes, objects and variable, arrays, Exception Handling ,threads, Regular Expressions, Strings, Objects in Ruby

TEXT BOOKS:

1. Programming Perl Larry Wall, T.Christiansen and J.Orwant, O'Reilly,SPD.
2. Guide to Programming with Python, M.Dawson, Cengage Learning.

REFERENCES:

1. The Ruby Programming Language 1st Edition by David Flanagan
2. Professional PHP Programming by Jesus M. Castagnetto , Harish Rawat , Deepak T. Veliath (WROX publication)
3. Perl Power, J.P.Flynt, Cengage Learning.
4. Perl by Example, E, Quigley, Pearson Education.
5. Programming Ruby: The Pragmatic Programmer's Guide, by Pragmatic Dave Thomas, Andy Thomas

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Open Elective- II

3 0 3

(5EI72) LABVIEW PROGRAMMING

Course Objectives:

The Objective of this course is to make the students:

1. Understand the new concept in measurement and automation.
2. Understand how to control an external measuring device by interfacing a computer.
3. Competent in data acquisition and instrument control.
4. Program for networking and other applications like Digital image processing control system and signal processing.

Course Outcomes:

After completion of the course the student is able to:

- Develop a Virtual Instrument using LabVIEW to communicate with real world.
- Identify salient traits of a virtual instrument and incorporate these traits in their projects.
- Experiment, analyze and document in the laboratory prototype measurement
- Develop program for application like networking, Digital image processing ,control system, etc

UNIT I

VIRTUAL INSTRUMENTATION:

Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Active X Programming.

UNIT II

STRUCTURES AND SEQUENCE:

Controlling program execution with structures: While and For loops, Shift registers, Case and Sequence structure and Sub VI

UNIT III

COMPOSITE DATA AND DISPLAYS:

Arrays and Structures: Two dimension array, Auto Indexing to set the for loop count, Building arrays with auto indexing, Array Acrobats, Polymorphism, Cluster Order, Cluster to pass data, Bundling and unbundling cluster, Interchangeable arrays and cluster , Error Cluster and Error handling functions:

Chart update modes, Single Plot chart, Wiring multiple plot chart, Single Plot versus Multiple plot data types, The X scroll bar, clearing the chart, Stacked and overlaid plots, Multiple Y scales and chart history lengths.: Activity: Temperature monitor, Graphing a sine wave, XY plot to plot a circle, Temperature analysis and 3D graphs.

UNIT IV

STRINGS, FILE OUTPUT AND SIGNAL MEASUREMENTS AND GENERATION:

Single line strings, online string updation, Scroll bar, Writing and reading a measurement file, Writing and reading from a spread sheet, Computer to real world

interface using LabVIEW, Creating Ni DAQ Task in Measurement and Automation Explorer (MAX), Generating code from MAX, DAQ timing and trigger, Multichannel and continuous acquisition, Streaming Data file and Counting frequency and events. VI Chassis requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB.

UNIT V

APPLICATIONS:

Networking basics for office & Industrial applications, VISA and IVI, VI toolsets, Distributed I/O modules, Development of Control system, Industrial Communication, Image acquisition and processing,

TEXT BOOKS:

1. Gary Johnson, LabVIEW Graphical Programming, 2nd edition, McGraw Hill, Newyork, 1997.
2. Lisa K. wells & Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersey, 1997.

REFERENCES:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000.
2. Rick Bitter ,LabVIEW advanced programming technique, 2nd Edition, CRC Press, 2005
3. Jovitha Jerome, Virtual Instrumentation using LabVIEW, 1st Edition, PHI, 2001.

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Open Elective - II

3 0 3

(5EI79) FUNDAMENTALS OF ROBOTICS

Course Objectives

The course is intended for students to:

- Understand the Robot coordinate system and control system
- Learn different types of Robot sensors and actuators
- Identify different types of Robot grippers and their applications.
- Acquire Knowledge on kinematics and vision systems used for different Robots

Course Outcomes

After completion of the course the student is able to:

- Gain knowledge about basic concepts of robots.
- Appreciate the usage of different actuators, sensors and grippers in Robotics.
- Analyze the direct and the inverse kinematic problems.
- Able to identify the applications of Machine Vision in Robotics.

UNIT I:

Basic Concepts:

An over view of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT II:

Sensors:

Sensor characteristics, Position sensors, Velocity sensors, Acceleration sensors, Force and Pressure sensors, Torque sensors, Microswitches, Light and infrared sensors, Touch and tactile sensors, Proximity sensors, Range finders.

Unit III:

Actuators and Grippers:

Characteristics of actuating system, Comparison of actuating systems, Hydraulic actuators, Pneumatic devices, Electric motors, Magneto-strictive actuators, Shape-Memory Metals, Electro-active Polymer Actuators.

Classification of Grippers, Drive system for Grippers, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks and Scoops, Gripper Force analysis and design, Active and Passive Grippers.

UNIT IV:

Kinematics:

Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of Transformations, Inverse of Transformation Matrices, Forward and Inverse Kinematics with Equations.

UNIT V:

Vision:

Image acquisition, Illumination Techniques, Imaging Geometry, Basic Relationships between Pixels, Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

TEXT BOOKS

1. Saeed B. Niku ,Introduction To Robotics : Analysis, Control, Applications ,Wiley, 2nd Edition .
2. Deb.S.R, "Robotics technology and flexible Automation", John Wiley

REFERENCES

1. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
2. K.S.Fu, R.C.Gonzalez, C.S.G Lee, "Robotics- Control ,Sensing ,Vision and Intelligence ",McGraw-Hill International Edition.
3. Klafter. R.D, Chimielewski. T.A, Negin. M, "Robotic Engineering–An integrated approach", Prentice Hall of India, New Delhi

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Open Elective- II

3 0 3

(5IT72) RELATIONAL DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To describe database management systems (DBMS) concepts and relational data model.
- To employ DBMS concepts to organize, maintain and retrieve information efficiently and effectively from a DBMS.
- To discuss the concepts of transactions and transaction processing systems
- To examine the issues and techniques relating to concurrency and recovery in multi-user database environments

Course Outcomes:

After completion of the course the student is able to

- Describe the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
- Employ the Relational Database Model to understand the Logical and Physical aspects of the DBMS architecture.
- Analyse and apply normal forms for real time database applications.
- Evaluation of transaction properties and file organization methods

UNIT I

Introduction to Databases and Database Management System - Database system Applications - Advantages of DBMS over File System - Data Models – Instances and schema - View of Data - Database Languages -DDL-DML - Database Users and Administrator - Database System Structure.

UNIT II

Database Design and ER diagrams – Attributes and Entity Sets – Relationships and Relationship Sets – Constraints - Keys - Design Issues - Entity-Relationship Diagram-Weak Entity Sets - Extended E-R Features - Database Design with ER model - Database Design for Banking Enterprise

UNIT III

Introduction to the Relational Model – Structure of RDBMS - Integrity Constraints over Relations – Enforcing Integrity Constraints – Querying Relational Data - Relational Algebra and Calculus.

Introduction to SQL- Data Definition commands, Data Manipulation Commands, Basic Structure, Set operations Aggregate Operations - Join operations - Sub queries and correlated queries, SQL functions , views ,Triggers, Embedded SQL.

UNIT IV

Functional Dependencies– Introduction , Basic Definitions, Trivial and Non trivial dependencies, closure of a set of dependencies, closure of attributes, irreducible set of dependencies- Schema Refinement in Database Design- Problems Caused by Redundancy – Decompositions – Problem Related to Decomposition – Lossless Join

Decomposition – Dependency Preserving Decomposition - FIRST, SECOND, THIRD Normal Forms – BCNF — Multi valued Dependencies – Fourth Normal Form.

UNIT V

Transaction concept- Transaction state- Implementation of atomicity and Durability- Concurrent executions – Serializability, Recoverability

File Organization – Organization of records in file - Data Dictionary Storage – Indexing and Hashing – Basic Concepts , Ordered Indices, B+Tree Index files, B- tree index files

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth , Fifth Edition, McGraw hill.
2. Introduction to Database Systems, C.J.Date, Pearson Education.

REFERENCES:

1. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
2. Database Management Systems, Raghu ramakrishnan, Johannes Gehrke, TATA Mc Graw Hill.
3. Data base Systems design, Implementability, and Management, Peter Rob and Carlos Coronel 7th Edition.
4. Data Base Systems using Oracle : A simplified guide to SQL and PL /SQL, Shah, PHI

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Open Elective II

3 0 3

(5AE72) MODERN AUTOMOTIVE TECHNOLOGIES

Course Prerequisites: Principles of automobile engineering

Course Objectives:

- Provide an overview on advanced engine control system concepts
- Study the concepts and drivetrain configurations of electric and hybrid electric vehicles
- Present principle, working and automotive applications of fuel cell and solar technology
- Aware of intelligent vehicle technologies like navigation, safety, security and comfort systems

Course Outcomes:

After completion of the course the student is able to:

- Apply advanced engine control system concepts in engineering
- Discuss electric and hybrid electric drivetrain technologies and drivetrain components
- Describe automotive applications of fuel cell and solar technology
- Appreciate the technological advancements driver assistance systems

UNIT I

ADVANCED ENGINE CONTROLS: Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping, on-board diagnostics – engine control module and powertrain control module.

