ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

CIVIL ENGINEERING

B.TECH 4 YEAR UG COURSE

(Applicable for the batches admitted from 2018-2019)

REGULATION: R18

(I, II, III & IV Year Syllabus)

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS
Bhaskar Nagar, Yenkapally, Moinabad Mandal, R.R. District,
Hyderabad – 500 075, Telangana State, India
Email: principal@jbiet.edu.in, Website: www.jbiet.edu.in

J.B. INSTITUTE OF ENGIEERING & TECHNOLOGY
UGC AUTONOMOUS

Institute Vision & Mission

Vision

To be a centre of excellence in engineering and management education, research and application of knowledge to benefit society with blend of ethical values and global perception.

Mission:

- To provide world class engineering education, encourage research and development.
- To evolve innovative applications of technology and develop entrepreneurship.
- To mould the students into socially responsible and capable leaders.

DEPARTMENT OF CIVIL ENGINEERING

Department Vision and Mission

Vision

To ensure that every learner has the feeling 'I am not just being taught, I am being educated'.

Mission

- To achieve academic excellence by imparting sound technical knowledge based on strong fundamentals of science and engineering that leads to higher education and research.
- To mould the learners into thorough professionals with the confidence of standing up as entrepreneurs in a fiercely competitive world.
- To leave the learners with a wide range of choices for employment and imparting social relevance to the profession by inculcating inquisitive spirit and ethical values.

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Bhaskar Nagar, Yenkapally, Moinabad, Hyderabad – 500075, Telangana, India

ACADEMIC REGULATIONS FOR B.TECH. REGULAR STUDENTS

WITH EFFECT FROM ACADEMIC YEAR 2018-19 (R-18)

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

J.B.Institute of Engineering and Technology (JBIET) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year 2018-19 in the following branches of Engineering:

Sl. No.	Branch
1	Civil Engineering
2	Electrical and Electronics Engineering
3	Mechanical Engineering
4	Electronics and Communication Engineering
5	Computer Science and Engineering
6	Information Technology
7	Electronics and Computer Engineering
8	Mining Engineering

2.0 Eligibility for admission

2.1 Admission to the under graduate (UG) programme is made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2 The medium of instructions for the entire under graduate programme in Engineering & Technology will be **English** only.

3.0 B.Tech. Programme structure

3.1 A student after securing admission shall complete the B.Tech. programme in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester.

Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the under graduate programme and award of the B.Tech. degree.

3.2 **UGC/AICTE** specified definitions/descriptions are adopted appropriately for

various terms and abbreviations used in these academic regulations/norms, which are listed below.

3.2.1 Semester Scheme

Each undergraduate programme is divided into 4 academic years (8 semesters) with each semester of 22 weeks of duration (16 weeks for instruction), each semester having 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Promotion System (CBPS) as indicated by UGC and curriculum/course structure as suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/courses are to be registered by the student in a semester to earn credits which is assigned to each subject/course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/week/semester for theory/lecture (L) courses or tutorials.
- One credit for two hours/week/semester for laboratory/practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/courses offered for the under graduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The College has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group / Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES-Engg Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to humanities, social sciences and management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.

5		Project Work	B.Tech. project or UG project or UG major project or Project Stage I & II
6		Industrial training/ Mini-project	Industrial training/ Summer Internship/ Industrial Oriented Mini-project/Mini-project
7	Elective Courses (EℓC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/department/branch of Engineering.
8		OE – Open Electives	Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/department/branch of Engineering.
9		Seminar	Seminar/Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor courses	-	1 or 2 Credit courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory courses (non-credit)

4.0 Course registration

4.1 A 'faculty advisor or counselor' is assigned to a group of 20 students, who will advise the students about the under graduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2 A student is allowed to register for 160 credits in completion of B.Tech programme. However, they can register for additional credits (above 160 credits). The additional credits scored shall not be considered for award of division and also not considered for calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). For such extra course(s) registered, a certificate will be issued with a letter grade indicated as a performance measure.

4.3 **Open Electives**: The students have to choose requisite number of open electives (as prescribed in the course structure) from the list of open electives given. However, the student cannot opt for an open elective subject offered by his own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

4.4 **Professional Electives**: The students have to choose requisite number of professional electives (as prescribed in the course structure) from the list of professional electives given.

5.0 Subjects/ courses to be offered

5.1 A typical section (or class) strength for each semester is 60.

5.2 A subject/ course may be offered to the students, **only if** a minimum of 30 students (1/2 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

5.3 More than one faculty member may offer the same subject (lab / practical may be included along with the corresponding theory subject in the same semester) in any semester. However, the selection of choice for students will be based on - 'first come, first serve basis and CGPA criterion' (i.e. first focus is on early on-line entry from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

5.4 If more entries for registration of a subject come into a picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course (Professional Elective and Open Electives) for **two (or multiple) sections**.

6.0 Attendance requirements:

6.1 A student is eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses) for that semester.

The attendance of Mandatory Non-Credit courses should be maintained separately.

6.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned on medical grounds by the committee comprising of HOD of Concerned Department, Class incharge and 2 senior faculty members.

6.3 A stipulated condonation fee is payable for condoning of shortage of attendance. This fee will be informed time to time by the college administration.

6.4 Shortage of attendance below 65% in aggregate shall in **no** case be condoned.

6.5 A student detained in a semester due to shortage of attendance may be readmitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulations under which a student has been readmitted shall be applicable. However, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.**6.**

7.1 A student is deemed to have fulfilled the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing course or project if he/she secures not less than 35% of marks (24 out of 70 marks) in the semester end examination and a minimum of 40% of marks in the sum total of the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) taken together.

7.2 A student is deemed to have fulfilled the minimum academic requirements and earned the credits allotted to Industrial Oriented Mini Project /Summer Internship and seminar if the student secures not less than 40% marks in each of them.

7.3 A student may reappear once for each of the above evaluations, when they are scheduled again.

7.4 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	(i) Regular course of study of first year second semester. (ii) Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 40 credits out of 80 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.

6	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 61 credits out of 122 credits i.e., 50% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.5 A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.6 A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulation under which a student has been readmitted is applicable. However, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.7 A student detained **due to lack of credits, is promoted to the next academic year only after acquiring the required academic credits.** The academic regulation under which the student has been readmitted is applicable to him.

7.8 A student who fails to earn all the 160 credits as indicated in the program structure within eight academic years from the year of admission shall forfeit his seat in B.Tech Program, unless an extension is given by college Academic council to complete the program for a further period of two years.

8.0 Evaluation - Distribution and Weightage of marks

8.1 The performance of a student in every subject/course (including practical and Project Stage – I & II) will be evaluated for 100 marks each, with 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End-Examination).

8.2 For theory courses, during the semester there are 2 mid-term examinations (internal exams of 20 marks each), 5 unit tests of 5 marks each and 2 assignments carrying 5 marks each.

8.3 Each mid-term examination will be of 1 hour 20 minutes consisting of Part-A (objective questions) for 10 marks and Part-B (long answer) for 10 marks. The Part-A objective paper is set with 20 bits of multiple choice, fill-in the blanks and

matching type of questions. The Part- B consists of 4 questions each carrying 5 marks and student should answer any two questions.

8.4 Each Unit Test will be of 1 hour duration, consisting of 3 questions from that unit carrying 5 marks each and student should answer any two questions for 10 Marks. These 10 marks are scaled down to 5 for Unit Test marks calculation.

8.5 First mid-term examination is conducted for first 2 units of syllabus and second mid-term examination is conducted for remaining 3 units of syllabus.

8.6 The Continuous Internal Evaluation for theory course shall be made as average of marks obtained in CIE – I and CIE –II as detailed in the table below.

CIE – I	Marks	CIE - II	Marks
MID – I	20	MID - II	20
Best of Unit Test - I and Unit Test - II	5	Average of the best two of Unit Test – III, Unit Test – IV and Unit Test V	5
Assignment – I	5	Assignment - II	5
Total	30	Total	30

8.7 If a student is absent for any mid term examination, may be permitted to apply for makeup examinations within a week after completion of mid-term examinations on medical grounds. A subcommittee with the following composition will look into such cases.

Subcommittee-composition:

S.No	Faculty Member	Designation
1	Concerned Head of the Department	Chairman
2	Faculty nominated by Principal	Member
3	Senior faculty member of the concerned Department	Member
4	Class Teacher of the class	Member

8.7.1 The Semester End Examinations (SEE) will be conducted for 70 marks consisting of two parts viz. i) **Part- A** for 20 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question consisting of ten sub-questions. The first five sub-questions are from each unit and carry 1 mark each. The next five sub- questions are one from each unit and carry 3 marks each.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

8.7.2 For subjects like **Engineering Graphics/Engineering Drawing,** the SEE shall consist of five questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions. There is no Part – A, and Part – B system.

8.7.3 For subjects like **Machine Drawing Practice/Machine Drawing**, the SEE is conducted for 70 marks consisting of two parts viz. (i) Part – A for 30 marks. 3 out of 4 questions must be answered, (ii) Part – B for 40 marks. Part – B is compulsory with a single question.

8.7.4 For the Subject **Estimation, Costing and Project Management**, the SEE paper should consist of Part- A, Part-B and Part C. (i) Part – A – 1 out of 2 questions from Unit – I for 25 Marks, (ii) Part – B – 1 out of 2 questions from Unit – II for 15 Marks, (iii) Part – C – 3 out of 5 questions from Units – III, IV, V for 30 Marks.

8.7.5 For subjects **Structural Engineering – I & II (RCC & STEEL),** the SEE will be conducted for 70 marks consisting of 2 parts viz. (i) Part – A for 15 marks and, (i) Part – B for 55 marks. Part – A is a compulsory question consisting of ten sub-questions. The first five sub-questions are from each unit relating to design theory and codal provisions and carry 2 marks each. The next five sub-questions are from each unit and carry 1 mark each. Part – B consists of 5 questions (numbered 2 to 6) carrying 11 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there is either or choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

8.8 For practical subjects there is a continuous internal evaluation during the semester for 30 marks and 70 marks for semester end examination. Out of the 30 marks for internal evaluation, day-to-day work in the laboratory is evaluated for 20 marks and internal practical examination is evaluated for 10 marks conducted by the laboratory teacher concerned. The semester end examination is conducted with an external examiner and the laboratory teacher. The external examiner is selected and appointed by the Principal from the list submitted by Head of the Department.

8.9 For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, machine drawing practice and estimation), the distribution is 30 marks for continuous internal evaluation (20 marks for day-to-day work and 10 marks for internal tests) and 70 marks for semester end examination.

8.10 There is Life Skills and Professional Skills course offered for 2 credits and will be evaluated in IV year I semester as a laboratory course.

8.11 There is summer internship, in collaboration with an industry of their specialization, to be taken up during the vacation after II year II Semester examination and it will be evaluated in III Year I semester. A report to be submitted in prescribed format on the internship carried out by the student. The report will evaluated for 100 marks by the committee consisting of head of the department, and internship coordinator and a senior faculty member of the department. There is no semester end examination for the seminar

8.12 There is an Industry Oriented Mini Project, in collaboration with an industry of their specialization to be taken up during the vacation after III year II semester examinations. Industry Oriented Mini Project is submitted in a report form and presented before the committee in IV year I semester. It is evaluated for 100 marks by the committee consisting of Head of the Department, supervisor of the Industrial Oriented mini project and a senior faculty member of the department.

8.13 There is a seminar in IV year II semester. For the seminar, the student shall collect the information on a specialized topic, prepare a technical report, and submit it to the department. It is evaluated by the departmental committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report is evaluated for 100 internal marks. There is no semester end examination for the seminar.

8.14 UG project work shall be carried out in two stages: Project Stage – I during IV Year I Semester, Project Stage – II during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations..

8.15 For Project Stage – I, the Project Review committee (PRC) consisting of Head of the Department, project coordinator and two senior faculty members shall evaluate(SEE) the project work for 70 marks and project supervisor (CIE) shall evaluate for 30 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together..

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.16 For Project Stage – II, the external examiner shall evaluate the project work for 70 marks and the project supervisor shall evaluate it for 30 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project stage – II, Principal selects an external examiner from the list of experts in the relevant branch submitted by the HODs of the College.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.17 For mandatory courses of Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. **These marks should also be submitted along with the internal marks of other subjects.**

8.18 No marks or letter grades is printed in the Mark Statement for mandatory/non-credit courses. Only Pass/Fail is indicated in Grade Card.

9.0 Grading procedure

9.1 Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, seminar, Industry Oriented Mini Project, and project Stage - I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade is given.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks is followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A^+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B^+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3 A student who has obtained an '**F'** grade in any subject is deemed to have '**failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 To a student who has not appeared for an examination in any subject, '**Ab'** grade will be allocated in that subject, and he is deemed to have '**failed'**. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7 A student passes the subject/ course only when **GP ≥ 5 ('C' grade or above).**

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (∑CP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

SGPA = { $\sum^{N}_{i=1} C_i G_i$ } / { $\sum^{N}_{i=1} C_i$ } …. For each semester,

where 'i' is the subject indicator index (takes into account all subjects in a semester), 'N' is the no. of subjects '**registered'** for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

CGPA = { $\sum^{M}_{j=1} C_j G_j$ } / { $\sum^{M}_{j=1} C_j$ } … for all S number of semesters registered

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1^{st} semester onwards up to and inclusive of the 8^{th} semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course/Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	**69**		**Total Credit Points**	**518**

CGPA = 518/69 = 7.51

The above illustrated calculation process of CGPA will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. Programme.

9.10 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off'** values of the CGPAs will be used.

9.11 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA is mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing standards

10.1 A student is declared successful or 'passed' in a semester, if he secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.00 at the end of that particular semester); and he is declared successful or 'passed' in the entire under graduate programme, only when gets a CGPA ≥ 5.00 for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet is issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.), credits earned.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of degree

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, is declared to have '**qualified'** for the award of B.Tech. degree in the chosen branch of Engineering selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 is placed in the following classes.

12.3 A student with final CGPA > 8.00 (at the end of the under graduate programme), and fulfilling the following conditions - is placed in '**first class with distinction'**.
However, he

(i) Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from I year I semester onwards.

(iii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA ≥ 8 is placed in **'first class'.**

12.4 Students with final CGPA (at the end of the under graduate programme) ≥ 6.50 but < 8.00 are placed in **'first class'.**

12.5 Students with final CGPA (at the end of the under graduate programme) ≥ 5.50 but < 6.50, are placed in '**second class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the under graduate programme) ≥ 5.00 but < 5.50, are placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the under graduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

13.0 Withholding of results

13.1 If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Student transfers

14.1 Transfer of students from other colleges or universities are permitted subjected to the rules and regulations of Telanga State Council for Higher Education (Technical Education Department) and JNTUH in vogue.