UNIT II

ELECTRIC AND HYBRID VEHICLES: Electric vehicles - Layout of an electric vehicle, performance, energy consumption, advantage and limitations. Hybrid electric vehicles - Concepts, types of hybrid drive train architecture, merits and demerits.

UNIT III

FUEL CELL AND SOLAR VEHICLES: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

UNIT IV

TELEMATICS AND COMFORT SYSTEMS: Global positioning system, geographical information systems, navigation system, automotive vision system, adaptive cruise control system, active suspension system, power steering and power windows.

UNIT V

SAFETY AND SECURITY SYSTEMS: Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti lock braking systems, traction control

system, electronic immobilizers, remote keyless entry, smart card system, number plate coding.

TEXT BOOKS:

1. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn,1998.
2. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2005.

REFERENCES:

1. "Automotive Hand Book" Robert Bosch, SAE, 5th edition, 2000.
2. Ljubo Vlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
3. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
4. "Navigation and Intelligent Transportation Systems – Progress in Technology", Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998.

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Open Elective- II

3 0 3

(5BS72) ENTREPRENEURSHIP

Course Objectives:

- To introduce basics of entrepreneurship development and the skills set required for innovation.
- To understand changing business trends to enhance decision making skills.
- To learn analytical and conceptual skills of identifying opportunities and check on their feasibility for start-ups.
- To motivate the engineers to choose entrepreneurship as a career for personal and societal growth.

Course Outcomes:

After completion of the course the students are able:

- To identify business opportunities and equip themselves in preparing business plans
- To analyze and evaluate different proposals and its requirements for start-ups.
- To pitch the ideas to launch their own venture.
- To assess the impact of competition and find methods to overcome the problems in business.

UNIT-1:

Entrepreneurial Skills-Opportunities

Entrepreneurship as a career, Personality and Skill Set of Entrepreneur, The Wisdom of Five WHY's and in action, Value and Growth-Stories of Successful Enterprises.

Innovation and Entrepreneurship: Three Learning Milestones of Innovation: Use of Minimum Viable Product-Startup's must tune the baseline towards the ideal-Pivot or Persevere.

UNIT-2:

Changing Business Environment-Role of Entrepreneur

The Role of Quality and Design, Beyond "The right place at the right time", Current trends in Business, Entrepreneurial Management.

UNIT-3:

Origins Of Lean Start-up-Business Plans

The Concept of Vision to Steering: From Start-Define-Learn-Experiment to Leap-Test-Measure-Pivot.

UNIT-4:

Validation of Projects and Products

Projects Evaluation by Budgeting Techniques, Value vs Waste, Analogs and Antilogs, Analysis Paralysis, Why first products are not meant to be perfect-Experiences, Forecasting and Experimenting of Products.

UNIT-5:

Start-up Methods and Understanding Competition

Accelerating Start-up's, optimization versus learning, Kanban Diagram of work as it progresses from stage to stage, the value of three A's: Actionable, Accessible and Auditable, Engines of growth to determine product/market fit, adopting smaller batches, reasons for Failures in Start-up's, Pricing Strategies Based On Competition

TEXT BOOKS:

1. EricRies, "The Lean Startup", Crown Business, New York. v.3.1.
2. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001.
3. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2001.

REFERENCES:

1. Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, Biztrantra ,2nd Edition ,2005
2. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, 1996.
3. P.Saravanavel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai -1997.
4. Arya Kumar. Entrepreneurship. Pearson. 2012
5. Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning.2012

(5CE60) GEO-TECHNICAL ENGINEERING LABORATORY

Course Objectives:

The Student shall be able to

- **Know** the concepts of various types of soils.
- **Apply** the knowledge of science, mathematics and engineering with the context of applications in geotechnical engineering.
- **Describe** various characteristics of soils to decide the problems related to foundational engineering
- **Solve** the problems encountered in real world situation.

Course Outcomes:

After the completion of the course student should be able to

- **Identify** the various types of soils existing at the site.
- **Decide** the soil stabilization techniques if required to make the soil suitable for particular project.
- **Predict** probable problems that may be encountered in any project.
- **Suggest** the remedial measures to solve the problems encountered in existing problems.

List of Experiments:

1. Determination of Moisture Content and Specific Gravity
2. Field Density Tests
 - A. Core cutter method
 - B. Sand replacement method
3. Grain Size Analysis
 - A. Sieve Analysis
 - B. Hydrometer Analysis
4. Determination of Consistency Limits
5. Permeability Test
 - A. Constant Head Method
 - B. Falling Head Method
6. CBR Test
7. Proctor Light And Heavy Compaction Test
8. Vane Shear Test
9. Direct Shear Test
10. Unconfined Compression Test
11. Unconsolidated and Undrained Triaxial Test

(5CE61) TRANSPORTATION ENGINEERING LABORATORY

Course Objectives:

Student shall be able to

- **learn** on test on aggregates materials used road constructions
- gain **knowledge** on Bitumen grading used for flexible pavement construction.
- **analyze** different tests on Bitumen materials along with its specifications.
- **examine** test performed for Bitumen mixes.

Course Outcomes:

After the completion of the course student should be able to

- **Categorize** aggregate used in pavements along with its suitability
- **Identify** and select the various **Design** strategies of pavement using Lab Equipment.
- **Appraise** on bitumen grades.
- **Evaluate** stability parameters of bitumen mixes.

Test on Road Aggregates

1. Aggregate Crushing Value
2. Aggregate Impact Value
3. Los Angeles Abrasion Test.
4. Shape Tests a) Elongation Index, b) Flakiness Index, c) Angularity Number.
5. Specific Gravity & Water absorption

Test on Bitumen

1. Penetration Test, Softening Point test, Ductility Test
2. Flash & Fire Point Test.
3. Absolute Viscosity
4. Kinematic Viscosity
5. Bitumen Extraction Test

Test on Bituminous Mixes

Marshal Stability Test (Demo)

***Note: Bituminous Mix design is carried as per MoRT&H & IRC specifications.**

(5BS03) ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

Introduction:

This course aims to offer students a practical approach to Technical Writing, and provide a relevant, contemporary and authoritative introduction to the dynamic field of technical communication that prepares them for Workplace Communication. Each unit in the syllabus is devised so as to include a writing component as well as an oral component.

Course Objectives:

- enable the students to create clear, accurate, and succinct content to write business letters, resume, SOP, Proposals and Technical Reports for academics as well as for workplace
- enable students to adjust technical content to meet the needs of a specific target audience
- groom students to speak accurately and fluently and prepare them for real world activities through behavioral skills.
- train students in soft skills through role play and group discussion to improve their EQ.

Course Outcomes:

Students will be able to:

- summarize and synthesize information and produce technical writing that is required in academics as well as in the engineering profession
- write covering letters, resume, SOP, Project Proposals and Technical Reports
- speak fluently and address a large group of audience and participate in debates and discussions.
- negotiate terms, manage complex situations through interpersonal skills, persuade people and make quick decisions.

Methodology:

Writing Component

A Process- Genre methodology will be used in teaching the technical genres. This method would enable students to understand the use of particular lexico-grammatical patterns required of in the context of technical writing. They would learn to use language to express the particular communicative intent that is required of in the context of writing these genres.

UNIT I

- Oral Communication :Talking About Yourself
- Applications and Covering letters
- Resume Writing
- Verbal Ability: Vocabulary (Technical and Non-Technical) reading and listening (analysis and reasoning)

UNIT II

- Oral Communication: Making Presentations

- Writing an SOP
- Summarizing and Synthesizing Information

UNIT III

- Oral Communication: Group Discussions
- Writing Abstracts

UNIT IV

- Oral Communication: Debate
- Writing Reports

Unit V

Soft Skills

TEXT AND MATERIALS

- Ashraf Rizvi, M (2005). Effective Technical Communication, Tata Mc Graw Hill Publishing Company Limited, New Delhi.
- Anderson, Paul V. (2003). Reports. In Paul V. Anderson's Technical Communication: A Reader-Centered Approach (5th ed..) (pp. 457-473). Boston: Heinle.
- William S. Pfeiffer, (2012) Technical Communication: A Practical Approach (7th ed.) Longman

REFERENCES:

- Burnett, Rebecca. Technical Communication. 5th Ed., Heinle, 2001.
- Gerson Sharon J. and Steven Gerson : Technical Writing Process and Product. 3rd edition, New Jersey: Prentice Hall 1999
- Markel, Mike. Technical Communication: Situations and Strategies (8th EDITION (2006-2007)
- R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Third Edition, TMH, 2002. (Indian Edition)
- M. Raman and S. Sharma, Technical Communication : Principles and Practices, OUP, 2004. (Indian Edition)

(5CE20) GEOGRAPHICAL INFORMATION SYSTEM

Course Objectives:

Student shall able to

- To **describe** and **define** various concepts of Remote Sensing and GIS.
- To enable the students to **analyze** Remote sensing and GIS data.
- To make the students **appraise** the importance of accuracy of remote sensing and GIS data
- To enable the students to **apply** Remote Sensing and GIS knowledge in solving various Civil Engineering related problems.