15.0 Scope

15.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

15.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

15.3 The College may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made is applicable to all students with effect from the dates notified by the College authorities.

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

ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME) FROM THE AY 2019-2020

1. Eligibility for award of B. Tech. Degree (LES)

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 122 credits and secure 122 credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission. However, he/she is permitted to write the examinations for two more years after six academic years of course work, failing which he/she shall forfeit his/her seat in B.Tech course.

4. The attendance requirement of B. Tech. (Regular) is applicable to B.Tech. (LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 42 credits out of 84 credits i.e., 50% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No.	**Nature of Malpractice/Improper conduct**	**Punishment**
	If the student:	
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 student is appearing but has not made use of (material shall include any marks on the body of 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 student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in the subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the student is to be cancelled and sent to the university.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and UG major project) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the

		student is subject to the academic regulations in connection with forfeiture of sea. If the imposter is and outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the answer book or additional sheet or takes our or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in the subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	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 organizers 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 writer or by signs or by 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	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 student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeiture of seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeiture of seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all other subjects the student has already appeared including practical

		examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of performance in that subject and all other subjects the student has appeared including practical examinations and UG major project of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 is reported to the Examination Result Processing Committee (ERPC) for further action to award a suitable punishment.	

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J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

COURSE STRUCTURE – R18

I B. Tech – I Semester

Sl. No.	Code	Subject	L	T-P-D	C
1	F110A	Mathematics – I	3	1-0-0	4
2	F110B	English	2	0-0-0	2
3	F112A	Basic Electrical Engineering	3	1-0-0	4
4	F110E	Engineering Physics	3	1-0-0	4
5	F1105	Basic Electrical Engineering Lab	0	0-2-0	1
6	F1103	Engineering Physics Lab	0	0-3-0	1.5
7	F1101	English Language and Communication Skills Lab	0	0-2-0	1
		Induction Programme			
		Total	**11**	**3-7-0**	**17.5**

I B. Tech – II Semester

Sl. No.	Code	Subject	L	T-P-D	C
1	F120A	Mathematics – II	3	1-0-0	4
2	F125A	Programming for Problem Solving	3	0-0-0	3
3	F120D	Engineering Chemistry	3	1-0-0	4
4	F123A	Engineering Drawing and Computer Graphics	1	0-0-4	3
5	F1206	Programming for Problem Solving Lab	0	0-4-0	2
6	F1205	Workshop and Manufacturing Practices	1	0-4-0	3
7	F1203	Chemistry Lab	0	0-3-0	1.5
		Total	**11**	**2-15-0**	**20.5**

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

COURSE STRUCTURE – R18

II B. Tech – I Semester

Sl. No.	Code	Subject	L	T-P-D	C
1	F211A	Surveying and Geomatics	3	0-0-0	3
2	F211B	Engineering Geology	2	0-0-0	2
3	F211C	Applied Mechanics	3	1-0-0	4
4	F211D	Strength of Materials – I	3	1-0-0	4
5	F211E	Fluid Mechanics	3	1-0-0	4
6	F2111	Surveying Lab	0	0-3-0	1.5
7	F2112	Strength of Materials Lab	0	0-2-0	1
8	F2113	Engineering Geology Lab	0	0-2-0	1
9	F210D	Environmental Science	2	0-0-0	0
		Total	**16**	**3-7-0**	**20.5**

II B. Tech – II Semester

Sl. No.	Code	Subject	L	T-P-D	C
1	F223A	Basics of Electronics and Mechanical Engineering	2	0-0-0	2
2	F221A	Hydraulics and Hydraulic Machinery	3	0-0-0	3
3	F221B	Strength of Materials – II	3	0-0-0	3
4	F220A	Probability and Partial Differential Equations	3	1-0-0	4
5	F221C	Environmental Engineering	3	0-0-0	3
6	F221D	Building Materials, Construction and Planning	3	0-0-0	3
7	F2211	Environmental Engineering Lab	0	0-2-0	1
8	F2212	Fluid Mechanics and Hydraulic Machinery Lab	0	0-2-0	1
9	F2213	Computer Aided Civil Engineering Drawing	0	0-3-0	1.5
10	F220E	Gender Sensitization	2	0-0-0	0
		Total	**19**	**1-7-0**	**21.5**

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

COURSE STRUCTURE – R18

III B. Tech – I Semester

Sl. No.	Code	Subject	L	T-P-D	C
1	F311A	Geotechnical Engineering	3	0-0-0	3
2	F311B	Structural Analysis	3	0-0-0	3
3	F311C	Structural Engineering – I (RCC)	3	0-0-1	3.5
4	F311D	Hydrology & Water Resources Engineering	3	0-0-0	3
5	F310B	Managerial Economics and Financial Analysis	3	0-0-0	3
6	F311E	Concrete Technology	3	0-0-0	3
7	F3111	Geotechnical Engineering Lab	0	0-2-0	1
8	F3112	Concrete Technology Lab	0	0-2-0	1
9	F3113	Summer Internship	0	0-2-0	1
		Total	**18**	**0-6-1**	**21.5**

III B. Tech – II Semester

Sl. No.	Code	Subject	L	T-P-D	C
1	F321A	Foundation Engineering	3	0-0-0	3
2	F321B	Transportation Engineering	3	0-0-0	3
3	F321C	Structural Engineering –II (Steel)	3	0-0-1	3.5
4		Professional Elective – I	3	0-0-0	3
5		Professional Elective – II	3	0-0-0	3
6		Open Elective – I	3	0-0-0	3
7	F3221	Highway Engineering Lab	0	0-2-0	1
8	F3222	Computer Aided Design and Drafting Lab	0	0-2-0	1
		Total	**18**	**0-4-1**	**20.5**

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

COURSE STRUCTURE – R18

IV B. Tech – I Semester

Sl. No.	Code	Subject	L	T-P-D	C
1		Professional Elective – III	3	0-0-0	3
2		Professional Elective – IV	3	0-0-0	3
3		Open Elective – II	3	0-0-0	3
4		Open Elective – III	3	0-0-0	3
5	F4101	Life Skills and Professional Skills Lab	0	0-4-0	2
6	F4111	Project Stage – I	0	0-8-0	4
7	F4112	Industrial oriented Mini Project	0	0-4-0	2
		Total	**12**	**0-16-0**	**20**

IV B. Tech – II Semester

Sl. No.	Code	Subject	L	T-P-D	C
1		Professional Elective – V	3	0-0-0	3
2		Professional Elective – VI	3	0-0-0	3
3		Open Elective – IV	3	0-0-0	3
4	F4212	Seminar	0	0-2-0	1
5	F4211	Project Stage – II	0	0-16-0	8
		Total	**9**	**0-18-0**	**18**

Note: All End Examinations (Theory and Practical) are of three hours duration.

L – Lecture, T – Tutorial, P – Practical, D – Drawing, C – Credits.

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

PROFESSIONAL ELECTIVE SUBJECTS

Professional Elective – I

Sl. No.	Code	Subject	L	T-P-D	C
1	F321D	Estimation, Costing and Project Management	3	0-0-0	3
2	F321E	Air Pollution and Control	3	0-0-0	3
3	F321F	Ground Water Development & Management	3	0-0-0	3
4	F321G	Structural Health Monitoring	3	0-0-0	3

Professional Elective – II

Sl. No.	Code	Subject	L	T-P-D	C
1	F321H	Remote Sensing & GIS and Lab	3	0-0-0	3
2	F321I	Urban Disaster Intelligent Control system	3	0-0-0	3
3	F321J	Solid Waste Management	3	0-0-0	3
4	F321K	FEM for Civil Engineering	3	0-0-0	3

Professional Elective – III

Sl. No.	Code	Subject	L	T-P-D	C
1	F411A	Advanced Structural Engineering	3	0-0-0	3
2	F411B	Traffic Engineering and Management	3	0-0-0	3
3	F411C	Bridge Engineering	3	0-0-0	3
4	F411D	Irrigation and Hydraulic Structures	3	0-0-0	3

Professional Elective – IV

Sl. No.	Code	Subject	L	T-P-D	C
1	F411E	Ground Improvement Techniques	3	0-0-0	3
2	F411F	Construction Technology and Project Management	3	0-0-0	3
3	F411G	Airports, Railways and Waterways	3	0-0-0	3
4	F411H	Urban Transportation Planning	3	0-0-0	3

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad(M), RR Dist., Telangana-500075

CIVIL ENGINEERING

PROFESSIONAL ELECTIVE SUBJECTS

Professional Elective – V

Sl. No.	Code	Subject	L	T-P-D	C
1	F421A	Prestressed Concrete	3	0-0-0	3
2	F421B	Rehabilitation and Retrofitting of Structures	3	0-0-0	3
3	F421C	Watershed Management	3	0-0-0	3
4	F421D	Sustainable Materials & Green Buildings	3	0-0-0	3

Professional Elective – VI

Sl. No.	Code	Subject	L	T-P-D	C
1	F421E	Pavement Design	3	0-0-0	3
2	F421F	Theory and Applications of Cement Composites	3	0-0-0	3
3	F421G	Industrial Waste Water Treatment	3	0-0-0	3
4	F421H	Earth & Rock fill Dams & Slope stability	3	0-0-0	3

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad (M), RR Dist , Telangana-500075

COURSE STRUCTURE – R18

List of Subjects offered by various Board of Studies

Open Elective – I

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	F32OA	Energy Audit and Green Building	Civil Engineering
2	F32OB	Environmental Impact Assessment	Civil Engineering
3	F32OC	Energy Storage systems	Electrical and Electronics Engineering
4	F32OD	Energy Auditing, Conservation and Management	Electrical and Electronics Engineering
5	F32OE	Automotive Technology	Mechanical Engineering
6	F32OF	Matlab Programming Language	Electronics and Communication Engineering
7	F32OG	Principles of communications	Electronics and Communication Engineering
8	F32OH	Database Management Systems	Computer Science and Engineering
9	F32OI	Operating Systems	Computer Science and Engineering
10	F32OJ	Introduction to Data Structures	Information Technology
11	F32OK	Introduction to web Design	Information Technology
12	F32OL	Internet of things	Electronics and Computer Engineering
13	F32OM	Introduction to Mining Technology	Mining Engineering

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad (M), RR Dist , Telangana-500075

COURSE STRUCTURE – R18

List of Subjects offered by various Board of Studies

Open Elective – II

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	F41OA	Waste Management	Civil Engineering
2	F41OB	Estimation, Quantity Surveying and Valuation	Civil Engineering
3	F41OC	Electric and Hybrid vehicles	Electrical and Electronics Engineering
4	F41OD	Materials in Electrical Systems	Electrical and Electronics Engineering
5	F41OE	Fundamentals of Operations Research	Mechanical Engineering
6	F41OF	Digital systems Using VHDL	Electronics and Communication Engineering
7	F41OG	IC Technology	Electronics and Communication Engineering
8	F41OH	Computer Networks	Computer Science and Engineering
9	F41OI	Python Programming	Computer Science and Engineering
10	F41OJ	Computer Organization	Information Technology
11	F41OK	Human Computer Interaction	Information Technology
12	F41OL	Introduction to Embedded systems	Electronics and Computer Engineering
13	F41OM	Introduction to Surface Mining	Mining Engineering

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad (M), RR Dist , Telangana-500075

COURSE STRUCTURE – R18

List of Subjects offered by various Board of Studies

Open Elective – III

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	F41ON	Elements of CIVIL Engineering	Civil Engineering
2	F41OO	Disaster Management	Civil Engineering
3	F41OP	Electric Costing And Estimation	Electrical and Electronics Engineering
4	F41OQ	Power Plant Engineering	Electrical and Electronics Engineering
5	F41OR	Fundamentals of Robotics	Mechanical Engineering
6	F41OS	Digital systems Using Verilog	Electronics and Communication Engineering
7	F41OT	Advanced Computer Architecture	Electronics and Communication Engineering
8	F41OU	Software Engineering	Computer Science and Engineering
9	F41OV	Cloud Computing	Computer Science and Engineering
10	F41OW	Java Programming	Information Technology
11	F41OX	Software Project Management	Information Technology
12	F41OY	Introduction to Intelligent System	Electronics and Computer Engineering
13	F41OZ	Introduction to Geology	Mining Engineering

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

Bhaskar Nagar, Yenkapally, Moinabad (M), RR Dist , Telangana-500075

COURSE STRUCTURE – R18

List of Subjects offered by various Board of Studies

Open Elective – IV

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1	F42OA	Industrial Waste Water Treatment	Civil Engineering
2	F42OB	Air pollution and Control	Civil Engineering
3	F42OC	Distributed Generation And Micro grid	Electrical and Electronics Engineering
4	F42OD	Renewable Energy Sources	Electrical and Electronics Engineering
5	F42OE	Digital Manufacturing	Mechanical Engineering
6	F42OF	Embedded System Design	Electronics and Communication Engineering
7	F42OG	Software Defined Radio	Electronics and Communication Engineering
8	F42OH	E-commerce	Computer Science and Engineering
9	F42OI	Big Data Analytics	Computer Science and Engineering
10	F42OJ	Computer Forensics	Information Technology
11	F42OK	E-Disaster Management	Information Technology
12	F42OL	Introduction to Neural Networks	Electronics and Computer Engineering
13	F42OM	Introduction to Mine Environment	Mining Engineering

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UGC AUTONOMOUS

B.Tech.: CE	**L**	**T-P-D**	**C**
I Year -I Semester	**3**	**1-0-0**	**4**

MATHEMATICS-I

(LINEAR ALGEBRA & DIFFERENTIAL EQUATIONS)

(COMMON TO CE, EEE, ME, ECE, CSE, IT, ECM & MIE)

Course Objectives:

The student will :

1. Understand the concept of matrices and solutions of system of linear equations
2. Learn the concept of eigen values and eigen vectors and cayley hamilton theorem
3. Learn the concept of sequences and series & nature
4. Get an idea to find the solutions of differential equations of first order and first degree
5. Find the solutions of second and higher order.

UNIT – I: MATRICES:

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT – II: EIGEN VALUES and EIGEN VECTORS:

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT – III : SEQUENCES and SERIES:

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence

UNIT – IV: FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS:

Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT – V : ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER :

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax$, polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. R.K.Jain& S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition, 2014.