Course Outcomes:

After the completion of the course student should be able to

- At the end of the course student should be able to **describe** different concepts and terms used in Remote Sensing and GIS
- At the end of the course student should be able to **compare** and process different data sets
- At the end of the course student should be able to **evaluate** the accuracy and **decide** whether a data set can be used or not.
- Students will be able **demonstrate** various applications in RS and GIS.

UNIT – I

Introduction to Photogrammetry Introduction to aerial photography and photogrammetry. Principle and types of aerial photographs, stereoscopy, Map, Map Vs Mosaic, ground control, points, Parallax measurements for height, determinations.

UNIT – II

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

UNIT – III

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT – IV

Geographic Information System Introduction, GIS definition & terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS, Data collection & input overview, data input & output, keyboard entry & co-ordinate geometry procedure, manual digitizing & scanning, Raster GIS,

Vector GIS-File management, Spatial dataLayer based GIS, Feature based GIS mapping spatial analysis with raster and vector data. overview of GPS.

UNIT – V

Applications of Remote Sensing and GIS Land Use Land Cover mapping, agricultural applications, oceanographic applications, urban and regional planning applications, water resources applications, environmental studies and disaster management applications

TEXT BOOKS

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.Kiefer, Wiley Publishers, 7th Edition, 2015.
2. Remote Sensing and GIS by Basudeb Bhatta , Oxford University Press, 2nd Edition, 2011.

REFERENCES

1. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N.Madhu, Pearson Education, 1st Edition, 2007.
2. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy, B.S.Publications, 3rd Edition, 2006.
3. Textbook of Remote Sensing and Geographical Information systems by Kali Charan Sahu, Atlantic Publishers and Distributors, 1st Edition, 2007.
4. Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7th Edition, 2013.

(5CE21) GEO-TECHNICAL ENGINEERING-II

Course Objectives:

Student shall be able to

- To **create** ability to solve foundation engineering design and problems associated.
- To **develop** an understanding of sampling techniques in soils.
- To **understand** the impact of engineering solutions related to the ground stability.
- To **determine** the bearing capacity for the **design** of shallow and deep foundations.

Course Outcomes:

After the completion of the course student should be able to

- **Correlate** the mechanics of soil and apply them in solving the problems related to foundation engineering.
- **Determine** the stability of the slopes.
- **Design** an effective foundation system for economic and safe aspects.
- **Develop** and apply the knowledge on various problems related to the different types of foundations and their adoption to site conditions.

UNIT – I

Subsoil Exploration

Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Borelogs, planning of exploration programmes, report writing.

UNIT – II

Earth slope stability

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

UNIT – III

Earth Pressure

Types of Earth pressure. Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil Coloumbs wedge theory, Culmans and Rebhanns graphical method for active earth pressure. **RETAINING WALLS:** Types of retaining walls - Stability of retaining walls.

UNIT – IV

Bearing Capacity

Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundation, General and

local shear failure conditions. Factors affecting bearing capacity of Soil. Allowable bearing pressure based on N-values. Bearing capacity from plate load tests. Shallow Foundations: Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations. Problems with foundations on expansive soils.

Settlement analysis

Causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement.

UNIT – V

Deep Foundations

Types, Construction, load carrying capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction.

TEXT BOOKS

1. Analysis, Design of foundations and Earth retaining structures by Shamsheer Prakash, Gopal Ranjan and Swami Saran, IBH Publishers, 1979
2. Foundation Analysis and Design by J. E. Bowles., TataMc-Graw Hill Publishers 4th Edition, 1996

REFERENCES

1. Foundation Design by W.C Teng, Prentice Hall Publishers
2. Soil Mechanics, Foundation Engineering by V.N.S. Murthy., CBS Publishers & Distributors Pvt. Ltd. First Edition, 2013
3. Geotechnical Engineering by S.K.Gulhati& Manoj Datta.,Tata McGraw-Hill Education Pvt.Ltd., First edition 2005.
4. Soil Mechanics and Foundation Engineering by K.R. Arora, Standard Publishers Distributors, Seventh Edition, 2011.
5. Problems in Soil Mechanics and Foundation Engineering by Dr.B.P.Verma, Khanna Publications, 10th Edition, 2010.

(5CE22) TRANSPORTATION ENGINEERING

Course Objectives:

Student shall be able to

- **To introduce** students on concepts of railway engineering design and its related railway components.
- The students should be able to **analyze** different geometrical elements used in design of railways.
- The students shall **formulate** the fundamental parts of aircraft and carry out runway design in an airport.
- To provide fundamental concepts in **identification** and understanding the importance of docks and harbours.

Course Outcomes:

After the completion of the course student should be able to

- The student should **explain** railway track components, its importance and requirements.
- The student should **design** elements of track geometry, points and crossings and concepts of railway signaling
- The student is expected to **elaborate** on air–craft characteristics, site selection and perform corrections in runway length design.
- The student should **predict** the importance and necessity of harbours and docks in transportation.

UNIT – I

Introduction to Railways

Role of Indian Railways in national development – Railways for Urban Transportation – LRT , Mono Rail, Metro Rail & MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast less Tracks.

UNIT – II

Geometric Design of Railway Track

Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT – III

Track maintenance and Operation

Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.

UNIT - IV

Airport Engineering

Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of

Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

UNIT – V

Dock & Harbour Engineering

Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

TEXT BOOKS.

1. Railway engineering by S.C. Saxena and S. Arora; Dhanpat Rai & Sons; Delhi, India, 2007.
2. Airport planning and Design by S.K. Khanna & M.G Arora; Nemchand & Bros, Roorkee, India, 2012.

REFERENCES

1. Railway Engineering by Bindra, S.P. Dhanpat Rai and Sons, New Delhi, India, 1997.
2. Air Transportation Planning and Design by Virendhra Kumar & Satish Chandra; Gal Gotia Publications Pvt. Ltd., New Delhi, India, 1999.
3. Dock and Harbour Engineering by Seetharaman, S., Umesh Publications, New Delhi, India, 1999.
4. A Course in Docks and Harbour Engineering by Bindra, S.P.; Dhanpat Rai and Sons, New Delhi, India, 1992.

VNR Vignana Jyothi Institute of Engineering and Technology

IV Year B. Tech CE – I Sem

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3	0	3

(5CE23) ENVIRONMENTAL ENGINEERING

Course Objectives:

Student shall be able to

- **Identify** the sources of water supply and water quality standards
- **Define** the terms of water supply engineering and **Describe** the water treatment process and distribution networks
- **Define** the terms of wastewater engineering and **Design** the sewers
- **Describe and design** waste water treatment process

Course Outcomes:

After the completion of the course student should be able to

- **Acquire** the knowledge of the water borne diseases and water sources
- **Develop skills** in designing the water treatment plant.
- **Acquire the knowledge** of the estimation of sewage and storm water
- **Develop skills** in design of sewers, waste water treatment units

UNIT – I

Introduction: Importance, Necessity and Objectives of Protected Water Supply systems. Water Demand and Quantity studies: Estimation & Types of water demands, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Forecasting Studies. Quality Analysis of Water: Characteristics of water, Impurities in water, Water borne diseases, Drinking water quality standards. Sources of water, Capacity of storage reservoirs, Infiltration galleries, confined and unconfined aquifers, Intakes-Types, Conveyance of Water, Types of Pipes, Pipe Materials, Pipe joints, Valves and water meters.

UNIT - II

Layout and general outline of water treatment units, Treatment methods (Theory and Design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration—working of slow and rapid gravity filters, Chlorination and other Disinfection methods—theory of chlorination-Chlorine Demand-other disinfection methods.

UNIT - III

Distribution systems-types of layouts of distribution systems-design of distribution systems, Hardy cross and equivalent pipe methods, water meters, laying and testing of pipe lines. Sources of wastewater generation, effects, sewerage systems, Estimation of sewage and storm water—time of concentration, characteristics of sewage and factors affecting cycles of decay –BOD,COD equations, Effluent standards.

UNIT-IV

Design of sewers - Hydraulics of flow in sewers, Objectives, Design period , Design of sanitary and storm sewers , shapes and materials –sewer appurtenances; Laying, joining & testing of sewers , appurtenances – Pumps – selection of pumps and pipe Drainage - Plumbing System for Buildings , One pipe and two pipe system.

UNIT-V

Layout and general outline of various units in a waste water treatment plant – Selection of treatment processes, primary treatment - design of screens, grit chambers, skimming tanks, sedimentation tanks. Principles and design of secondary treatment - biological treatment, trickling filters–standard and high rate construction and design of oxidation ponds , sludge digestion tanks,sludge disposal by drying –septic tanks working principles and design-soak pits.