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

Course outcomes:

The student will : able to

1. solve system of linear equations
2. analyze the Eigen values and Eigen vectors which come across under linear transformations
3. find the nature of the given series by different tests.
4. identify whether the given differential equation of first order is exact or not
5. solve higher differential equation and apply the concept of differential equation to real world problems

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech: CE	**L**	**T-P-D**	**C**
I Year -I Semester	**2**	**0-0-0**	**2**

ENGLISH
(COMMON TO CE & ECM)

Course Objectives:
The student will :

1. understand the concept of raman effect and concept in lsrw skills.
2. acquire the knowledge in ancient architecture in india and vocabulary
3. learn how denim jeans were manufactured.
4. know practice of healthy eating.
5. know how to change their fortune

UNIT –I:

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions. **Reading:** Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT – II:

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms, Homophones, Homonyms, and Homographs.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, and Job Application with Resume.

UNIT – III :

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence and Essay Writing

UNIT – IV:

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension**-** Intensive Reading and Extensive Reading

Writing: Writing Practices--Writing Introduction and Conclusion -Précis Writing.

UNIT – V :

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports

TEXT BOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

REFERENCES:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

Course outcomes: The student will able to

1. Assess the nature of diffraction and use LSRW skills in his day to day life conversations.
2. Analyze the ideas in the construction field.
3. Design different models in manufacturing jeans.
4. Adapt balanced eating habits.
5. Focus on their career.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.: CE	**L**	**T-P-D**	**C**
I Year -I Semester	**3**	**1-0-0**	**4**

BASIC ELECTRICAL ENGINEERING
(COMMON TO CE, ME, CSE, IT & MIE)

Course objectives:

1. To introduce the concept of electrical circuits using network laws and theorems.
2. To outline and analyse single phase A.C and three phase A.C circuits.
3. To study and understand magnetic circuits and transformers.
4. To understand the different types of D.C and A.C rotating electrical machine.
5. To import the knowledge of protection and switch gear of electrical components.

UNIT-I: DC Circuits:

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

UNIT –II: AC Circuits:

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

UNIT-III: Transformers:

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Rotating Electrical Machines:

D.C Motors - principle of operation, characteristics, speed control and application of series and shunt motor. Three-phase induction motor - construction, generation of rotating magnetic fields, principle of operation, torque-slip characteristics. Single-phase induction motor - construction, working, torque-speed characteristic.

UNIT –V: Electrical Installations:

Components of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables, earthing. Types of batteries, important characteristics for batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS :

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

REFERENCES:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course outcomes:

The students will be able to:

1. Illustrate and solve electrical circuits using network laws and theorem.
2. Acquire knowledge about the single phase and three phase electrical circuits.
3. Get exposure of magnetic circuits and transformers.
4. Demonstrate the working principle of electrical machines.
5. Acquire the knowledge on components of low voltage electrical installation.

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B.Tech.: CE	**L**	**T – P-D**	**C**
I Year -I Semester	**3**	**1 – 0 - 0**	**4**

ENGINEERING PHYSICS
(COMMON TO CE, ME & MIE)

Course Objectives:

The student will :

1. The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
2. demonstrate competency and understanding of the concepts found in Mechanics, Harmonic Oscillations, Acoustics and Ultrasonic's, Dielectric and Magnetic Properties, wave Optics, Lasers, Fiber Optics and a broad base of knowledge in physics
3. The main purpose of this course is to equip engineering undergraduates with an understanding of the scientific method, so that they may use the training beneficially in their higher pursuits.
4. Today the need is to stress principles rather than specific procedures, to select areas of contemporary interest rather than of past interest, and to condition the student to the atmosphere of change he will encounter during his carrier.
5. To study the Lasers and fiber optics enable in the field of telecommunications

UNIT-I: Harmonic Oscillations

Mechanical simple harmonic oscillators, Complex number notation and phasor representation of simple harmonic motion, Damped harmonic oscillator: heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor, Mechanical impedance, Steady state motion of forced damped harmonic oscillator.

UNIT-II: Acoustics and Ultrasonic's:

Introduction, Basic requirement for the acoustically good halls, reverberation and times of reverberation, factors, effecting the architectural acoustics and their remedy, sound absorbing materials, Sabine formula, Absorption co-efficient.

Introduction to Ultrasonic's, production of Ultrasonic's, Piezo Electric method, Properties of Ultrasonic's waves, use of Ultrasonic'sfor non-destructive testing**.**

UNIT-III: Dielectric and Magnetic Properties:

Introduction, types of polarizations, calculation of total electronic polarisability, internal field clausius - mossotti equation, Ferro electricity.

Introduction to magnetism, origin of magnetic movement, Bohr Magnton, Classifications of Dia, Para, Ferro, Antiferro and Ferri Magnetic materials on the basis of magnetic movement, hysteresis loop, soft and hard magnetic materials.

UNIT-IV: Wave Optics:

Huygen's principle, Superposition of waves and interference of light by division of wave front and amplitude , Young's double slit experiment, Newton's rings, Difference between Frenel and Frunhofer diffraction , Frunhofer diffraction from a single slit, Diffraction grating- resolving power, Polarization, Brewster's angle, Double refraction, Nicol's prism**.**

UNIT-V: Lasers and Fibre Optics :

Lasers: Introduction, absorption, spontaneous emission, Stimulated emission, calculation of Einstein co-efficient, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, He-Ne laser, Semiconductor laser, Applications of laser.

Fibre Optics: Introduction, Construction and working principle of Optical fibre, Acceptance angle, Acceptance cone and Numerical aperture, Types of optical fibres, Applications of optical fibres.

TEXT BOOKS:

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning
2. Engineering Physics, Gaur and Gupta, McGraw Hills .
3. " Optics" , AjoyGhatak, McGraw Hill Education, 2012A textbook of Engineering Physics,

REFERENCES:

1. "The physics of vibrations and waves", H. J. Pain, Wiley, 2006
2. "Principles of Lasers", O. Svelto,
3. "Introduction to Mechanics", M.K.Verma, Universities PressP.K.Palanisamy, "Engineering Physics", Scitech Publications, Fourth edition.

Course Outcomes: The student will able to

1. Describe the properties of mechanical simple harmonic oscillator and explain their energy decay in damped oscillator.
2. Identify and Apply methods for audio signal processing and real time control in acoustically good hall.
3. Categorize various magnetic, dielectric and properties and apply them in engineering applications.
4. Identify concept of refelction and refraction rules of light in different medium
5. Describe principles of fiber optics ,different types of fiber optics, laser and its applications .

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UGC AUTONOMOUS

B.Tech.: CE	L	T– P-D	C
I Year -I Semester	0	0 – 2 - 0	1

BASIC ELECTRICAL ENGINEERING LAB
(COMMON TO CE, ME, CSE, IT & MIE)

Course Objectives:

The student will :

1. analyze a given network by applying various electrical laws and network theorems
2. know the response of electrical circuits for different excitations.
3. calculate, measure and know the relation between basic electrical parameters
4. analyze the performance of single phase and three phase Transformers.
5. analyze the performance characteristics of DC and AC electrical machines.

Choice of 10-12 experiments from the following

List of Experiments

1. Verification of Ohms Law.
2. Verification of KVL and KCL.
3. Transient response of series RL and RC circuits using DC excitation.
4. Transient response of RLC series circuit using DC excitation.
5. Resonance in series RLC circuit.
6. Calculations and verification of impedance and current of RL, RC and RLC series circuits.
7. B-H loop for single phase transformers.
8. Measurement of voltage, current and real power in primary and secondary circuits of a single phase transformer.
9. Load test on single phase transformer (Calculate Efficiency and Regulation).
10. Three phase transformer: Verification of relationship between voltages and currents (Star-Delta, Delta-Delta, Delta-star, Star-Star).
11. Measurement of active and reactive power in a balanced three-phase circuit.
12. Performance Characteristics of a DC Shunt Motor.
13. Torque-Speed Characteristics of a DC Shunt Motor.
14. Performance Characteristics of a Three-phase Induction Motor.
15. Torque-speed Characteristics of a Three-phase Induction Motor.

Course outcomes:

The student will able to

1. demonstrate electrical circuits with basic electrical laws.
2. make use of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters
4. illustrate the basic characteristics of transformers .
5. test the performance of various electrical machines

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B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -I Semester	**0**	**0-2-0**	**1**

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

(COMMON TO CE & ECM)

Course Objective:

The student will : :

1. Recognize sounds of English .
2. Apply stress and intonation while speaking .
3. Develop Listening skills.
4. Develop introducing himself and others.
5. Understand how to describe, debate and knows the types of presentations.

The following course content is prescribed for the English for the English Language and Communication Skills Lab based on Unit -6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the lab.

SYLABUS:

English Language and Communication Sills Lab (ELCS) will have two parts:

a) **Computer Assisted Language Learning (CALL) Lab:**
b) **Interactive Communication Skills (ICS) Lab:**

Exercise – I:

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.
ICS Lab: Understand: Communication at Work Place- Spoken vs. Written language. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II:

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.
ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette

Exercise – III:

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV:

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – V:

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.

Practice: Mock Interviews.

Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students. **System Requirement (Hardware component):** Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

Course Outcomes

The student will able to

1. Develop correct pronunciation.
2. Use stress and intonation properly while speakng and writing.
3. Develop listening skills
4. Describe himself and others in day to day life situations.
5. Acquire debating and oral presentation skills.

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B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -II Semester	**3**	**1-0-0**	**4**

MATHEMATICS-II
(ADVANCED CALCULUS)
(COMMON TO CE, EEE, ME, ECE, CSE, IT, ECM & MIE)

Course Objectives:

The student will : :

1. Geometrical approach to the mean value theorems and their application to the mathematical problems & Evaluation of improper integrals using Beta and Gamma functions
2. Finding maxima and minima of function of two and three variables
3. Evaluation of multiple integrals and their applications
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

UNIT - UNIT – I: CALCULUS:

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT – II: MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS):

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative; Jacobean; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT – III: MULTIVARIABLE CALCULUS (INTEGRATION):

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelopiped).

UNIT – IV : VECTOR DIFFERENTIATION:

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors

UNIT – V : VECTOR INTEGRATION:

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. R.K.Jain& S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition, 2014.

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2010.

Course Outcomes:

The student will able to

1. Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.
2. Find the extreme values of functions of two variables with/ without constraints.
3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped.
4. Compute partial derivatives, Derivatives of vector valued functions and gradient functions
5. Evaluate the line, surface and volume integrals and converting them from one to another

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B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -II Semester	**3**	**0-0-0**	**3**

PROGRAMMING FOR PROBLEM SOLVING
(COMMON TO CE, ME, CSE, IT& MIE)

Course objectives:
The students will :

1. Learn the fundamentals of computers.
2. Understand the various steps in program development.
3. Understand the syntax and semantics of C programming language.
4. Learn the usage of structured programming approach in solving problems.
5. Gain the knowledge on searching and Sorting methods.

UNIT – I:INTRODUCTION TO PROGRAMMING :

Introduction to components of a computer system: disks, primary and secondary Emory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems.

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command linear guments

Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

UNIT – II: ARRAYS, STRINGS, STRUCTURES AND PREPROCESSOR:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays.

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures
Preprocessor: Commonly used Preprocessor commands like include, define, under, if, if defifndef.

UNIT – III: POINTERS AND FILE HANDLING IN C:

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type.

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT – IV : FUNCTION AND DYNAMIC MEMORY ALLOCATION:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions.

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types.

UNIT – V : INTRODUCTION TO ALGORITHMS:

Basic searching algorithms (linear and binary search techniques),Basic sorting algorithms (Bubble, Insertion, Quick, Merge and Selection sort algorithms) Basic concept of order of complexity through the example programs

TEXT BOOKS:

1. Reema Thareja ,Programming in C, Oxford university press.
2. B.A.Forouzan and R.F. Gilberg, C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
3. Stephen G. Kochan, Programming in C, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, McGraw-Hill, 4thEdition
5. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Course outcomes:

The students will be able to:

1. design the algorithms/flowcharts to C programs.
2. write the code test a given logic in C programming language.
3. decompose a problem into functions and to develop modular reusable code.
4. make use arrays, pointers, strings and structures to write C programs.
5. apply searching and sorting algorithms.

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UGC AUTONOMOUS

B.Tech.: CE	**L**	**T-P-D**	**C**
I Year -II Semester	**3**	**1-0-0**	**4**

ENGINEERING CHEMISTRY
(COMMON TO CE, ME, CSE, IT & MIE)

Course Objectives:

The student will :

1. To know the suitability of water for domestic and industrial purposes
2. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
3. To understand the principles of electrochemistry and corrosion
4. To acquire knowledge of chemical reactions those are used in the synthesis of molecules.
5. To include the importance of spectroscopic techniques and molecular energy levels

UNIT – I: ATOMIC STRUCTURE AND THEORIES OF BONDING:

Atomic and Molecular orbital's. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2, F_2, CO and number Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbital's in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance

UNIT – II: WATER AND ITS TREATMENT:

Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complex metric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

UNIT – III : ELECTROCHEMISTRY AND CORROSSION:

Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation, determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery).

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods-Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – techniques of coating-hot dipping, cementation and electroplating of Copper.

UNIT–IV: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS:

Principles of spectroscopy, selection rules and applications of electronic spectroscopy. Vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

UNIT – V: REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES:

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_{N1}, S_{N2} reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO4 and chromic acid. Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

TEXT BOOKS:

1. Engineering Chemistry by P. C. Jain & M. Jain; DhanpatRai Publishing Company (P) Ltd., New Delhi.
2. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
3. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N. E. Schore, 5th Edition.
4. University Chemistry, by B.M. Mahan, Pearson IV Edition.
5. Physical Chemistry, by P.W. Atkins
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

REFERENCES:

1. Engineering Chemistry(NPTEL web book) by B. L. Tembe, Kamaluddin and M.S.Krishnan
2. Stereochemistry of organic compounds by D.Narsipuri published by New age international publishers

Course Outcomes:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels; one has to base the description of all chemical processes at molecular levels.

The students will be able to:

1. Analyze microscopic chemistry in terms of atomic and molecular orbital's
2. Understand the suitability of water for domestic and industrial purposes
3. Apply their knowledge in solving related engineering problems.
4. Synthesize drug molecules
5. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques

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B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -II Semester	**1**	**0-0-4**	**3**

ENGINEERING DRAWING&COMPUTER GRAPHICS
(Theory and Lab)
(COMMON TO CE, EEE, CSE, IT & ECM)

Course Objectives:
The student will :

1. Learn a system, component, using conventional graphics for manufacturability.
2. Prepare to communicate the projections of points, lines and planes effectively.
3. Learn to use the techniques, skills, and modern graphictools for generating projections of solids.
4. Learn to convert an object into isometric views and vice versa
5. Learn computer-aided drawings

UNIT – I: INTRODUCTION TO ENGINEERING DRAWING (2 Lecture classes and 8 Practical's): Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloids, Hypocycloid and In volute.

UNIT – II: ORTHOGRAPHIC PROJECTIONS AND PROJECTIONS OF POINTS, LINES AND PLANES (2 Lecture classes and 12 Practical's): Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined to both the Planes- Draw simple annotation, dimensioning and scale.

UNIT – III: PROJECTIONS OF REGULAR SOLIDS AND SECTIONAL VIEWS OF RIGHT REGULAR SOLIDS (2 Lecture Classes And 12 Practical's): Projections of regular solids - Prism, Cylinder, Pyramid, Cone – Auxiliary Views; , Draw the sectional views of geometrical solids.

UNIT – IV: ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS(2 Lecture classes and 12 Practical's): Principles of Isometric projection – Isometric Scale, Isometric Views, Conversion of Isometric Views to Orthographic Views and Vice-versa.

UNIT – V: OVERVIEW OF COMPUTER GRAPHICS (**2 Lecture classes and 16 Practical's):** *Drafting Software*: Computer Aided Drafting (CAD) – Drafting Software – Manual Drafting vs Auto CAD Drafting. *Auto CAD commands*: Starting Auto CAD - Auto CAD commands – (Generation of Points, Lines, Curves and Polygons) - Editing and Modifications - Drafting Settings - Dimensioning and Text - Geometrical Constructions. Projection of Points - Straight Lines - Plane surfaces – Solids - Isometric projections.

Note: CAD Lab facility is required for this unit.
(Only theory Question to be set from this Unit for Examinations)

TEXT BOOKS :

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. K. Venugopal& V. Prabhu Raja (2011), Engineering Drawing + Auto CAD, New Age International Publishers. Fifth Edition.
3. CAD Software Theory and User Manuals

REFERENCES:

1. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
2. Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication.

Course outcomes:

The students will be able to:

1. Identify the principals of engineering drawings
2. Examine visual aspects of engineering drawing and graphics
3. Draw the three dimensional objects.
4. Demonstrate the ideas of engineering components in the form of a drawing
5. Design creative Engineering working drawings .

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UGC AUTONOMOUS

B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -II Semester	**0**	**0-4-0**	**2**

PROGRAMMING FOR PROBLEM SOLVING LAB

(COMMON TO CE, ME, CSE, IT & MIE)

Course objectives:

The students will :

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To write programs using the Dynamic Memory Allocation concept, files

1. SIMPLE NUMERIC PROBLEMS:

a) Write a program for find the max and min from the three numbers.
b) Write the program for the simple, compound interest.

Write program that declares Class awarded for a given percentage of marks, where mark<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >=70% = Distinction. Read percentage from standard input.

2. EXPRESSION EVALUATION:

a) 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)
b) Write a program that finds if a given number is a prime number
c) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of these sequence.

Write a C program to find the roots of a Quadratic equation.

3. ARRAYS AND POINTERS AND FUNCTIONS:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a C program to find Addition of Two Matrices
c) Write a C program to find Multiplication of Two Matrices
d) Write C programs that use both recursive and non-recursive functions Write a program for reading elements using pointer into array and display the values using array.

4.Files:

a) Write a C program to display the contents of a file to standard output device.
b) Write a C program which copies one file to another, replacing all lowercase characters with their upper case equivalents.

Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

5. Strings:

a) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

Write a C program to count the lines, words and characters in a given text.

6. Sorting and Searching:

a) Write a C program for using binary search method.
b) Write a C program for linear search.
c) Write a C program that implements the Bubble sort method.
d) Write a C program that implements the Insertion sort method.
e) Write a C program that implements the Quick sort method.
f) Write a C program that implements the Merge sort method.

ADDITIONAL PROGRAMS (Given to Students as Assignment):

1) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   a. 5 x 1 = 5
   b. 5 x 2 =10
   c. 5 x 3 =15
2) Write a program that shows the binary equivalent of a given positive number between 0 to255.
3) Write a C program to find the sum of individual digits of a positive integer and test given
   Number is palindrome.
4) Write a C program to generate all the prime numbers between 1 and n, where n is a value
   supplied by the user.
5) Write a C program to calculate the following, where x is a fractional value. 1-x/2+x^2/4-
   x^3/6.
6) Write a C program to read in two numbers, x and n, and then compute the sum of this
   geometricprogression:1+x+x^2+x^3+.....+x^n. For example: if n is3 and xis 5, then the program computes 1+5+25+125.
7) Write a C program to find the minimum, maximum and average in an array of integers.
8) Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.
9) Write a C program that uses functions to perform the following:
   (a) Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
   (b) To find the factorial of a given integer.
   (c) To find the GCD (greatest common divisor) of two given integers.