TEXT BOOKS:

1. Environmental Engineering by Garg, S.K., Vol.1 Khanna Publishers, New Delhi, 2005.
2. Water Supply Engineering by Modi, P.N. Vol. I Standard Book House, New Delhi, 2005.

REFERENCES:

1. Environmental Engineering –I : Water supply Engineering by Garg, S.K., Khanna Publishers.
2. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering by Garg, S.K. Khanna Publishers.
3. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1997.
4. Wastewater Engineering – Treatment and Reuse by Metcalf and Eddy, Tata Mc.Graw-Hill Company, New Delhi, 2003.
5. Water Supply and Sanitary Engineering by Birdie and Birdie, DhanpatRai Publishing Company, New Delhi, 2014.

(5CE73) GROUND WATER DEVELOPMENT AND MANAGEMENT

Course Objectives:

Student shall be able to

- To **describe** the concepts of Groundwater Development and Management.
- To **explain and** derive the basic equations used in Groundwater development and management
- To **solve** groundwater problems using the mathematical equations
- To investigate, **analyze** and conduct field studies to conduct basic ground water studies.

Course Outcomes:

After the completion of the course student should be able to

- **Identify** different fundamental equations and concepts as applied in the Groundwater studies
- **Discuss** and derive differential equation governing groundwater flow in three dimensions
- To **solve** groundwater mathematical equations and analyze pumping tests in steady and non steady flow cases
- **Distinguish** and understand the saline water intrusion problem in groundwater

UNIT-I

Ground Water Occurrence

Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. Ground Water Movement-Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.

UNIT-II

Analysis of Pumping Test Data-I

Steady flow ground water flow towards a well in confined and unconfined aquifers - Dupuit's and Thim's equations, assumptions, formation constants, yield of an open well interface and well tests.

UNIT-III

Analysis of Pumping Test Data-II

Unsteady flow towards well - Non Equilibrium equations, Theis solution, Jacob and Chow's simplifications, Leaky aquifers.

UNIT-IV

Surface and sub-surface Investigation

surface methods of exploration-Electrical resistivity method and Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water ,recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

UNIT-V

Saline water intrusion in aquifer

Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

TEXT BOOKS

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York, 2005.
2. Ground water by H.M.Raghunath, Wiley Eastern Ltd, 2002.

REFERENCES

1. Applied Principles of Hydrology by Manning, CBS Publishers Distributers, New Delhi, 2007.
2. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributors, New Delhi, 2013.
3. Ground Water Assessment, Development and Management by K R Karanth, Mc Graw hill Publications., 2003.
4. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Printice Hall, 1998.

Vignana Jyothi Institute of Engineering & Technology

IV Year B. Tech CE – I Sem
Elective - I

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(5CE74) FINITE ELEMENT METHODS

Course Objectives:

Student shall be able to

- Understand the general steps of finite element methods.
- Understand the basic finite element formulation techniques.
- Equip the students with the Finite Element Analysis fundamentals.
- Enable the students to perform engineering simulations using Finite Element Analysis software

Course Outcomes:

After the completion of the course student should be able to

- An ability to solve multi-disciplinary problems
- Ability to derive equations in finite element methods for 1-D and 2-D problems.
- Ability to formulate and solve basic problems in structural mechanics using different elements.
- Ability to apply knowledge of mathematics and Engineering.

UNIT-I

Introduction: Basic concepts of the FEM – Steps of the FEM – Advantages and Disadvantages- – Applications - Discretization-A general procedure for Finite element analysis.

Principles of Elasticity: Equilibrium equations – Strain displacement relationships- Stress-Strain Relations- Plane stress, Plane strain problems- Axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT-II

One Dimensional FEM

Linear spring as a Finite element-Local and Global coordinate systems-Finite element modeling-Stiffness matrix for bar element, Flexure element- Element load vector- Equivalent nodal loads-Analysis of plane truss - shape functions for one dimensional elements – One dimensional problems-Comparison of the Finite element solution to the exact solution.

UNIT-III

Two Dimensional FEM

Different types of elements for plane stress and plane strain analysis-CST element-LST element- Rectangular elements- Displacement models – generalized coordinates – shape functions – convergence and compatibility requirements – Geometric invariance – Natural coordinate system – Area coordinates - Volume coordinates.

UNIT-IV

Isoparametric formulation

Concepts of Isoparametric elements for 2D analysis- Formulation of CST element, 4 – noded and 8-noded iso-parametric quadrilateral elements – Shape functions- Strain-displacement matrices-Lagrangian and Serendipity elements- Isoparametric ,Super

parametric and Sub parametric elements.

UNIT-V

Solution Techniques

Numerical Integration- Gaussian Quadrature- One point, Two Point and Three point formula- Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOKS

1. A First course in the Finite element method by Daryl L. Logon, 3rd ed- Thomson, 2002
2. Finite Elements Methods in Engineering by Tirupati.R. Chandrepatla and Ashok D. Belegundu - Pearson Education Publications, 2007.

REFERENCES

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. 2nd ed, Jhon Wiley & Sons, 2005.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- 2nd ed, Tata Mc.Graw Hill, 2004
3. Text book of Finite Element analysis by P.Seshu – 2nd ed, Prentice Hall of India, 2011.
4. Finite element analysis by S.S. Bhavakatti, 3rd ed, -New age international publishers, 2015
5. Finite element analysis by David V Hutton, 7th edition, Tata McGraw Hill, 2005.

(5CE75) TRAFFIC ENGINEERING

Course Objectives:

Student shall be able to

- **Understand** the basic concepts of traffic engineering.
- **Analyze** capacity and level of service of highways.
- **Identify** the importance and types of parking and traffic safety in day-to-day life.
- **Design** signals at the intersection.

Course Outcomes:

After the completion of the course student should be able to

- **explain** basic characteristics of traffic engineering like speed, flow and density.
- **analyze** and calculate the capacity and level of service of any given highway.
- **formulate** the parking demand and design a parking facility.
- **design** the signals at the intersection.

UNIT – I

Basic traffic characteristics - Speed, volume and concentration. Relationship between Flow, Speed and Concentration Volume Studies - Objectives, Methods; Speed studies - Objectives: Definition of Spot Speed, time mean speed and space mean speed

UNIT – II

Speed Studies: Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies.

Highway Capacity and Level of Service: Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways Multilane highways and freeways.

UNIT – III

Parking Studies and Analysis:

Types of parking facilities - on street parking and off street Parking facilities; Parking studies and analysis.

Traffic Safety: Accident studies and analysis; Causes of accidents - The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents, Road User cost study, Road safety audit

UNIT - IV

Traffic Control and Regulation:

Traffic Signals - Design of Isolated Traffic Signal by Webster method, Warrants for signalization, Signal Co-ordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.

UNIT – V

Traffic and Environment:

Detrimental effects of Traffic on Environment; Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic.

TEXT BOOKS

1. Traffic Engineering and Transportation Planning by Kadiyali L.R., Khanna Publication, New Delhi, 2011.
2. Traffic Engineering by Roger P. Roess, Elena S. Prassas and William R. McShane, , Prentice Hall, 4th edition, 2010.

REFERENCES

1. Mike Slinn, Paul Matthews, Peter Guest, Traffic Engineering Design: Principles and Practice, Butterworth-heinemann, 2nd Edition, 2005.
2. Traffic & Highway Engineering by Nicholas J Garber, Lester A Hoel, Third edition, Bill, 2011.
3. Design codes IRC: SP: 41-1994, IRC SP: 31-1992, IRC 43-1994, Indian Roads Congress, New Delhi. Highway Capacity Manual 2010, Transportation Research Board
4. Traffic Engineering, by Matson T M, Smith W S ,Hurd F W, Mcgraw Hill Book Co, NY USA.

(5CE76) SOLID WASTE MANAGEMENT

Course Objectives:

Student shall be able to

- **Define the terms and Understands** the necessity of solid waste management
- **Explain** the strategies for the collection of solid waste
- **Describe** the solid waste disposal methods
- **Categorize** bio-medical waste and e-waste

Course Outcomes:

After the completion of the course student should be able to

- **Understand and classify** the necessity of solid waste management
- **Explain** the solid waste disposal techniques
- **Acquire** the knowledge of Bio medical waste disposal techniques
- **Choose** different strategies for the disposal of solid waste

UNIT – I

Introduction

Solid Waste problem, Meaning and definition of solid waste, concept and classification of municipal solid waste, Impacts of solid waste on environment, Solid waste management rules and regulations.

UNIT – II

Collection and Transport of Municipal Solid Waste

Developing a solid waste collection and transport system, characterizing waste, determining public and private collection/transport options.

UNIT – III

Solid Waste Management Techniques

Solid waste management Hierarchy, waste avoidance /waste prevention, Definition of source Reduction, waste reduction at source using 5R's Technique.

UNIT – IV

Waste Disposal Techniques

Introduction, composting, principles of composting, factors affecting composting, Vermi-composting, waste to energy techniques, Landfill technique, and design and operating procedure of landfill.

UNIT – V

Solid Waste Management of Biomedical Waste, plastic and E- Waste

Biomedical Waste – Sources and generation, biomedical waste management. Plastic – Dangers of plastic wastes, Recycling and disposal of plastic wastes. E-Wastes – Definition, Health hazards, E-Waste management and conclusion.

TEXT BOOKS

1. Handbook of Solid Waste Management by George Tchobanoglous and Frank Kreith, McGRAW-HILL, 2002.
2. Solid waste management by K. Sasi Kumar & S. Gopi Krishna, Prentice-Hall publishers, 2009.

REFERENCES

1. Management of Municipal Solid Waste by T.V. Ramachandra, The Energy and Resources Institute, TERI, 2009.
2. Municipal Solid Waste Management in India by Subhrabaran Das and Korobi Gogoi, VDM Verlag, 2010.
3. Solid waste engineering by William A. Worrell and P. Aarne Vesilind, 2nd Edition, Cengage Learning, 2000.
4. Solid Waste Management by Jagbir Singh and A. L. Ramanathan, I K International Publishing House Pvt. Ltd, 2009.

(5CE77) DESIGN AND DRAWING OF HYDRAULIC STRUCTURES

Course Objectives:

Student shall be able to

- **Describe** the role of various structures for the control of flows in open channels and canals for the benefit of society.
- To **demonstrate** the hand-on experience in drawing of irrigation and environmental engineering structures
- To **apply** the engineering knowledge to the architecture and design of weirs
- To **analyze and compare** various design options for energy dissipation structures

Course Outcomes:

After completion of this course, student should be able to:

- **Identify** appropriate hydraulic structures under different conditions.
- **Analyze**, design and draw different kinds of hydraulic structures.
- **Prepare** engineering drawing and design reports
- **Select** an appropriate design for a given engineering, environmental, social and economic consideration.

Design and drawing of the following hydraulic structures

1. Slopping glacis weir
2. Tank sluice with tower head
3. Type III Syphon aqueduct
4. Surplus weir
5. Trapezoidal notch fall
6. Canal regulator

TEXT BOOKS

1. Design of minor irrigation and canal structures by C. Satyanarayana murthy, New Age International Publishers, New Delhi, 1990.
2. Irrigation Engineering and Hydraulic Structures by S.K.Garg, S.K. Khanna Publishers, 2010.

REFERENCES

1. Hydraulic Structures; P. Novak, AIB Moffat, C. Nalluri, and R. Narayanan: Taylor & Francis, New York, 2007.
2. Design Textbooks in Civil Engineering – Irrigation Engineering – Vol VI – Dams; L Leliavsky; Chapman & Hall, 1981.
3. Theory and Design of Irrigation Structures; Varshney, Gupta, Gupta; Nem Chand, 1979.
4. Text book of irrigation Engineering & Hydraulic Structures – R.K. Sharma, Oxford & IBH Publishing Company, New Delhi, 2002.

IS Codes

IS Code 6512: Criteria for Design of Solid Gravity Dams

IS Code 1893: Criteria for Earthquake Resistant Design of Structures

IS Code 4410 : Part 22 : 1994 Glossary of terms relating to river valley projects: Part 22 Barrages & Weirs

IS Code 6966 : Part 1 : 1989 Guidelines for hydraulic design of barrages and weirs: Part-1 Alluvial Reaches

IS Code 7349 : 1989 Guidelines for operation and maintenance of barrages and weirs

IS Code 7720 : 1991 Criteria for Investigation, Planning and Layout for Barrages and Weirs

IS Code 11130 : 1984 Criteria for Structural Design of Barrages and Weirs

IS Code 14955 : 2001 Guidelines for Hydraulic Model Studies of Barrages and Weirs

Final Examination pattern: Any two questions of the above six designs may be asked out of which the candidate has to answer one question. The duration of examination will be three hours.

(5CE78) EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

Course Objectives:

Student shall be able to

- **Understand** Engineering Seismology
- **Explain** and discuss single degree of freedom systems subjected to free and forced vibrations
- **Acquire** the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
- **understand** importance of ductile detailing of RC structures

Course Outcomes:

After the completion of the course student should be able to

- **Explain** and **derive** fundamental equations in structural dynamics
- **Discuss** and **explain** causes and Theories on earthquake, seismic waves, measurement of earthquakes
- **Evaluate** base shear using IS methods
- **Design** and **Detail** the reinforcement for earthquake forces

UNIT-I

Introduction to structural Dynamics

Elements of vibrating system - Degrees of freedom - Continuous system - Lumped mass idealization - Oscillatory motion -Free vibrations of Single degree of freedom system - undamped, damped and critical damping - logarithmic decrement-Forced vibrations of SDOF - Harmonic loading

UNIT-II

Engineering seismology

Earthquake phenomenon - causes of earthquakes -Theories on earthquake causes - Seismic waves - Magnitude and Intensity of earthquake - Energy released - Earthquake measuring Instruments - Seismograph – Accelerograph - Seismic zones of India

UNIT-III

Conceptual design

Introduction to functional planning - Continuous load path - Overall form-simplicity and symmetry - elongated shapes -stiffness and strength - Horizontal and vertical members - Twisting of buildings - flexible buildings - framing systems -unconfined concrete and confined concrete - reinforcing steel - lateral load resisting systems - irregularities in buildings

UNIT-IV

Basic assumptions - principles in earthquake resistant designs - permissible stresses - Seismic methods of analysis based on IS: 1893 - Equivalent lateral force method - Dynamic analysis - Response spectrum method - Time history method

UNIT-V

Ductility considerations in earthquake resistant design of RC buildings - Impact of ductility - requirements for ductility -Assessment of ductility - Factors affecting ductility - Ductile detailing considerations as per IS:13920 - Behaviour of beams, columns and joints in RC buildings during earthquake

TEXT BOOKS

1. Earthquake Resistant Design of Structures-S.K.Duggal, Oxford University Press, 2011
2. Earthquake Resistant Design of Structures-Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt.Ltd.2006
3. Seismic Design of Reinforced Concrete and Masonry Building -T Paulay and M.J.N. Priestly, John Wiley & Sons, 2009

REFERENCES

1. Structural Dynamics – Mario Paz, CBS Publisher, 2004
2. Earthquake Resistant Design of Masonry Building ,Miha Tomazevic, Imperial College Press, 2006
3. Earthquake Tips-Learning Earthquake Design and Construction- C.V.R.Murthy

REFERENCE CODES

1. IS: 1893(Part-1)-2002, "Criteria for Earthquake Resistant Design of structures", B.I.S.,New Delhi
2. IS: 13920-1993, "Ductile detailing of Concrete structures subjected to seismic force"- guidelines, B.I.S. New Delhi

(5CE79) AIR POLLUTION AND CONTROL TECHNOLOGY

Course Objectives:

Student shall be able to

- **Understands** and **Define** Air pollution Concepts
- **Identify** the sources air pollution
- **Describe** and **Sketch** Air pollution Control devices
- **Describe** and **Sketch** Air quality monitoring devices

Course Outcomes:

After the completion of the course student should be able to

- **Understands** Air pollution Concepts
- **Acquire** the knowledge of Effects of air pollution
- **Explain** Air pollution Control devices
- **Explain** Air quality monitoring devices

UNIT – I

Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants and particulates. Gases-Sources of pollution ,Air qualities standards.

UNIT – II

Meteorology – Wind roses – lapses rates – mixing depth atmospheric dispersion – plume behavior accumulation, estimation of pollutants – Effective stack height.

UNIT – III

Air Pollution effects on human beings, animals, plants and materials global conditions– Air Pollution Episodes in India and abroad.

UNIT – IV

Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) settling chamber, cyclones, wet scrubbers/collectors, centrifugal scrubbers, spray towers, packed beds, electrostatic precipitators, absorption – adsorption – Diffusion.

UNIT – V

Air pollution monitoring and management.-Environmental guide lines for siting industries, Environmental Impact assessment, Environmental management plan, stack emission standards, stack emission monitoring, ambient air quality monitoring, ambient air quality survey.

TEXT BOOKS

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Elements of Air Pollution Control by Prof. T. Shivaji Rao, Lavanya lata Pub. 1988.

REFERENCES

1. Air Pollution Control by K.V.S.G. Murali Krishna, Kaushal & Co 1995.
2. Air Pollution and its Control by M.N.Rao. & H.V.N.Rao, TaTa Mc.Graw Hill, 15th reprint, 2000.
3. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.
4. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynard publisher Academic Press.