10) Write a C program that does the following:
    (a) It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function). The program should then read all 10 values and print them back.
    (b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).
11) Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
12) Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
13) Write a C program that uses functions to perform the following operations:
    (a)To insert a sub-string in to a given main string from a given position.
    (b) To delete n Characters from a given position in a given string.
14) Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2          * *
1 2 3      * * *      4 5 6      3 3 3          * * *
                                 4 4 4 4      * *
                                              *
```

Write a C program that sorts a given array of names.

Suggested Reference Books for solving the problems:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language Prentice Hall ofIndia
3. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
4. Stephen G. Kochan, Programming in C, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, McGrawHill, 4thEdition
6. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Course outcomes:

The students will be able to:

1. Formulate the algorithms for simple problems
2. Examine syntax errors as reported by the compilers
3. define and manipulate data with arrays, strings and structures
4. make use pointers of different types, functions
5. Create, read and write to and from simple text and binary files

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -II Semester	**1**	**0-4-0**	**3**

WORKSHOP AND MANUFACTURING PRACTICES
(COMMON TO CE, ME, ECE, ECM & MIE)

Course Objectives:

The student will :

1. Learn fabricating small components using engineering tools and machines
2. Understand the working principles of maintaining dimensional accuracies and dimensional tolerances in different manufacturing processes
3. Understand assembly of various components.
4. Understand the Tools used for different trades
5. Learn machining practices

(I) WORKSHOP AND MANUFACTURING PRACTICES – 10 Lecture hours

1. Brief introduction to Manufacturing processes : –
   a. machining on lathe, milling and drilling machines,
   b. basic process involved in the casting,
   c. brief process of forging , forming,
   d. metal joining , brief process of gas welding **(3 hours)**
2. Demo of working of CNC machine**(2 hours)**
3. Fitting operations & power tools **(1 hour)**
4. Electric house wiring **(1 hour)**
5. Carpentry **(1 hour)**
6. Metal casting **(1hour)**
7. Welding (arc welding & gas welding), brazing **(1hour)**

(II) WORKSHOP PRACTICE: 60 hours

1. Machine shop **(12 hours) - on Lathe , Milling and drilling**
2. Fitting shop **(8 hours)**
3. Carpentry **(8 hours)**
4. Electrical house wiring **(8 hours)**
5. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6. Foundry practices – mould preparation **(8 hours)**
7. Smithy – Black smithy and Tin smithy **(8 hours)**

TEXT BOOKS :

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

REFERENCES:

1. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
2. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course outcomes:

The students will be able to:

1. Identify gauging skills
2. Apply skills of Black smithy
3. Apply skills of fabricatoin in design analysis
4. Produce wodden patterns for casting
5. Apply skills of fabricatoin in Welding

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. : CE	**L**	**T-P-D**	**C**
I Year -II Semester	**0**	**0-3-0**	**1.5**

CHEMISTRY LABORATORY
(COMMON TO CE, ME, CSE, IT & MIE)

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will : learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.
5. To measure the conductance and EMF values of solutions

Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe^{2+} by Potentiometry using KMnO4
7. Estimation of amount of Cu^{+2} by Colorimetry
8. Estimation of amount of $KMnO_4$ by Colorimetry
9. Synthesis of Aspirin and Paracetamol
10. Determination of acid value of coconut oil
11. Thin layer chromatography calculation of R_f values. egortho and para nitro phenols
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

REFERENCES:

1. B.D. Khosla, A. Gulati and V. Garg ,Senior practical physical chemistry, B (R. Chand & Co., Delhi)
2. K.K. Sharma and D. S. Sharma , An introduction to practical chemistry, (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in engineering chemistry – S.S. Dara

Course outcomes:

The student will able to:

1. Estimate the parameters like hardness and chloride content in water.
2. Determine the rate constant of a reaction from concentration – time relationships.
3. Measure the physical properties like adsorption and viscosity.
4. Evaluate the Rf values of some organic molecules by TLC technique.
5. Determine the partition coefficient of a organic compound in two immissible liquids

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**3**	**0-0-0**	**3**

SURVEYING AND GEOMATICS

Course Objectives:

The student will :

1. Know the Principles and Methods of Surveying
2. Know the field applications and concepts of Leveling Survey and different methods of calculation of Area, Contouring and Measurement of Volumes
3. Know the basics of Theodolite survey in Elevation and Angular Measurements and understand Tachometric Surveying in distance and height measurements
4. Familiarize with different types of curves and curve setting
5. Use modern surveying equipment for obtaining accurate results

UNIT - I:

Linear Measurements- Objectives, Principles and Classification of Surveying, Scales, Shrinkage of Map, Conventional Symbols and Code of Signals, Surveying Accessories, Phases of Surveying. Approximate Methods, Direct Methods- Chains- Tapes, Ranging, Tape Correction, Errors and Obstacles in Chaining.

Angular Measurements - Compass, Bearings, Included Angles, Local Attraction, Magnetic Declination, and Dip.

UNIT II:

Levelling and Contouring - Types of levels and Levelling staves, Temporary Adjustments, Methods of levelling, Booking and Determination of levels, Effect of Curvature of Earth and Refraction. Characteristics and uses of Contours, Methods of Contour surveying.

Areas and Volumes- Determination of Areas consisting of Irregular Boundary and Regular Boundary. Determination of Volume of Earth work in cutting and embankments for level section, Volume of Borrow pits, Capacity of Reservoirs.

UNIT - III:

Theodolite Surveying: Types of Theodolite, Fundamental Lines, Temporary Adjustments, Measurement of horizontal angle by Repetition Method and Reiteration Method, Measurement of vertical angle, Trigonometrical levelling when base is accessible and inaccessible. Methods of Traversing, Traverse Computations and Adjustments, Omitted measurements.

Tacheometric Surveying: Principles of Tacheometry, Stadia and Tangential Methods of Tachometry.

UNIT - IV:

Setting Out Curves: Types of Curves and their necessity, Elements of Simple, Compound, Reverse, Transition and Vertical Curves.

Plane Table Survey – Principles, Adjustment, working operations, Methods of Plane Table surveying, Two-point problem, Three-point problem, Advantages and Disadvantages

Modern Surveying: Principle and Types of E.D.M. Instruments, Total Station- Advantages and Applications. Field Procedure for Total Station Survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.

UNIT - V:

Photogrammetry: Introduction, Basic concepts, Perspective Geometry of Aerial photograph, Stereoscopy, Relief and Tilt displacements, Terrestrial Photogrammetry, Flight planning, Ground Control Extension for Photographic Mapping.

Aerial Triangulation, Radial Triangulation - Methods; Photographic Mapping- Mapping using Paper Prints, Mapping using Stereo Plotting Instruments, Mosaics, Map Substitutes.

Text Books:

1. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001

Reference Books:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
   Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi.

Course Outcomes:

The students will be able to:

1. Understand the basic principles of chain surveying
2. Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the methodologies
3. Apply the knowledge to calculate angles, distances and levels.
4. Design simple and compound Curves for highways
5. Relate the knowledge on Surveying to the frontiers of science like Hydrographic Surveying, Electronic Distance Measurement, Global positioning System, Photogrammetry and Remote Sensing

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**2**	**0-0-0**	**2**

ENGINEERING GEOLOGY

Course Objectives:

The student will :

1. Learn the basic knowledge of Geology that is required for constructing various Civil Engineering Structures,
2. Study the basic knowledge on basic Geology, Geological Hazards and Environmental Geology
3. Understand the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation.
4. Study the geological aspects in planning and construction of major Civil Engineering projects
5. Study the importance of different geological elements.

UNIT I:

Introduction to Geolog:, Different branches of Geology and the Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks.

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

UNIT-II:

PETROLOGY: Importance of Petrology from Civil Engineering point of view. Definition of Rock, Weathering of Rocks and its effects in construction. and study of weathering of common rock like granite. Geological classification of rocks, study of common structures and textures and their distinguishing features of rocks. Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT- III:

STRUCTURAL GEOLOGY: Introduction to Structural Geology, Indian stratigraphy, geological time scale**,** out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and their case studies.

Rock Mechanics- Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and shear strength of rocks, Bearing capacity of rocks.

UNIT- IV:

GEOLOGICAL HAZARDS: Earthquakes - 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 effect measures to be taken to prevent their occurrence. Land Subsidence and Environmental Geology,

Geophysical Studies: Importance of Geophysical Studies, geophysical studies by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method.

Ground water: Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT- V:

GEOLOGICAL CONSIDERATIONS IN CIVIL ENGINEERING STRUCTURES:

Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Studies of dam failures of the past due to geological draw backs. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs

Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Lithological, structural and ground water) in tunneling over break and lining in tunnels. Improvement of competence of sites by grouting etc.

Text Books:

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Principles of Engineering Geology by K.V.G.K Gokhale- B.S. Publications.

Reference Books:

1. Engineering Methods by D. Venkat Reddy, Vikas Publishers 2015
2. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014.

Course Outcomes:

The students will be able to

1. Perform Site characterization and to collect, analyze, and report geological data using Standards in engineering practice.
2. Grasp the fundamentals of the engineering properties of Earth materials and fluids.
3. Do Rock mass characterization and the mechanics of planar rock slides and topples.
4. Utilize the different geological elements which are available at the construction site.
5. know the importance of geological hazards.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**3**	**1-0-0**	**4**

APPLIED MECHANICS

Course Objectives:

The student will :

1. Study the Resolution of a System of Forces, compute its Resultant, and Solve problems using equations of equilibrium
2. Perform Static Analysis of bodies subjected to External Forces and Friction.
3. Locate the Centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
4. Study Kinetics and Kinematics of particles, and plane motion of rigid bodies.
5. Study the concepts of work-energy principle and its applications to translation, rotation and plane motion

UNIT - I:

Introduction to Engineering Mechanics: Basic concepts – Mass, Particle, Rigid body, Time, Space, Force, Branches of Mechanics. Fundamental Principles of Mechanics – Resolution and Composition of forces, Newton's Laws of Gravitation, Laws of Superposition and Transmissibility of forces.

Force Systems: Types of Forces – Coplanar, Concurrent and Parallel Forces, Moment and Couple, Free Body diagram, Resultant of Force Systems, Equilibrium equations of forces, Lame's theorem, Varignon's Theorem, Resultant and Equilibrium of Force System, Force and Moment Components in Space, Types of Supports, Beams and Loads.

UNIT II:

Friction: Laws of Friction, Coefficient of Friction, Angle of friction, Ladder friction and Wedge friction.

Analysis of Perfect Frames: Types of Frames, Assumptions for forces in members of a perfect frame, Method of joints and Method of sections of a Cantilever truss and Simply supported statically determinate trusses.

UNIT III

Centroid and Centre of gravity of plane curves, plane areas, and volumes (both regular and composite shapes) from (i) first principles, and (ii) theorems of Pappus and Guldinus.

Area and Mass moments of Inertia: area moment of inertia of simple and composite plane areas, transfer formulae; introduction to polar and product moments of inertia; mass moment of inertia of regular and composite volumes.

UNIT - IV:

Kinematics of particles: Rectilinear motion - Basic concepts, Equations of motion, Variable acceleration, Motion curves, Relative motion and Dependent motion.

Curvilinear motion - Basic concepts, Equations of motion in a Cartesian, Path and polar coordinates, Motion of Projectile.

Kinematics of Rigid Bodies - Equations defining rotation of rigid bodies about a fixed axis; General plane motion, Instantaneous center of rotation.

UNIT - V:

Kinetics of particles: Newton's second law of motion, Work-Energy Principle, Impulse-momentum principle.

Curvilinear motion of particles: Newton's second law of motion, Motion in Cartesian and Polar Coordinates.

Kinetics of Rigid Bodies: Newton's second law of motion, general plane motion, rolling without Slipping.

Text Books:

1. Vector Mechanics for Engineers Volume-I and Volume-II by F.P. Beer and E.R Johnson, Tata McGraw-Hill Publications.
2. Engineering Mechanics by S.P Timoshenko and D.H. Young, Tata McGraw-Hill Publications..

Reference Books:

1. Engineering Mechanics by Ferdinand L. Singer, Harper and Rowe Publications.
2. Engineering Mechanics by Arthur Boresi and Richard J Schmidt, Brooks/Cole Publications.
3. Engineering Mechanics by J.L Meriam and Craige, John Wiley and Sons Publications

Course Outcomes:

The students will be able to:

1. Determine resultant of forces acting on a body and analyses the equilibrium of a body subjected to a system of forces.
2. Solve problems of bodies subjected external forces and friction.
3. Locate the centroid of a given area and to find the Area moment of inertia and Mass moment of inertia of a given section.
4. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**3**	**1-0-0**	**4**

STRENGTH OF MATERIALS-I

Course Objectives:

The student will :

1. Understand the nature of stresses developed in bars, cantilevers and beams for various types of loads.
2. Calculate the elastic deformation occurring in simple members for different types of loading.
3. Understand the concept of stress transformation for different orientations of a coordinate system in a plane.
4. Understand Shear force and bending moment diagram for different types of loads.
5. Evaluate the slope and deflection of beams by both analytical method and geometrical methods for various types of loading.

UNIT - I:

Stresses and Strains:

Concepts of stress and strain - Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Generalized Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Strain Energy – Resilience – Gradual, sudden, and impact loadings – simple applications.

UNIT – II

Shear Force & Bending Moment:

Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between intensity of loading, bending moment and shear force.

Shear force and bending moment diagrams for statically determinate beams subjected to point load, uniformly distributed load, uniformly varying load, couple and their combinations.

UNIT – III

Stresses in Beams:

Bending Stresses: Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections

UNIT - IV:

Slope and Deflection of Beams:

Analytical methods: Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and couple.

Geometrical methods: Moment area method and conjugate beam methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and couple.

UNIT - V:

Transformation of Stresses and strains:

Normal and tangential stresses on a plane element, their transformation to a different coordinate axes in the same plane, principal stresses.

Analytical and graphical solution technique. Mohr's circle of stresses and their advantages of each. Analogy to be extended to strains as wells.

Text Books:

1. Strength of Materials Part – I & II, Elementary theory and problems, by Timoshenko.
2. Mechanics of Materials 6th edition by Ferdinand P. Beer & E. Russell Johnston Jr & John T. De Wolff & David F. Mazurek.

Reference Books:

1. Mechanics of material by R.C. Hibbeler, Printice Hall publications.
2. Engineering Mechanics of Solids by Egor P. Popov, Printice Hall publications.

Course Outcomes:

On completion of the course, The student will ::

1. Understand the concepts of stress, strain, elasticity and the relation between all elastic constants for homogenous, isotropic materials.
2. Describe the concepts and principles to understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structural and mechanical components.
3. Recognize various types of loads applied on structural components of simple framing geometrics and understand the nature of internal stresses that will develop within the components.
4. Evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
5. Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**3**	**1-0-0**	**4**

FLUID MECHANICS

Course Objectives:

The student will :

1. Study the fundamentals of Fluid Mechanics, Pressure exerted by Fluids, measurement of pressure and Forces on submerged bodies.
2. Study the different types of Fluid flows; different methods applied for describing Fluid in motion.
3. Learn about different types of energies associated with Fluid in motion.
4. Study the methods of dimensional analysis and importance of Reynolds and Froude's model laws
5. Learn the concept of equivalent pipe; Energy losses in pipe flow.

UNIT - I:

Fundamentals of fluid mechanics: Introduction, Ideal fluid and Real fluid, Fluid Continuum, Fluid properties - Density, Specific weight, Specific gravity, Specific volume, Viscosity, Capillarity, Vapor pressure, Compressibility, Surface tension, Cohesion and Adhesion.

Fluid Statics: Pressure at a point, Pascal's Law, Hydrostatic Law, Measurement of Pressure, Atmospheric, Gauge and Absolute pressures, Manometers - Principle of Manometer, Piezometer, U-tube differential manometer, Inverted differential manometer, Mechanical gauges - Bourdons tube pressure gauge, Hydrostatic forces on Submerged plane and Curved surfaces, Total pressure and Center of pressure. Buoyancy and Floatation - Archimedes principle, Stability of floating and submerged bodies. Metacenter, Met centric height.

UNIT – II

Fluid Kinematics: Classification of fluid flow– Steady and Unsteady, Uniform and non-uniform, One, Two- and three-dimensional flow, Streamline, Path line, Streak line and stream tube, Acceleration of Fluid particle.

Continuity equation in one, two- and three-dimensional flow, Circulation and Vorticity, Rotational and Irrotational flow, Conditions for irrotational flow, Velocity potential and Stream function

UNIT – III

Fluid Dynamics: Forces causing motion, Euler's equation of motion and its integration, Bernoulli's equation, Linear momentum equation, Application of Linear momentum equation, Forces on pipe bend,

Flow measurements - Venturimeter, Orificemeter, Pitot tube, Orifices, Mouthpieces, Notches and Weirs

UNIT - IV:

Dimensional Analysis: Dimensions and Dimensional Homogeneity, Dimensional analysis by Rayleigh's method and Buckingham's Theorem, Dimensionless numbers and their consequences in Fluid Mechanics.

Model Analysis: Forces Influencing Hydraulic phenomena, Types of Similarities, Model Analysis, Similitude studies and Modeling, Classification of Models, Model Laws - Reynolds and Froude's Model laws.

UNIT - V:

Flow Through Pipes: Energy losses in pipes - Major and Minor losses - Expression for head loss due to Friction – Darcy's Weisbach equation, Expressions for head loss due to Pipe Expansion and Pipe Contraction, Hydraulic Gradient and Total Energy Lines, Pipes in Series and parallel, Equivalent pipe, Power transmission through pipes.

Laminar Flow: Characteristics of Laminar flow, Reynolds experiment, Critical Reynold's number, Critical velocity, Steady laminar flow through a circular pipe, Hagen Poiseuille equation.

Text Books:

1. Victor Streeter and E. Benjamin Wylie, "Fluid Mechanics", McGraw Hill, Singapore, 1st Metric Edition, 1983.
2. P. N. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulic Machines", Standard Book House, Raj sons Publications Private Limited, 18th Edition, 2011.

Reference Books:

1. A.K. Jain, "Fluid Mechanics including Hydraulic Machines", Khanna Publications, 2010.
2. M Frank White, "Fluid Mechanics", Tata McGraw Hill, New Delhi, Special Indian Edition, 2007.
3. Fluid Mechanics by J F Douglas, J M Gaserek and J A Swaffirld (Longman).

Course Outcomes:

The student will able to:

1. Identify the properties of a fluid and analyze the hydrostatic forces on plane and curved surfaces.
2. Explain the kinematics of a fluid element.
3. Explain flow measurement techniques.
4. Apply Rayleigh's method and Buckingham's theorem for model analysis
5. Evaluate energy losses in a pipe flow and apply Hagen Poiseuille equation for pipe flow.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**0**	**0-3-0**	**1.5**

SURVEYING LAB

Course Objectives:

The student will :

1. Apply the basic principles of engineering surveying and measurements
2. Follow effectively the field procedures required for a professional surveyor
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.
4. Measure height and distances for accessible and inaccessible points.
5. Learn leveling methods.

EXPERIMENT 1: Surveying of an Area by Chain Survey (closed traverse) & Plotting.

EXPERIMENT 2: Chaining Across Obstacles

EXPERIMENT 3: Determination of Distance between two inaccessible points with Compass

EXPERIMENT 4: Survey of a given Area by Prismatic Compass (closed traverse) and plotting after adjustment.

EXPERIMENT 5: Radiation method, Intersection methods by Plane Table Survey.

EXPERIMENT 6: Two point and Three-point problems in Plane Table Survey.

EXPERIMENT 7: Levelling- Plotting of Longitudinal and Cross-section.

EXPERIMENT 8: Trigonometric levelling using theodolite.

EXPERIMENT 9: Height and Distances using principles of Tacheometric Surveying.

EXPERIMENT 10: a) Measurement of Horizontal angle and vertical angle.

b) Measurement of distance between inaccessible points by Theodolite.

Course outcomes:

The students will be able to:

1. Apply the basic principles of engineering surveying for linear and angular measurements.
2. Comprehend effectively the field procedures required for a professional surveyor.
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.
4. take accurate measurements, field booking, plotting and adjustment of errors can be understood
5. plot traverses / sides of building and determine the location of points present on field on a piece of paper.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**0**	**0-2-0**	**1**

STRENGTH OF MATERIALS LAB

Course Objectives:

The student will :

1. Apply knowledge of mathematics and engineering in assessing the mechanical properties of structural materials.
2. Use the techniques, skills and modern engineering tools necessary for engineering.
3. Understand professional and ethical responsibility in the areas of material testing.
4. Study the mechanical properties of materials.
5. Identify the Hardness and tensile strength of given specimen.

EXPERIMENT 1: Tension test

EXPERIMENT 2: Bending test on steel (Simply supported beam and Cantilever beam)

EXPERIMENT 3: Bending test on wooden and concrete beams

EXPERIMENT 4: Torsion test

EXPERIMENT 5: Hardness test (Brinell and Rockwell)

EXPERIMENT 6: Spring test

EXPERIMENT 7: Compression test on wood and concrete

EXPERIMENT 8: Impact test (Izod and Charpy)

EXPERIMENT 9: Shear test

EXPERIMENT 10: Use of electrical resistance strain gauges

Course outcomes:

The student will able to:

1. Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
2. Identify, formulate and solve engineering problems of structural elements subjected to flexure.
3. Evaluate the impact of engineering solutions on the society and will be aware of contemporary issues regarding failure of structures due to unsuitable materials.
4. Analyze the Young's modulus using deflection test on beams and tensile test on rods.
5. Apply the procedures for conducting tensile, torsion tests on mild steel specimens

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**0**	**0-2-0**	**1**

ENGINEERING GEOLOGY LAB

Course Objectives:

The student will :

1. Understand the importance of geology in civil engineering.
2. Study the mega and microscopic properties of minerals
3. Study the mega and microscopic properties of rocks
4. Be Introduced to Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities.
5. Understand Drawing of Geological maps, showing Faults, Uniformities etc

EXPERIMENT 1: Study of physical properties of Minerals.

EXPERIMENT 2: Study of different group of Minerals.

Study of physical properties and identification of following minerals

EXPERIMENT 3: Feldspar, Quartz, Flint.

EXPERIMENT 4: Jasper, Olivine, Augite.

EXPERIMENT 5: Hornblende, Muscovite, Biotite.

EXPERIMENT 6: Chlorite, Kyanite

EXPERIMENT 7: Garnet, Talc, Calcite.

EXPERIMENT 8: Pyrite, Hematite, Magnetite.

EXPERIMENT 9: Chlorite, Galena, Pyrolusite.

EXPERIMENT 10: Graphite, Magnesite, and Bauxite.

EXPERIMENT 11: Megascopic description and identification of Rocks. Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

EXPERIMENT 12: Simple structural Geology Problems (Folds, Faults & Unconformities)

EXPERIMENT 13: Interpretation and drawing of sections for geological maps showing Tilted beds, Faults, Uniformities etc.

Course Outcomes:

The course students will be able to:

1. Learn the role of geology in the design and construction process of underground openings in rock.
2. Apply the knowledge on properties of minerals and use
3. Apply the knowledge on properties of rocks and use
4. Learn about Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities.
5. Couple geologic expertise with the engineering properties of rock and unconsolidated materials.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - I Semester	**2**	**0-0-0**	**0**

ENVIRONMENTAL SCIENCE

(Common to ME&CE **)**

Course Objectives:

The student will :

1. Study about the different natural resources available and how to use them
2. Learn about biodiversity.
3. Learn about environmental impact assessment and management.
4. Study about the global environmental problems
5. Study about sustainability

UNIT - I:

Ecosystems & Natural Resources, **Biodiversity:** Concept, Classification of Resources: Water resources, Land resources, land degradation, Forest resources, Mineral resources, Energy resources. Concept of ecosystem, Classification of ecosystem, Functions of ecosystem. Biodiversity, Level, values, hotspots of biodiversity, Threats to Biodiversity, Conservation Of Biodiversity.

UNIT II:

Global Environmental Problems and Global Efforts: Deforestation, Greenhouse effect, Global Warming, Sea level rise, Ozone depletion. International conventions/protocols: green-belt-development, Concept of Green Building, Clean Development Mechanism (CDM).

Environmental Impact Assessment (EIA) And Environmental Management Plan: Definition of Impact, classification of impacts, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society, impact assessment methodologies. Environmental management plan (EMP).

UNIT - III:

Environmental Policy, Legislation, Rules And Regulations: Environmental Protection Act: Air (Prevention and control of pollution) Act-1981, Water (Prevention and control of pollution) Act-1974, Forest Conservation Act **.**

Towards Sustainable Future: Concept of Sustainable Development, Threats to Sustainability, Strategies for achieving Sustainable development, Environmental Ethics, Environmental Economics, Concept of Green Computing

Text Books:

1. TEXT BOOK OF ENVIRONMENTAL Science and Technology by M.Anji Reddy2007
2. Principles of Environmental Science and Engineering by P.Venugopal Rao.
3. Introduction to Environmental Studies by K.Mukkanti
4. Text book of Environmental studies by Kaushik &A nubhakaushik

Reference Books:

1. **Tata McgrawHill :**Introduction to Environmental Studies by Benny Joseph
2. **Environmental Studies** by Erach Bharucha 2005, University Grants Commission, University Press.

Course Outcomes:

The students will be able to:

1. identify the importance of natural resources and use them efficiently.
2. support and conserve the biodiversity.
3. apply environmental plan in developing any sort of environmental projects.
4. solve the sources and risks caused by pollution.
5. apply the environmental legislation in every walk of life and importance of sustainability.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year – II Semester	**2**	**0-0-0**	**2**

BASIC ELECTRONICS AND MECHANICAL ENGINEERING

Course Objectives:

The student will :

1 The basics of Electronics and circuits

2. The IC engines

3. The Compressors in mechanical systems

4. The moving systems in mechanical equipment.

5. The Belt and rope drives mechanical equipment.

UNIT - I:

Semiconductors, Energy levels, PN- Junction diode, VI- characteristics of PN- Junction, Diode as a switch, Rectifiers. Transistor, CB-Configuration, CE-configuration, CC-Configuration

UNIT II:

Digital Circuits: Number Systems, Binary, Octal, Hexadecimal System, Binary - Decimal, Decimal - Binary Conversions. BCD Code. Logic Gates: AND, OR, NAND, NOR. Boolean Theorems, De Morgan's Theorem

UNIT - III:

IC Engines: Working principle of I.C. Engine and function of important parts, study of fuel supply systems in SI and CI Engines, study of fuel ignition, cooling and lubrication systems. Simple calculations of indicated power, brake power, mechanical efficiency, thermal efficiency and fuel consumption

Unit – IV

Compressors: Compressed air generation and applications. Types of air compressors, reciprocating and rotary compressors like roots blower, vane type, centrifugal, axial flow, screw type. Two stage air compressor with inter cooling, simple problems.

Unit- V

Belt, Rope and Chain Drives : Introduction, Belt and rope drives, selection of belt drive-types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

Text Books:

1. I.C.Engines by Ganeshan
2. Turbo machines by Prof. Yahya
3. Thermal Engineering by R.S. Khurmi & J.K. Gupta
4. Theory Machines by Rattan

Course Outcomes:

The students will be able to:

1. Understand the basics of Electronics and circuits
2. Understand the IC engines
3. Understand the Compressors in mechanical systems
4. Understand the moving systems in mechanical equipment
5. Understand the materials used for belts, rope drivers

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year – II Semester	**3**	**0-0-0**	**3**

HYDRAULICS AND HYDRAULIC MACHINERY

Course Objectives:

The student will :

1. Characteristics of turbulent flow and water hammer phenomenon.
2. Boundary layer concept of displacement thickness, momentum thickness and energy thickness.
3. Most economical channel cross sections for maximum discharge.
4. The basics of hydro-machinery and its components, function and use of different types of turbines.
5. Pump installation details and speed losses.

UNIT - I:

Turbulent flow in Pipes: Characteristics of Turbulent flow, Shear stress due to Turbulence, Reynolds stresses, Prandtl's mixing length theory, Universal velocity distribution law near a solid boundary, Smooth and Rough boundaries, Nikuradse's experiment, Karman – Prandtl resistance equations, Variation of friction factor with Reynold's number – Moody's Chart.

Water Hammer in Pipes: Water hammer phenomenon, Gradual and sudden closure of valves, Expression for pressure rise considering elasticity of pipe and fluid, Pressure relieving devices

UNIT II:

Boundary Layer Theory: Concept of Boundary layer, Boundary layer growth over a flat plate, Boundary layer thickness, Displacement thickness, Momentum thickness and Energy thickness, Laminar and Turbulent boundary layers, Integral momentum equation for boundary layer, Separation of Boundary layer and its Control.

Fluid Flow around Submerged Bodies: Drag and Lift - Basic concepts and expressions, Drag and lift forces on Sphere and Cylinder.

UNIT III:

Flow in Open Channels: Difference between Pipe flow and Channel flow, Characteristics of open channels, Classification of flow, Manning's and Chezy's equations, Most economical cross sections of channels - Rectangular, Trapezoidal, Triangular and Circular shapes, Velocity distribution in channel section.

Hydraulic Jump: Energy concepts in open channel flow, Specific Energy curve, Critical depth, Critical velocity, Condition for Critical, Subcritical and Super critical flows. Hydraulic jump - expressions for depth of Hydraulic jump and Loss of energy due to Hydraulic jump. Channel transitions, Equation for gradually varied flow, Classification of surface profiles, Rapidly varied flow.

UNIT - IV:

Hydraulic Machines: Impact of Jets - Force exerted by a liquid jet on a stationary and moving bodies (only flat plates and curved vanes)

Hydraulic Turbines - Heads and Efficiencies, Classification - Impulse and Reaction turbines, Pelton and Francis turbines, Specific speed, Draft tube, Cavitation, Characteristic curves and Selection of turbines.

UNIT - V:

Pumps: Introduction, Centrifugal pump - Heads and Efficiencies, Specific sped, Characteristic curves, Net positive suction head, Priming, Selection and Operational difficulties.

Reciprocating Pump - Single and Double acting Reciprocating pumps, Coefficient of discharge and Slip, Use of Air vessels and Characteristic curves.

Text Books:

1. P. N. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulic Machines", Standard Book House, Rajsons Publications Pvt. Ltd., 18th edn., 2011.
2. A. K. Jain, "Fluid Mechanics Including Hydraulic Machines" Khanna Publications, 2010.

Reference Books:

1. VenTe Chow, "Open Channel Hydraulics", McGraw-Hill, New York, 1973.
2. L. Victor Streeter and E. Benjamin Wylie, "Fluid Mechanics", McGraw Hill, Singapore, 1st edn., 1983.
3. Jagdeesh Lal, "Hydraulic Machines", Metropolitan Book Co., New Delhi.

Course Outcomes:

The student will able to:

1. Explain the characteristics of turbulent flow and the concept of water hammer in pipelines.
2. Explain the concept of boundary layer.
3. Identify the most economical section for a channel flow.
4. Demonstrate the characteristic curves of turbines.
5. Demonstrate the characteristic curves of pumps.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year – II Semester	**3**	**0-0-0**	**3**

STRENGTH OF MATERIALS- II

Course Objectives:

The student will :

1. Understand the Theory of pure torsion.
2. Calculate the stability and elastic deformation occurring in columns and struts for different types of loading
3. Understand the concept of direct and bending stresses.
4. Understand the nature of stresses developed in circular shafts, columns, and cylindrical shells for various types of loads.
5. Understand the unsymmetrical bending and shear center, the importance of a structural member having different axis of symmetry under equilibrium conditions

UNIT - I:

Torsion:

Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Combined bending and torsion

Power transmitted by shafts - Shaft of varying sections – Composite shaft – strain energy due to torsion

UNIT II:

Columns and Struts:

Introduction–Types of columns–Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions-derivation of Euler's critical load formulae for various end conditions– Equivalent length of a column – slenderness ratio - Limitations of Euler's theory. Rankine-Gordon's formula for columns - Long columns subjected to eccentric loading.

Laterally loaded struts; struts subjected to uniformly distributed and concentrated lateral loads – Maximum B.M. and stress due lateral loading.

UNIT - III:

Direct and Bending Stresses:

Introduction – Eccentric loading – Columns with eccentric loading – Symmetrical columns with eccentric loading about one axis and two axes.

unsymmetrical columns with eccentric loading – limit of eccentricity.

UNIT - IV:

Thin Cylinders and Thick Cylinders:

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

Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

UNIT - V:

Unsymmetrical bending and shear Centre:

Introduction – Determination of moment and product of inertia about any axis – area of maximum/ minimum moment of inertia – principal axes.

Analysis of beams subjected to unsymmetrical bending – deflection of beams due to unsymmetrical bending.

Shear Centre - Introduction - Shear Centre for symmetrical and unsymmetrical (channel, I, T and L) sections.

Text Books:

1. Strength of Materials Part – I & II, Elementary theory and problems, by S.Timoshenko.
2. Mechanics of Materials 6th edition by C.FerdinandP.Beer& E. Russell Johnston Jr & John T. Dewolf& David F. Mazurek.

Reference Books:

1. Mechanics of material by R.C.Hibbeler, Printice Hall publications.
2. Engineering Mechanics of Solids by EgorP.Popov, Printice Hall publications.

Course Outcomes:

The students will be able to:

1. Understand the concepts and principles, understand the theory of elasticity, to perform calculations related to the strength of structures subjected to torsion and direct compression.
2. Evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for all types of loading conditions.
3. Analyze the strength and stability of structural members subjected to direct and bending stresses.
4. Understand and evaluate the shear center and unsymmetrical bending.
5. Analyze and design thin and thick cylinders.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - II Semester	**3**	**1-0-0**	**4**

PROBABILITY AND PARTIAL DIFFERENTIAL EQUATIONS

(COMMON TO CE,ME, & MIE)

Course Objectives:

The student will :

1. Basic properties of probability and random variables
2. Types of hypothesis and hypothesis testing
3. The t-distribution-distribution and chi-square distribution
4. Different numerical techniques used for solving algebraic and transcendental equations
5. Formation and solution of first order PDE

UNIT - I:

PROBABILITY AND DISTRIBUTIONS

Random variables-Definitions of Random variables (Discrete and continuous).Distributions- Binomial-Poisson and normal distributions-related properties.

UNIT II:

SAMPLING THEORY

Sampling distributions –Sampling distribution of means (σ known and Unknown)-Estimation-Point estimation-interval estimation-confidence interval estimates of parameters.

UNIT - III:

TESTING OF HYPOTHESIS

Tests of hypothesis -Large samples- Null hypothesis – Alternate hypothesis type I, & type II errors – critical region, confidence interval for mean testing of single variance, Difference between the means.

UNIT – IV

PARTIAL DIFFERENTIAL EQUATIONS OF FIRST ORDER

Introduction-Formation of partial equation by elimination of arbitrary constants-arbitrary functions-solutions of first order linear (Lagrange) equation and nonlinear (Standard type)

UNIT- V:

PARTIAL DIFFERENTIAL EQUATIONS OF SECOND ORDER