(5CE80) AIRPORT PLANNING AND DESIGN

Course Objectives:

Student shall be able to

- **understand** the classification of airports and related aircraft characteristics
- **comprehend** the site selection for airport
- **explicate** the grading and drainage of airport
- **explain** the air traffic control aids

Course Outcomes:

After the completion of the course student should be able to

- The student Should **illustrate** on the design of runway length and estimate the corrections for runway length
- The student should **explain** the planning and designing the terminal area in airport locations.
- The student should **recall** importance of marking runway and taxiway areas.
- The student should **explain** the importance of structural design of airport pavements & visual aids

UNIT-I

Introduction & aircraft characteristics

General, Requirements of Aircraft Types, Field Length Regulations, Restrictions On Payload- Range Performance, Weight Components, Airplane Components Parts, Military And Civil Aircrafts, Civil Military Co-Ordination, Classification Of Flying Activity, Relation Of Aircraft To Landing Facility, Aircraft Characteristics, Future Trends In Aircraft Design

UNIT-II

Airport obstructions & runway design

Zoning Laws, Classification of Obstructions, Turning Zone, Runway Orientation, Basic Runway Length, Correction for Elevation, Temperature and Gradient, Airport Classification Runway Geometric Design

UNIT-III

Taxiway design & terminal area

Factors Controlling Taxiway Layout, Geometric Design Standards, Exit Taxiways, Fillets, Separation Clearance, Holding Apron, Turnaround or Bypass Taxiway

Building and Building Area, Vehicular Circulation and Parking Area, Apron, Hangar, Blast Considerations, Typical Airport Layouts

UNIT-IV

Airport planning

General, Airport Master Plan, Regional Planning, Data Required Before Site Selection, Airport Site Selection, Surveys For Site Selection, Drawings To Be Prepared, Estimation Of Future Air Traffic Needs

UNIT-V

Design of Airport Pavements & Visual Aids

Introduction, Various Design Factors, Design Methods for flexible Pavements, Design Method for air field rigid pavements, Influence Charts - concrete pavement due to load in the interior of slab, LCN system of Pavement design, Joints In Cement Concrete Pavements, Airport Marking, Airport Lighting.

TEXT BOOKS

1. Airport planning & Design by S. K. Khanna SS Arora MG Arora , Jain Publications, 2000.
2. Planning & Design of Airports – Robert M. Horonjeff, Francis X Mc Graw Hill Professional, 1995.

REFERENCES

1. Airport Engineering by Norman j Ashford Mc. Graw hill Professional, 2000.
2. Airport planning and management by Seth Young and Alexander Wells, Mc Graw Hill, 2000.
3. Airport Operations by Norman J. Ashford, H. P. Martin Stanton , Mc Graw Hill, 2000.
4. Airport Engineering: Planning, Design and Development of 21st Century Airports by Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, Mc. Graw Hill Professional, 2000

(5CE62) CAD/GIS LABORATORY

CAD LAB:

Course Objectives:

Student shall be able to

- **Understand** the GUI of the analysis package
- **Create** geometries using preprocessor
- **Analyse** and Interpret the results using post processor
- **Design** the structural elements

Course Outcomes:

After the completion of the course student should be able to

- **Model** the geometry of real world structure Represent the physical model of structural element/structure
- Perform **analysis**
- **Interpret** from the Post processing results
- **Design** the Concrete & Steel structural elements as per IS Codes

CAD :

1. Analysis of simple and overhanging beams
2. Analysis of fixed and continuous beams
3. 2-D RC frame analysis and Design
4. Steel Truss analysis and Design using angle sections
5. 3-D RC frame analysis and Design
6. Steel Truss analysis and Design using tubular sections

Software: Legal Structural Analysis Software

GIS LAB:

Course Objectives:

Student shall be able to

- **Explain** the process of image interpretation.
- **Perform** remotely sensed image classification
- **Perform** different tasks with various GIS modules
- **Acquire** knowledge on creating maps with GIS

Course Outcomes:

After the completion of the course student should be able to

- **Identify** different objects and components present in a image using visual image interpretation technique.
- **Classify** an image into different classes using supervised and unsupervised classification techniques.
- **Create** a new digitized map of an area from given toposheet.
- **Develop** solutions for few civil engineering problems using RS and GIS.

REMOTE SENSING:

1. Aerial photograph interpretation
2. Visual interpretation of multispectral and panchromatic image
3. Image classification, supervised and unsupervised classifications
4. Change detection from multi-date imagery

GIS:

1. Analog to Digital Conversion – Scanning methods
2. Introduction to software
3. Digital database creation – Point features, Line features, Polygon features
4. Data Editing-Removal of errors – Overshoot and Undershoot, Snapping
5. Data Collection and Integration, Non-spatial data attachment working with tables
6. Dissolving and Merging
7. Clipping, Intersection and Union
8. Buffering techniques
9. Spatial and Attribute query and Analysis
10. DEM

Software: Remote Sensing and GIS Software

(5CE63) ENVIRONMENTAL ENGINEERING LABORATORY

Course Objectives:

Student shall be able to

- **Understand** about the importance of Environmental Engineering Lab
- **Perform** the experiments to determine water, waste water and Industrial water quality
- **Understand** the water sampling, waste water sampling & water quality standards
- **Estimate** quality of water, waste water, Industrial water and air

Course Outcomes:

After the completion of the course student should be able to

- **Understand** about the importance of environmental engineering laboratory
- **Perform** the experiments in the lab
- **Examine** and **Estimate** water, waste water, air and soil Quality
- **Compare** the water, air quality standards with prescribed standards set by the local governments
- **Develop** a report on the water quality and air quality

List of the Experiments:

1. P^h& Conductivity. Determination of pH and conductivity of water and waste water and soil.
2. Turbidity, Determination of turbidity of water and wastewater by Nephelometry.
3. Hardness, Determination of hardness of water and waste water by titrimetric method
4. a) Acidity estimation as CaCO₃ by titrimetric method
b) Alkalinity estimation as CaCO₃ by titrimetric method
5. Determination of chlorides, nitrates, fluorides and ammonia in water and waste water.
6. Determination of PM₁₀ in air by using respirable dust sampler
7. Determination of metal components like Ca, Na, Cu, Ag, Pb, Cr, Co etc by using Atomic Absorption Spectrophotometer (AAS).
8. Optimum dosage of coagulant by jar test. Determination of optimum dosage of coagulant using Jar test (flocculation test)
9. Estimation of Total Solids: Settleable Solids: Suspended solids, dissolved solids.
10. D.O. Determination of D.O polarographic probe method
11. B. O. D.
12. C. O. D.
13. Chlorides. Determination of chloride by Mohr's argentometric method
14. Determination concentration of CO, CO₂ by using indoor air quality monitor.

TEXT BOOKS:

1. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, McGraw-Hill, 1985.

2. Environmental Engineering Laboratory Manual by Dr. B. Kotaiah and Dr. N. Kumara Swamy, Charotar Publishing House Pvt. Ltd.

(5CE24) ESTIMATING AND COSTING

Course Objectives:

Student shall be able to

- **Understands** the terms of estimation
- **Calculate** detailed estimate of buildings
- **Perform** rate analysis of quantities
- **List** the methods of valuation of the property

Course Outcomes:

After the completion of the course student should be able to

- **Evaluate** the detailed estimate of RC building
- **Evaluate** the detailed estimate of roads, irrigation works
- **Assess** the value of a property.
- **Recommend** the type of contract for a specific Work

UNIT-I

Estimate - explanation of terms - contingencies - work charged establishments - provisional sum - lumpsum item - centage charge - types of estimate - revised estimate - supplementary estimate - maintenance estimate - approximate estimate - plinth area method - cubic rate method - unit rate method - bay method - approximate quantity from bill method - comparison method - cost from materials and labour. - preparation of detailed estimate for R.C building - centre line method and long wall - short wall method - methods of measurements of different items of work.

UNIT-II

Preparation of detailed estimate for sanitary and water supply works - roads - irrigation works - doors and windows - detailed specifications for common building materials and items of work as per I.S specifications - calculation of quantities of materials for items of work.

UNIT-III

Preparation of conveyance statement - analysis of rate for items of works required for civil engineering works - preparation of abstract of estimate of civil engineering works. Preparation of bar bending schedule for some typical RCC elements.

UNIT-IV

Competitive bidding- Local competitive bidding, global bidding, item rate contract percentage rate contract and Lumpsum contract. Preparing tender papers- Invitation of tenders, tender notice, tender documents, (various terms and conditions to contracts) submission. Scrutiny and acceptance. Award of jobs. Rights and responsibilities of parties to contracts. Negotiated contracts. Cost plus percentage. Cost plus fixed fees. Cost plus sliding scale of fees. Target cost as based on sharing risk and profits. Turnkey contracts. More than two party contracts.

UNIT-V

Valuation - explanation of items - types of values - sinking fund - years purchase - depreciation - straight line method - constant percentage method - S.F method - obsolescence - valuation tables - valuation of real property - rental method - profit based method - depreciation method - valuation of land - belting method - development method - hypothecated building scheme method - rent calculation - lease and lease hold property, Arbitration.

TEXT BOOKS

1. Estimating and Costing by B.N.Dutta, UBS Publishers, 26th edition, 2010.
2. Estimating, Costing, Specification & Valuation by M Chakraborti, 24th edition, 2010.