Introduction- Classification of linear PDEs-Method of separation of variables to solve IBVP like 1-D heat, 1-D wave and BVP like 2-D Laplace's equations.

TEXT BOOKS:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna publications, 42nd edition 2012
2. Advanced Engineering Mathematics by Jain and S.R.K. Iyangar, Narosa Publications.
3. Numerical Methods by T.K.V. Iyengar&B.Krishna Gandhi & Others, S.Chand

Reference Books:

1. Engineering Mathematics byG.Shankar Rao, I.K.International Publications.
2. KREYSZIG. E, "Advanced Engineering Mathematics" JohnWiley& Sons Singapore, 10th edition, 2012.
3. Veerarajan.T" Engineering Mathematics-I", Tata McGrawhill Publishing Co.New Delhi, 5th edition, 2006.
4. Engineering Mathematics by B.V.Ramana, Tata McGrawhill Publishing company Ltd New Delhi, 5th edition, 2011

Course Outcomes:

The students will be able to:

1. Classify the types of random variables and calculate mean and variance
2. Recognize where the binomial distribution could be appropriate model and find mean and variance
3. Understand the foundation for classical inference involving confidence interval and hypothesis testing
4. Calculate the solution of algebraic and transcendental equations form to form first order pde and solution of pde.
5. Formulate partial differential equations (PDEs) and seek understanding of their solutions.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year – II Semester	**3**	**0-0-0**	**3**

ENVIRONMENTAL ENGINEERING

Course Objectives:

The subject will:

1. Acquire the knowledge of water sources.
2. Study the design of distribution systems.
3. Understand the effects of pollutants on the environment
4. Study the methods of planning to control, reduce, and monitor pollution.
5. Learn Suitable techniques for treatment of water, waste water and contaminated air.

UNIT - I:

Introduction: Sources of Water, Population Forecast, Design Period, Water Demand, Fire Demand. Water Quality, Characteristics and Testing, Drinking Water Standards. Water Borne Diseases.

Water treatment units: Sedimentation, Coagulation, Flocculation – Principles and Design. Filtration – Theory, Working and Design of Slow, Rapid Gravity and Multi-Media Filters, Troubles in Operation Comparison of Filters. Disinfection and Miscellaneous Treatment Methods

UNIT II:

Distribution systems: Design of Pipeline Networks by Hardy Cross and Equivalent Pipe Methods.

Reservoirs and Pipelines: Service Reservoirs, Joints and Valves. Fire Hydrants, Water Meters, Laying and Testing of Pipe Lines and Pump House.

UNIT - III:

Sewage Treatment: Introduction to Sewage. Collection and Conveyance of Sewage. Waste water flow rates. Design of Sewers, Shapes and Materials. Sewer Appurtenances. Characteristics of Sewage-cycles of Decay-Decomposition of Sewage, Examination of Sewage, BOD-COD Equations.

Sewage Disposal: Drainage Components Requirements. Sanitary Fitting Traps, One Pipe and Two Pipe Systems of Plumbing, Ultimate Disposal of Sewage.

UNIT - IV:

Waste Water Treatment: Units- Principles and Design of Screens, Grit Chambers, Skimming Tanks, Sedimentation Tanks, Trickling Filters-Standard and High Rate.

Disposal Methods: Construction and Design of Oxidation Ponds, Sludge Digestion Tanks and The Factors That Decide the Design. Sludge Disposal by Drying, Septic Tanks and Their Working Principles and Design of Soak Pits.

UNIT - V:

Air Pollution: Classification and Their Effects. Meteorological Parameters Affecting Air Pollution, Atmospheric Stability. Plume Behavior. Control of Particulates by Gravity Settlers, Cyclone Filters, Electrostatic Precipitators. Control of Gaseous Pollutants and Automobile Pollution.

Noise Pollution: Basic Concepts, Measurement and Various Control Methods.

Text Books:

1. Metcalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
2. J.S. Birdie*, G.S.* Birdie*,* Water Supply & Sanitary Engineering By *Dhanpat Raj* Publications

Reference Books:

1. BC Punmia Environmental Engineering I and II by, Std. Publications.
2. SK Garg Environmental Engineering I and II by, Khanna Publications.
3. CS Rao Environmental Pollution and Control Engineering, Wiley Publications

Course Outcomes:

The students will be able to:

1. Understand the impact of humans on environment and environment on humans
2. Identify and value the effect of the pollutants on the environment.
3. Plan strategies to control, reduce and monitor pollution
4. Select the most appropriate technique for the treatment of water, wastewater and contaminated air.
5. Design the components of the distribution systems.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - II Semester	**3**	**0-0-0**	**3**

BUILDING MATERIALS, CONSTRUCTION AND PLANNING

Course Objectives:

The student will :

1. Study about the basic building material properties and their applications.
2. Know the basic properties of cement
3. Know smart building materials, types of paints and varnishes.
4. Understand different types of masonries and their applications.
5. Acquire concepts in building planning, arrangement of windows, doors, electrical and plumbing services.

UNIT - I:

BUILDING MATERIALS:

Building stones, classification of building stones, quarrying procedures, structural Requirement, dressing, and tools for dressing of stones. Bricks- Composition of Earth Brick, manufacturing of brick, structural requirements, field and lab test.

Tiles - Types of tiles, manufacturing of tiles, structural requirements of tiles.

UNIT II:

CEMENT AND ADMIXTUES:

Ingredients of cement, manufacturing of cement, field and lab tests. Lime-Various ingredients of lime, constituents of limestone and classification of lime, manufacturing of lime.

ADMIXTURES: Mineral admixtures, chemical admixtures.

UNIT - III:

AUXILIARY MATERIALS AND BUILDING COMPONENTS:

Auxiliary materials: Structure, types of wood, properties of wood, seasoning, defects, alternative material for wood. Glass Types of glasses, manufacturing of glass. Paints-Constituents of paints, types of paints.

Building Components: Lintel, arches, staircase, floors, roofs, foundation, and damp-proof course. Joinery-Doors, windows, materials and types.

UNIT - IV:

MASONRIES AND FORMWORK:

Brick masonry: Types, bonds. Stone Masonry: Types, composite masonry, concrete reinforced bricks, and glass reinforced brick. Finishing slope: plastering, pointing, and cladding- Types of ACP (Aluminum composite panel).

Formwork: requirements, standards, scaffolding, shoring, under pinning.

UNIT - V:

BUILDING SERVICES AND PLANNING:

Building services: Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics. characteristics-Absorption, fire protections, fire hazards, classification of fire resistance materials and construction.

Building Planning: Principles of building planning, classification of building and building bylaws.

Text Books:

1. Rangwala, Sushil Kumar, Bindra, kamala "Building materials and Construction", Standard Publishers, 1992.
2. S.P. Arora & S.P.Bindra, "Building Construction", Dhanpat Rai Publications.
3. B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Building Construction", Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2013.

Reference Books:

1. R. Choudly "Construction Technology" Vol. – 1 & 2,2nd Edition, Longman, UK, 1987.
2. P C Varghese, Building Construction, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.
3. National Building Code of India, 2006.
   CBRI Rookie, "Advance in Building Materials and construction".

Course Outcomes:

The students will be able to:

1. Identify various building materials and select suitable type for given situation.
2. Know the properties of cement as building material.
3. Know different types of masonry, types of bonds used in construction of walls of buildings.
4. Know the different types of doors, windows, roofs, staircase used in building works.
5. Plan suitable types of building for given requirement including arrangement of electrical and plumbing services.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - II Semester	**0**	**0-2-0**	**1**

ENVIRONMENTAL ENGINEERING LAB

Course Objectives:

The student will :

1. Perform the experiments to determine water and waste water quality.
2. Understand the water and waste water sampling, their quality standards.
3. Estimate quality of water, waste water, and industrial water.
4. Estimate Most Probable Number of given water sample and
5. Estimate optimum dosage of coagulant (Alum).

EXPERIMENT 1: pH
EXPERIMENT 2: Electrical Conductivity and Turbidity
EXPERIMENT 3: Total Solids (Organic and inorganic)
EXPERIMENT 4: Acidity
EXPERIMENT 5: Alkalinity
EXPERIMENT 6: Hardness (Total, Calcium and Magnesium Hardness)
EXPERIMENT 7: Chlorides content
EXPERIMENT 8: Optimum Coagulant Dosage by JAR Test
EXPERIMENT 9: Dissolved Oxygen (Winkler Method)
EXPERIMENT 10: COD
EXPERIMENT 11: BOD/DO
EXPERIMENT 12: Residual Chlorine
EXPERIMENT 13: Noise level measurement

Course outcomes:

The students will be able to:

1. Understand about the equipment used to conduct the test procedures
2. Perform the experiments in the lab
3. Examine and estimate water, waste water, air and soil quality
4. Compare the water quality standards with prescribed standards set by the local governments
5. Develop a report on the quality aspect of the environment.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - II Semester	**0**	**0-2-0**	**1**

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Course Objectives:

The student will :

1. Gain practical knowledge in verification of principles of fluid flow.
2. Get introduced to knowledge in measuring pressure, discharge and velocity of fluid flow and Understand Major and Minor Losses.
3. Gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head and
4. Understand the characteristics of turbines.
5. Understand the characteristics of pumps.

EXPERIMENT 1: Calibration of Venturi meter & Orifice meter.

EXPERIMENT 2: Calibration of contracted Rectangular Notch / Triangular Notch.

EXPERIMENT 3: Determination of Coefficient of discharge for a small orifice by constant head method.

EXPERIMENT 4: Determination of Coefficient of discharge for a mouthpiece by constant head method.

EXPERIMENT 5: Determination of friction factor of a pipe.

EXPERIMENT 6: Verification of Bernoulli's equation.

EXPERIMENT 7: Impact of jet on vanes.

EXPERIMENT 8: Performance test on Pelton wheel turbine.

EXPERIMENT 9: Performance test on Francis turbine.

EXPERIMENT 10: Performance characteristics of a single stage centrifugal pump.

EXPERIMENT 11: Performance characteristics of a multi-stage centrifugal pump.

EXPERIMENT 12: Performance characteristics of a reciprocating pump.

Course outcomes:

The student will able to:

1. Demonstrate fluid flow principles.
2. Apply the knowledge in calculating performance analysis in turbines and pumps that can be used in power plants and Analyse practical problems in all power plants.
3. Measure discharge in pipes and Demonstrate the characteristics curves of turbines and pumps.
4. Measure discharge in pipes.
5. Demonstrate the characteristics curves of turbines

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
II Year - II Semester	**0**	**0-3-0**	**1.5**

COMPUTER AIDED CIVIL ENGINEERING DRAWING

Course Objectives:

The student will :

1. Understand the fundamentals of graphics and drafting that are appropriate for developing functional skills in computer aided drafting.
2. Acquire adequate knowledge and experience in preparing engineering drawings using AutoCAD.
3. Acquire the skills pertinent to the production of properly detailed, formatted, and dimensioned civil engineering drawings.
4. Acquire the skills pertinent to the production of properly detailed, formatted and dimensioned Civil Engineering drawings.
5. Understand the concept and techniques to draw.

EXPERIMENT 1: Introduction to Computer Aided Drafting.

EXPERIMENT 2: To open and set up software in system.

EXPERIMENT 3: Introduction and Exercise on coordinate systems.

EXPERIMENT 4: Introduction and exercise on drawing commands.

EXPERIMENT 5: Introduction and exercise on modify commands.

EXPERIMENT 6: Introduction and exercise on Dimensions, Texting, and Layers.

EXPERIMENT 7: Drawing of building components like Doors, Windows, and Walls, using CAD commands.

EXPERIMENT 8: Drawing a plan of a given building and Dimensioning.

EXPERIMENT 9: Developing Sections and Elevations from a given plan.

EXPERIMENT 10: Drawing a plan of a Residential Building and developing its sections and elevations.

EXPERIMENT 11: Drawing a plan of a Commercial Building and developing its sections and elevations.

EXPERIMENT 12: Introduction and Exercise on 3-D commands.

EXPERIMENT 13: Developing a 3-D plan from a given 2-D plan.

Course outcomes:

The student will able to:

1. Memorize different AutoCAD commands
2. Develop plans, sections, and elevations of residential and commercial buildings.
3. Develop different components of buildings.
4. Develop working drawings of buildings with detailed layout.
5. Use different AutoCAD Commands to develop Plan, Section and elevation of single Storied and Multi Storied Buildings.

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B.Tech. CE	**L**	**T-P-D**	**C**
II Year - II Semester	**2**	**0-0-0**	**0**

GENDER SENSITIZATION

Course Objectives:

The student will :

1. Develop students' sensibility with regard to issues of gender in contemporary India.
2. Study a critical perspective on the socialization of men and women.
3. Introduce students to information about some key biological aspects of genders.
4. Expose the students to debates on the politics and economics of work.
5. Reflect critically on gender violence.

UNIT - I:

Gender: Why should we study it?

Socialization: Making women, Making Men Introduction, Preparing For Womanhood, Growing up male, First lessons in caste, Different masculinities.

UNIT II:

Women's Work: Its Politics and Economics,

Fact and fiction, Unrecognized and unaccounted work, Further reading: Wages and conditions of work.

Domestic Violence: Speaking Out, Is home a safe place?, When women unite [Film], Rebuilding lives, Further reading: New forums for justice.

UNIT - III:

Just Relationships: Being Together as Equals,

Mary Kom and Onler, Love and acid just do not mix, Love letters. Mothers and fathers, Further Reading: Rosa Parks – The brave heart.

Text Books:

1. Towards a world of equals by A.Suneetha SusicTharu publication Telugu academy Hyderabad

Course Outcomes:

The student will able to:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. 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.
3. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life.

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B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**3**	**0-0-0**	**3**

GEOTECHNICAL ENGINEERING

Course Objectives:

The student will :

1. Understand the importance of Geotechnical Engineering and how it is applied in civil engineering
2. Understand the role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated
3. Understand the stress distribution in the soil due to different types of loading.
4. Understand estimation of compaction, magnitude and time-rate of settlement due to consolidation.
5. Understand the shear strength of soil.

UNIT - I:

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

UNIT II:

Permeability: Soil water - capillary rise - flow of water through soils - Darcy-s law-permeability - Factors affecting - laboratory determination of coefficient of permeability of layered systems – In-situ permeability tests (Pumping in & Out tests), Effective stress: Total, neutral and effective stresses – Principle of effective stress - quick sand condition - Seepage through soils - Flow nets: Characteristics and Uses.

UNIT - III:

Stress distribution in soils: Boussinesqss and Westerguards theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical plane and horizontal plane, and - Newmark-s influence chart for irregular areas.

UNIT - IV:

Compaction: Mechanism of compaction - factors affecting - effects of compaction on soil properties. - Field compaction Equipment - compaction quality control. Consolidation: Immediate settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves –normally consolidated soil, over consolidated soil and under consolidated soil – pre consolidation pressure and its determination – Terzaghis 1-D consolidation theory.

UNIT - V:

Shear strength of soils: Importance of shear strength –Mohr's - Coulomb Failure theories - Types of laboratory strength tests - strength tests based on drainage conditions - Shear strength of sands and clays – Critical Void Ratio - Liquefaction.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.

Reference Books:

1. Geotechnical Engineering by Purushotham Raj
2. Geotechnical Engineering by Manoj Dutta & Gulati S. K - Tata Mc.Grawhill Publishers New Delhi.
3. Soil mechanics by B.Das

Course Outcomes:

The student will able to:

1. Carry out soil classification
2. Solve the role of water in soil behavior.
3. Solve any practical problems related to soil stresses estimation
4. Estimate the compaction and consolidation of soil
5. Solve practical problems related to shear strength of soil

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**3**	**0-0-0**	**3**

STRUCTURAL ANALYSIS

Course Objectives:

The student will :

1. Study the analysis of deflections of beams and trusses using Castigliano's theorems. Perform graphical method of analysis for plane truss
2. Learn the concept of Arches and analysis of statically indeterminate structures.
3. Study the methods of analysis for basic statically indeterminate structures
4. Study slope deflection and moment distribution method for analysis of statically indeterminate structures.
5. Study effect of moving loads on structural members using influence line diagrams

UNIT - I:

ENERGY THEOREMS:

Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano‟s first theorem-Unit Load Method. Deflections of simple beams and pin- jointed plane trusses. Deflections of statically determinate bent frames. Analysis of plane truss- Graphical method.

UNIT II:

THREE HINGED ARCHES:

Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches. Funicular shape. Linear Arch. Eddy‟s theorem. Analysis of Three hinged arches. Normal Thrust and radial shear in an arch. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Absolute maximum bending moment diagram for a three hinged arch.

UNIT - III:

CONTINUOUS BEAMS:

Introduction-Fixed beams-Continuous beams. Clapeyron‟s theorem of three moments-Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports.

UNIT - IV:

SLOPE DEFLECTION METHOD:

Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams.

MOMENT DISTRIBUTION METHOD:

Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of frames with and without side sway. Shear force and bending moment diagrams and Elastic curve.

UNIT - V:

MOVING LOADS:

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

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 - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Text Books:

1) Structural Analysis Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers.
2) Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.

Reference Books:

1) Structural Analysis by R.C.Hibbeler, Pearson Education
2) Mechanics of Structures Vol – I and II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
3) Structural Analysis by Devdas Menon, Narosa Publishing House.

Course Outcomes:

The student will able to:

1. Analyze the deflection of beams and trusses using Castigliano's theorems. Analyse plane trusses using graphical method
2. Analyze the arch structures.
3. Analyze fixed & continuous beams & perform theorem of three moments
4. Analyze the statically indeterminate structures using slope deflection & moment distribution method.
5. Determine the effect of moving loads on structural members using influence line diagrams.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**3**	**0-0-1**	**3.5**

STRUCTURAL ENGINEERING –I (RCC)

Course Objectives:

The student will :