REFERENCES

1. Estimating and Costing by G.S.Birdie, Dhanpat rai Publications,5th edition,2000.
2. Standard Schedule of rates and standard data book by public works department.
3. IS: 1200 (Parts I to XXV – 1974/method of measurement of building and civil engineering works – B.I.S)
4. National Building Code.

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IV Year B. Tech CE – II Sem
Elective - III

L	T/P/D	C
3	0	3

(5CE81) CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT

Course Objectives:

Student shall be able to

- **Learn** the fundamentals of construction laws.
- **Know** the fundamentals of construction safety.
- **Understand** various equipments used in construction.
- **Practice** Project Planning.

Course Outcomes:

After the completion of the course student should be able to

- **Differentiate** between different construction equipment.
- **Prepare** Plan and control resources of projects.
- **Prepare** Construction Schedule by using different methods.
- **Understand** and **apply** ISO 9000 Standards to projects

UNIT-I

Fundamentals of construction Technology, Construction activities, process, construction schedule construction records, documents, quality, safety, codes and regulations.

UNIT-II

Construction method , earthwork , piling , concrete and concreting, formwork , fabrication and erection, Mechanized construction, construction equipment, equipment economics, excavators, Rollers, Dozers, Scrapers, Handling equipment, concrete equipment, cranes, draglines and clamshells.

UNIT-III

Quality control, Assurance and safety, ISO 9000, quality systems, principles on safety, personnel, fire and electrical safety, environment protection, concept of green building.

UNIT-IV

Contract management, project estimation, types of estimation, contract document, classification, bidding, procurement process, Construction planning, project planning techniques, planning of manpower, material, equipment and finance.

UNIT-V

Project scheduling, PERT, CPM, Resource leveling, Construction claims, Dispute and project closure, source of claim, claim management, Dispute Resolution, Arbitration, Construction Closure, contract Closure, Documentation.

TEXT BOOKS

1. Construction Technology by Subir K.Sarkar, Subhajit Saraswati, Oxford University Press,2008

2. Construction Project Management – Theory and Practice, Neeraj jha, Pearson Education,2011

REFERENCES

1. Project Planning and Control with PERT and CPM – B.C. Punmia, K.K.Khandelwala – Laxmi Publication,2011
2. Construction Project Management by K.K.Chitkara, Tata Mcgraw Hill Education Private Limited, 2010
3. Construction Planning & Management by U.K.Srivastava, Galgotia Publications, 2013
4. Construction Planning Equipment and Methods by Peurifacy, Schexnayder, Sharpira TMH,2010

(5CE82) ADVANCED STRUCTURAL ANALYSIS

Course Objectives:

Student shall be able to

- **Understand** the various approximate methods of structural analysis.
- **Identify** principal axes in beams subjected to unsymmetrical bending.
- **Differentiate** between flexibility and stiffness methods of analysis of beams, frames and plane trusses
- **Explain** plastic analysis of beams and frames

Course Outcomes:

After the completion of the course student should be able to

- **Analyze** the multistory building frames by various approximate methods.
- **Determine** the Stresses in beams, deflections of beams subjected to unsymmetrical bending
- **Solve** the continuous beams, portal frames by matrix methods of analysis.
- **Understand** the plastic analysis of structures and can **Draw** the ILD's for indeterminate structures.

UNIT - I

Approximate Methods of Structural Analysis :

Application to building frames - (i) Portal method (ii) Cantilever method (iii) Substitute frame analysis-two cycle.

UNIT – II

Unsymmetrical Bending :

Introduction – Centroidal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis, deflection of beams under unsymmetrical bending, shear centre for simple section.

UNIT – III

Matrix Methods :

Stiffness method : Application to Plane frames and Plane Trusses.

Flexibility Method : Application to Plane frames and Plane Trusses.

UNIT – IV

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.

UNIT – V

Influence lines for Indeterminate structures :

Muller -Breslau principles for statically Indeterminate beams, Influence line diagrams for Reaction, Shearing force and Bending moment in case of Indeterminate beams and Influence line diagrams for member forces in statically Indeterminate trusses

TEXT BOOKS

1. Theory of Structures by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, 12th Edition .
2. Structural Analysis : A Matrix Approach by G.S.Pandit, S.P.Gupta, Tata McGraw-Hill Publishers, 2nd Edition.

REFERENCES

1. Structural Analysis by Devdas Menon, Narosa Publishers, 2008.
- 2.Theory of Structures – Vol. II by S.P.Gupta, G.S. Pandit, R.Gupta, Tata McGraw-Hill Publishers, 1st Edition.
3. Structural Analysis by A.Ghali, A.M. Neville and T.G. Brown, Spon Press, 6th Edition, 2009.
4. Structural Analysis by D.S.Prakash Rao, Universities Press, 1996.

(5CE83) GROUND IMPROVEMENT TECHNIQUES

Course Objectives:

Student shall be able to

- **Learn** and **understand** various ground improvement technique.
- **List** various method of compaction for ground improvement in it strength.
- **Explain** various physical and chemical modification for ground improvement
- **Choose** the foundation and or treatment method based on the site condition.

Course Outcomes:

After the completion of the course student should be able to

- **Select** the ground improvement technique which is suitable and economical for soil strengthening.
- **List** different techniques based on the various types of soils in-situ.
- **Design** reinforced earth structures.
- **Apply** the knowledge of geo-synthetic material for usage.

UNIT – I

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, Dewatering, Drain wells, Sand drains, Sandwich geodrains, Stone columns, Lime columns, Thermal methods.

UNIT – II

Reinforced earth principles, Components of reinforced earth walls, Factors governing design of reinforced earth walls, Design principles of reinforced earth walls.

UNIT – III

Geotextiles: Introduction, Type of geotextiles, Function and their application, tests for geotextile materials, Geogrids, Functions of geogrids. Expansive soils, Problems in Expansive soils, Mechanism of swelling, swell pressure, swell potential, Heave, Tests for identification, I. S.Test Methods of determination of swell pressure, Foundation techniques in Expansive soils.

UNIT – IV

Mechanical stabilization: Soil aggregate mixtures, Properties and proportioning techniques, soft aggregate stabilization, compaction, Field compaction control. Cement stabilization: Mechanism-Factors affecting and properties, Uses of additives, Design of soil-cement mixtures, Construction techniques

UNIT – V

Lime and Bituminous stabilization: Types of admixtures, Mechanisim, Factors affecting, Design of mixtures, Construction methods.

TEXT BOOKS

1. Ground Improvement Techniques- Dr. G.V.R. Purshotham Raj
2. Designing with Geosynthetics- Robert M. Koerner

REFERENCES

1. Foundation Analysis and Design by Joseph E. Bowles; McGraw – Hill International Book Company
2. Basic and Applied Soil Mechanics by Gopal Ranjan, A.S.R. Rao, New age Publications.
3. Foundation Engineering by Braja M. Das.
4. Soil Mechanics & Foundation Engineering Vol. II by V.N.S. Murthy, Saikripa, Technical consultants, Bangalore.

(5CE84) ENVIRONMENTAL IMPACT ASSESSMENT

Course Objectives:

Student shall be able to

- **Define and Classify** Environmental Impacts and the terminology
- **Understands** the environmental Impact assessment procedure
- **Explain** the EIA methodology
- **List and describe** environmental audits

Course Outcomes:

After the completion of the course student should be able to

- **Acquire** the knowledge of Environmental impacts
- **Understand and analyze** environmental clearances and guidelines
- **prepare** an audit report
- **memorize and reproduce** environment laws and regulations

UNIT – I

Introduction to EIA, Definition of EIA and EIS. Preparation of EIS, Elements of EIA, Classification of Environmental parameters, Initial Environmental Examination, Preparation of Environmental Base map, EIA procedure

UNIT – II

EIA methodology: Introduction, criteria for selection of EIA Methodology, EIA methods - Adhoc method, Check List Method, Matrix method, Network method, Environmental media quality Index method, Overlays method, Cost benefit analysis method

UNIT – III

Environmental impacts - Identification & measurement, Aggregation, Secondary and Cumulative Impacts, Environmental Guidelines and procedures, Environmental clearance, Environmental Appraisal Procedure, Single window Clearance, Time frame, Post project monitoring, Procedure for obtaining Environmental clearance for industries, Forest clearance, Consent to operate Industrial unit, Consent to handle hazardous chemicals in the Industrial unit

UNIT – IV

Assessment of Impact of developmental Activities on soil, ground water, surface water vegetation, air, wild life, Noise & Socio Economic Environment, Environmental impacts of Deforestation-Causes and effects

UNIT – V

Environmental Audit, Types of environmental Audit, Audit protocol, Stages of Environmental Audit onsite activities, evaluation of audit data and preparation of Audit Report, Post Audit Activities, Case studies On EIA, Environmental laws and regulations-Air act, Water act, environmental protection act.

TEXT BOOKS

1. Environment Impact Analysis by Jain, R.K., Urban, L.V. and Stacey, G.S., Von Nostrand Reinhold Company
2. Environmental Impact Assessment by Canter, L.W., McGraw Hills, New York, 1977.

REFERENCES

1. Environmental Impact Assessment by L. W. Canter, 2nd Ed., McGraw-Hill, 1997.
2. Handbook of Environmental Management and Technology by G. Burke, B. R. Singh and L. Theodore, 2nd Ed., John Wiley & Sons, 2000.
3. Environment Impact Statements: A Comprehensive Guide to Project and Strategic Planning by C. H. Eccleston, John Wiley & Sons, 2000.
4. Environmental Impact Assessment and Methodologies by Y.Anjaneyulu and Valli Manickam BS Publications, 2nd Edition, 2011.

(5CE85) WATERSHED MANAGEMENT

Course Objectives:

Student shall be able to

- To **define and identify** various processes and fluxes of mass and energy within a watershed and how land use changes potentially affect these processes.
- To **explain** the science-based management principles as applied to watershed systems.
- To develop/improve and **apply** critical problem solving, quantitative and data analysis skills commonly used by natural resource managers.
- **Evaluate** the potential environmental effects of various land and water uses and how these resources can benefit from integrated watershed management.

Course Outcomes:

After completion of this course, student should be able to

- **Enumerate** the physical, biological and environmental aspects and their interrelations within a watershed; choose and apply available system tools for system intervention.
- **Explain** the participatory decision making processes; comprehend the interdependencies between natural resources and management at different locations in land and water management.
- **Solve** watershed related problems by formulating a vision and design a sustainable watershed management plan that shows an integrated approach towards multiple uses of land- and water resources and social equity and economic viability.
- **Correlate** different aspects of Watershed management so as to work in multidisciplinary and multicultural groups (with respect for different views, expertise and culture); reflect on own contribution to group work and on group processes.

UNIT-I

Introduction

Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

UNIT-II

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-III

Principles and measures to control 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. Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-IV

Water harvesting

Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, and percolation tanks.

UNIT-V

Land and ecosystem management

Land use and Land capability classification, management of forest, agricultural, grassland and wild land, Reclamation of saline and alkaline soils, 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, 2009.
2. Water Resource Engineering by R. A. Wurbs and W.P. James, - Prentice Hall Publishers, 2001.

REFERENCES

1. Land and Water Management by VVN Murthy, - Kalyani Publications, 2008
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India, 2010.
3. Watershed Management Issues and Approaches - Timothy O. Randhir, Published by IWA Publishing, Alliance House, 12 Caxton Street, London SW1H 0QS, UK, 2007.
4. Integrated Watershed Management: Principles and Practice, Isobel W. Heathcote, Wiley publications, 2009.

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Elective- IV

L	T/P/D	C
3	0	3

(5CE86) PRESTRESSED CONCRETE

Course Objectives:

Student shall be able to

- Develop an understanding of the necessity of prestressed concrete structures.
- Develop an understanding of various techniques of prestressing.
- Develop an understanding of various losses of prestress.
- Develop an understanding of the analysis of prestressed concrete members.

Course Outcomes:

After the completion of the course student should be able to

- Acquire the knowledge of evolution of process of prestressing.
- Acquire the knowledge of various prestressing techniques.
- Develop skills in analysis of prestressed concrete beams, and slabs.
- Develop skills to satisfy the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).

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.

UNIT – II

Losses of prestress

Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

UNIT – III

Analysis of sections for flexure

Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

UNIT – IV

Deflections of prestressed concrete beams

Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections.

UNIT – V

Composite section

Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

TEXT BOOKS

1. Prestressed Concrete by Krishna Raju, Tata Mc.Graw Hill Publications, 4th Edition, 2006
2. Prestressed Concrete by N.Rajagopalan, Narosa publications, 2nd Edition, 2014

REFERENCES

1. Prestressed Concrete Structures by P.Dayaratnam, Oxford & IBH Publishers, Fourth Edition
2. Design of Prestressed Concrete Structures by T.Y. Lin & N.H.Burns, John Wiley & Sons, 3rd Edition, 2005
3. Prestressed Concrete Structures by M.K.Hurst, Tata Mc.Graw Hill Publications, 2nd Edition, 2009
4. Prestressed Concrete by Ramamrutham, Dhanpat Rai & Sons Publications, 2nd Edition, 2005
5. Prestressed Concrete by K. U. Muthu, Agmil Ibrahim, Maganti Janardhana, M. Vijayanand, PHI Publishers, 2016

Codes: BIS code on prestressed concrete, IS 1343-2012.

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Elective-IV

L	T/P/D	C
3	0	3

(5CE87) PAVEMENT ANALYSIS AND DESIGN

Course Objectives:

Student shall be able to

- **Understand** the concepts used to analyze flexible - rigid pavements.
- **Appreciate** design of flexible & rigid pavement using IRC approach.
- **Apply** the various types of construction procedures for pavement layers
- **Learn** how to pavement failures and its evaluation.

Course Outcomes:

After the completion of the course student should be able to

- The student should understand the **design** factors for flexible and rigid pavements
- The student should **explain** the assumptions in pavement layers and carryout design of flexible and rigid pavement.
- The student should **discriminate** methods of highway constructions used in pavement layers.
- The student should carryout **evaluation** pavement design

UNIT – I

Introduction to Pavements

Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT –II

Stresses In flexible and Rigid Pavements: Stress Inducing Factors in Flexible and Rigid pavements; Stress In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts; Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT –III

Material Characteristics: CBR and Modulus of Sub-grade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics. Non destructing testing

UNIT – IV

Design Of Flexible and Rigid Pavements: Development of design methods, Flexible Pavement

Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods for highways. Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, and Rigid Pavement Design for Low Volume Rural Roads and highways.

UNIT – V

Pavement Evaluation

Functional Evaluation - Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes-Rigid Pavement Failures- Types and causes-Structural Evaluation- Benkleman Beam method- Strengthening of Existing Pavements- Overlays, IRC method of Overlay design, Importance of profile correction course.

TEXT BOOKS

1. Principles of Pavement Design" by Yoder and Witczak, John Wiley and sons, New York, USA, 1975.
2. Design of functional Pavements by YC Yang, Mc Graw Hill Book Company, New York, USA, 1972.

REFERENCES

1. Asphalt Institute. Thickness Design – Asphalt Pavements for Highways and Streets Manual Series No. 1 (MS-1), Asphalt Institute, Kentucky, USA, 1999.
2. Design guidelines of Pavements IRC 37-2012, IRC 81-1997, IRC 58 – 2011, Indian road congress publications, New Delhi.
3. Croney, D. and P. Croney The design and performance of road pavements, McGraw-Hill Book Company, London, UK, 1991.
4. Huang, Y.H. Pavement Analysis and Design, Second Edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi, India, 2008.

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Elective-IV

L	T/P/D	C
3	0	3

(5CE88) GEO-SYNTHETICS AND SOIL REINFORCEMENT

Course Objectives:

Student shall be able to

- To **create** awareness of the latest trends, modern standards and state of the art techniques for solving geotechnical engineering problems.
- To **develop** an ability to design a Geo-synthetic system to meet desired needs such as economic, environmental and sustainability related.
- To **identify** latest trends in the curriculum consisting mostly of practical courses in numerous special aspects of civil engineering
- To **apply** the basic knowledge and to solve critical civil engineering problems in the field like landslides, pavements, dams etc.,

Course Outcomes:

After the completion of the course student should be able to

- **Describe** different concepts and terms used in Civil Engineering.
- **Identify** the critical awareness of current issues in Geotechnical Engineering
- **Interpret** various techniques, skills, and modern engineering tools for successful carrier in geotechnical engineering practices.
- **Solve** various Geotechnical Engineering problems using geo-synthetics.

UNIT – I

An Overview of Geo-synthetics

Classification of Geo-synthetics, Functions and applications, Properties of geotextiles, geogrids and geomembranes.

UNIT – II

Soil Reinforcement

Mechanism, Reinforced slopes, Embankments on soft ground, Reinforced Embankments and Reinforced soil walls- Internal and External Stability, Slope stabilization.

UNIT – III

Geo-environmental Applications

Geomembranes for landfills and ponds, Geosynthetic clay liners, designing with GCLs, Filtration and Erosion control, Slope protection

UNIT – IV

Geosynthetics for Highways

Roadway Reinforcement, Separation, Filtration, Drainage, Reinforcement, Moisture Barrier, Membrane encapsulation.

UNIT – V

Ground Improvement

Dewatering systems, Prefabricated Vertical drains (PVD), Sand Drains and French Drains.

TEXT BOOKS

1. Koerner, R. M. - Designing with Geo-synthetics
2. Rao, G. V. & Raju G. V. S. S. -Engineering with Geo-synthetics

REFERENCES

1. Mosley -Ground Improvement
2. Jones, C. J. F. P. -Earth Reinforcement and soil structures
3. Hausmann, M. R. -Engineering Principles of Ground Modifications
4. Xianthakos, Abremson and Bruce - Ground control and Improvement