1. Study the concept of R.C. Design of limit state method, working stress method, and use of I.S: 456 – 2000 Code Book. Provided with design procedure for bending members.
2. Understand the concepts of design for shear, torsion and bond on various beams.
3. Understand the design of short and long columns as per IS code provision.
4. Be provided with the design of two way slabs, one way slab and continuous slab and also design of limit state for serviceability for deflection, cracking as per IS code provision.
5. Understand the design of different types of footings, design of isolated, square, rectangular, circular footings, and combined footings**.**

UNIT - I:

Concepts of RC. Design – Working Stress Method - Limit State method – Material Stress-Strain Curves –Partial Safety factors – Characteristic values. Stress Block parameters – IS – 456 – 2000.

Beams: Limit state analysis and design of singly reinforced, doubly reinforced beams.

UNIT II:

Limit state analysis and design of T and L beam sections, Limit state analysis and design for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

UNIT - III:

Short and Long columns – under axial loads, uniaxial bending and biaxial bending – I S Code provisions.

UNIT - IV:

Design of Two-way slabs, one-way slab, and continuous slab Using I S Coefficients. Design of dog-legged staircase.

Limit state of serviceability for deflection, cracking and codal provision.

UNIT - V:

Footings: Different types of footings – Design of isolated, square, rectangular, circular footings and combined footings.

Text Books:

1. Limit state designed of reinforced concrete – P.C.Varghese, Prentice Hall of India, New Delhi.
2. Reinforced concrete design by S.Unnikrishna Pillai & Devdas Menon, TataMc.Graw Hill, NewDelhi.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, NewDelhi

Reference Books:

1. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.
2. Design of concrete structures by J.N.Bandhyopadhyay PHI Learning Private Limited.
3. Design of Reinforced Concrete Structures by I.C.Syal and A.K.Goel, S.Chand & company.

Course Outcomes:

The students will be able to:

1. Understand the methods for design of Reinforced concrete structures.
2. Design the different types of beams and check for shear, torsion and bond.
3. Design different types of columns as per IS codes
4. Design the one-way slab and two way slabs, and check for the serviceability
5. Design different types of footings and staircases and detailing of reinforcement

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**3**	**0-0-0**	**3**

HYDROLOGY AND WATER RESOURCES ENGINEERING

Course Objectives:

The student will :

1. Study about the hydrology and its applications, rainfall measurements, computation of average rainfall, empirical formulas and rational methods.
2. Study on flood hydrograph, effective rainfall, base flow, unit hydrograph and direct runoff.
3. Study on ground water occurrence, types of aquifers, Darcy's law and well hydraulics.
4. Study on classification of canals design of irrigation canals using IS standards.
5. Study of storage reservoirs.

UNIT - I:

Introduction to Engineering hydrology and its applications:

Hydrologic cycle, types and forms of precipitation, rainfall measurements, types of rain gauges, computation of average rainfall over a basin, Processing of rainfall data, adjustment of record, rainfall double mass curve. Run off factors affecting run off over a catchment, empirical and rational formula

Abstraction from rainfall: Evaporation, factors affecting evaporation, measurement of evaporation, evapotranspiration, consumptive use, Penman and Balney and criddle methods –Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT II:

Distribution of runoff:

Hydrograph analysis flood hydrograph- effective rainfall- baseflow separation-direct runoff-unit hydrograph, definitions and limitations of application of unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph and vice versa S-hydrograph, synthetic unit hydrograph.

UNIT - III:

Ground water occurrence:

Types of aquifiers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcys law, radial flow to wells in unconfined and unconfined aquifiers, types of wells, well construction- well development.

UNIT - IV:

Classification of canals: Design of irrigation canals by Kennedy's and Lacey's theories, Balancing, depth of cutting, IS standards for canal design ,canal lining.

Design discharge over a catchment: Completion of design discharge- rational formula, SCS curve number method, Flood frequency analysis, introductory part only. Stream gauging- measurement and estimation of upstream flow.

UNIT - V:

Storage works reservoirs: Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, and estimation of capacity of reservoir using mass curve- reservoir sedimentation-life of reservoir-types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

Text Books:

1. Irrigation and hydraulic structure by S K GARG
2. Irrigation water management by D K MAJUNDAR, PRINTTICE hall of indra

Reference Books:

1. Elementary hydrology by V P SINGH, PHI PUBLICATIONS
2. Irrigation and water resources and water power by P N MODI STANDARD BOOK HOUSE
3. Applied hydrology by Ventechow David R Maidment larry W' Mays Tata MC.GrawHill

Course Outcomes:

The student will able to:

1. Compute average rainfall over a basin and understand recording and non-recording type rain gauges and also to determine infiltration indices and runoff from a basin
2. Construct the unit hydrograph and determine the peak flood discharge.
3. Determine the aquifer parameters and their discharge from wells.
4. Design unlined canals by using Kennedy's and Lacey's theories.
5. Identify various types of reservoirs and their design aspects.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**3**	**0-0-0**	**3**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course objectives:

The student will :

1. know the Fundamental of Economy
2. study the functions of Production.
3. Learn Accounting Standards and Balance Sheet.
4. Study the Financial Analysis of the Organization.
5. learn the Economic and Financial Decision making.

UNIT-I:

Introduction to Managerial Economics & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

UNIT-II:

Production & Cost Analysis: Production Function - Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance.

UNIT-III:

Types of Markets & Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing - Objectives and Policies of Pricing. Methods of Pricing. Trends in economic Environment: Inflation, GDP, Introduction to GST, Interest rates.

UNIT-IV:

Introduction to Financial Accounting: Accounting concepts and Conventions - Introduction IFRS - Double - Entry Book Keeping, Journal, Ledger, Trial Balance - Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments)

UNIT-V:

FINANCIAL ANALYSIS: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart analysis.

TEXT BOOKS:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2014.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2014.
3. M. Kasi Reddy &Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2014.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi, 2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012.

Course outcomes:

The student will able to:

1. Importance of management and contributions of management thinkers.
2. Prominent importance of planning, vision& mission, types of organizational structures.
3. Fundamentals of operations management, project management.
4. Basic concepts of Human resource management, Job Evolution, Leadership and Motivation.
5. Marketing management, Marketing mix, PLC, rural marketing, Logistics & SCM.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**3**	**0-0-0**	**3**

CONCRETE TECHNOLOGY

Course Objectives:

The student will :

1. be provided with basic knowledge on the properties of cement and different grades of cement. Gain knowledge on types of admixtures, minerals, chemical admixtures and usage.
2. understand about the classification of aggregates and characteristics.
3. gain proper knowledge about behaviour and properties of fresh concrete, factors effecting fresh properties
4. hardened concrete, elastic, creep and shrinkage properties of concrete. and testing of hardened concrete.
5. attain knowledge on mix design of concrete and its ingredients, special concretes.

UNIT - I:

Cement: Portland cement – chemical composition – Manufacturing process**–** Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures

UNIT II:

Aggregates: Classification of aggregate –Recycled Aggregates – Introduction to M-Sand and manufacturing process of M-Sand – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT - III:

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability –Rheology of Fresh Concrete– Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water**.**

Water / Cement ratio – Abram's Law – Gel Space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

UNIT - IV:

Hardened Concrete: Elasticity, Creep & Shrinkage –

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

Testing Of Hardened Concrete:

Compression tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

UNIT - V:

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

Special Concretes:

Introduction to Light weight concrete – Cellular concrete – No-fines concrete (Pervious Concrete) – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete – Introduction to Precast concrete, applications, advantages and disadvantages.

Text Books:

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

Reference Books:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.
2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi.
3. Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers.

Course Outcomes:

The student will able to:

1. Acquire knowledge on the properties of concrete ingredients i.e. cement, sand and coarse aggregate.
2. Develop an advanced knowledge of the mechanical performance of cement-based materials and how it can be controlled. Apply usage of various chemical admixtures and mineral additives to design cement-based materials with tailor-made properties.
3. Develop perception on the effects of the rheology and early age properties of concrete on its long-term behaviour.
4. Apply the usage of laboratory tests to characterize hardened concrete and its properties.
5. Acquire the knowledge on the mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, fibre reinforced concrete, etc.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**0**	**0-2-0**	**1**

GEOTECHNICAL ENGINEERING LAB

Course Objectives:

The student will :

1. Provided with civil engineering basic knowledge to carry out field investigations and to identify soils in geotechnical engineering practice.
2. Educated in performing and interpreting laboratory tests for evaluating sub grade performance and for pavement design.
3. Acquiring the Knowledge of ability to perform laboratory tests needed to determine soil design parameters.
4. Provided with the design and conduct experiments as well as analyse and interpret data.
5. Knowledge of and ability to perform laboratory tests needed to determine soil design parameters.

EXPERIMENT 1: Atterberg Limits (Liquid Limit, Plastic Limit)

EXPERIMENT 2: a) Field density by core cutter method

b) Field density by sand replacement method.

EXPERIMENT 3: Grain size distribution by sieve analysis.

EXPERIMENT 4: Determination of specific gravity by pycnometer.

EXPERIMENT 5: Permeability of soil by constant and variable head test methods.

EXPERIMENT 6: Standard Proctor's Compaction Test.

EXPERIMENT 7: California Bearing Ratio Test (CBR Test).

EXPERIMENT 8: Unconfined compression test.

EXPERIMENT 9: Direct shear test.

EXPERIMENT 10: Differential free swell index (DFSI) test.

Note: At least any Eight (8) experiments have to be conducted out of available Ten (10) experiments.

Course outcomes: The student will able to:

1. Demonstrate site specific field investigations including collection of soil Samples for testing and observation of behavior/building damage.
2. Perform identify and classify soils based on standard geotechnical engineering practice.
3. Perform laboratory compaction and in-place density tests for fill quality control.
4. Evaluate unsoaked and soaked California Bearing Ratio (CBR) tests used to estimate subgrade behaviour during construction and beneath permanent structures.
5. Determine engineering properties of soils.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - I Semester	**0**	**0-2-0**	**1**

CONCRETE TECHNOLOGY LAB

Course Objectives:

The student will :

1. Understand the test procedures to find Physical properties of Cement.
2. Understand test procedures to find Specific Gravity of cement.
3. Study test procedures to find properties of Fresh Concrete.
4. Study the test procedures to find properties of Hardened Concrete.
5. Study the non destructive test of concrete with advanced equipment.

EXPERIMENT 1: Normal Consistency and fineness of cement

EXPERIMENT 2: Initial setting time and final setting time of cement & soundness of cement

EXPERIMENT 3: Specific gravity

EXPERIMENT 4: Compressive strength of cement

EXPERIMENT 5: Permeability Workability test on concrete by compaction factor & slump cone test

EXPERIMENT 6: Workability test on concrete by Vee-bee consistometer

EXPERIMENT 7: Young's modulus of concrete.

EXPERIMENT 8: Compressive strength of concrete.

EXPERIMENT 9: Sieve analysis& specific gravity of sand

EXPERIMENT 10: Bulking of sand

EXPERIMENT 11: Non-Destructive testing on concrete (for demonstration).

Note: At least any Eight (8) experiments have to be conducted out of available eleven (11) experiments.

Course outcomes:

The student will able to:

1. understand the consistency and fineness of cement and setting times of cement.
2. understand the specific gravity and soundness of cement.
3. understand properties of concrete material, behavior of concrete & properties of fresh & hardened concrete
4. get good idea about the water cement ratio.
5. perform non-destructive test on concrete.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

FOUNDATION ENGINEERING

Course Objectives:

The student will :

1. Emphasize the importance of soil investigations including destructive and non-destructive methods.
2. Understand how earth pressure theory is important in the design of retaining structure.
3. Acquire the concept of bearing capacity and how to estimate the safe bearing capacity for various foundation systems including settlement consideration.
4. Gain knowledge about suitable shallow foundation system for various site conditions and analysis of different foundation system.
5. Understand the circumstances when pile is needed and to understand the need of analysis of pile and pile group under various soil conditions.

UNIT - I:

SOIL EXPLORATION:

Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test – pressure meter – planning of soil exploration program and preparation of soil investigation report.

UNIT II:

SLOPE STABILITY: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's Stability Number- stability of slopes of earth dams under different conditions.

UNIT - III:

EARTH PRESSURE THEORIES: Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method.

RETAINING WALLS: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity. Drainage from backfill, introduction to reinforced earth walls.

UNIT - IV:

SHALLOW FOUNDATIONS: Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT - V:

PILE FOUNDATION: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT and CPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

WELL FOUNDATIONS: Types – different shapes of wells – forces on wells - components of wells – Grip length – sinking of wells – tilts and shifts.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi

Reference Books:

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Das, B.M., - (1999) Principles of Foundation Engineering –4th edition PWS Publishing, Singapore.
3. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
4. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
5. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005
6. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, Newyork.

Course Outcomes:

The student will able to:

1. Carry out soil investigation for any civil engineering construction.
2. Analyse earth retaining structures for any kind of soil medium.
3. Estimate bearing capacity using IS code methods.
4. Design proper foundations for any kind of shallow foundation system.
5. Estimate pile and pile group capacity for any kind of soil including group efficiency and negative skin friction.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

TRANSPORTATION ENGINEERING

Course Objectives:

The student will :

1. Study about Highway development in India, Necessity for Highway planning, different road development plans.
2. Understand about the Classification of Road Network Pattern and Highway alignment.
3. Gain knowledge about Basic parameters of traffic, parking studies and Traffic Signals.
4. Understand Importance of Geometric design and Intersection design.
5. Gain knowledge on railway and airport engineering.

UNIT–I:

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

UNIT–II:

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

UNIT–III:

Traffic engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams. Traffic regulation and management: Road Traffic Signs – Types and Specifications – Road Markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method

UNIT–IV:

Intersection design: Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design Criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

UNIT-V:

Introduction to railway and airport engineering: Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turnouts. Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram.

Text Books:

1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7th edition (2000).
2. Railway Engineering – A textbook of Transportation Engineering – S.P.chadula – S.Chand & Co. Ltd. – (2001).

References:

1. Principles of Transportation Engineering by Partha Chakroborty & Aminesh Das; Prentice Hall of India, New Delhi.
2. Transport planning and Traffic Engineering by Dr. L. R. Kadiyali 3. Airport Planning and Design- S.K.Khanna and Arora,Nemchand Bros

Course Outcomes:

The student will able to:

1. Classify roads based on functional classification.
2. Apply the concepts of geometric design element.
3. Perform traffic volume studies.
4. Apply the concept of traffic signals and intersections.
5. Design various geometric elements of railway track and runway.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-1**	**3.5**

STRUCTURAL ENGINEERING –II (STEEL)

Course Objectives:

The student will :

1. Understand The manufacturing process of steel, types of steel and their properties. and the salient features of Limit State Method of design of Steel structures.
2. Understand the various codal provisions given in IS.800. Connections in steel structures
3. Acquire the Knowledge on the behaviour of steel structures under tension, compression and flexure.
4. Understand the design procedures as per IS 800, for tension, compression and bending members
5. Provided with the details of joints in steel structures and design detailing of bolted and welded joints in beams &other members.

UNIT–I:

Materials-Manufacturing of iron and steel-type of structural steel-mechanical properties of steel-concepts of plasticity-yield strength-load and combinations-local buckling behaviour of steel-concepts of limit state design-limit state design strength deflection limits serviceability stability check Bolted connections-IS:800-2007 specifications-Design strength-efficiency of joint prying action-welded connections-type of welded joints specifications-design requirements-Eccentric connections..

UNIT–II:

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-plastic moment-bending and shear strength/buckling-built up section laterally supported beams.

UNIT–IV:

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

UNIT-V:

Design of Roof Trusses-Type of roof trusses-load on roof trusses-purlin design-Analysis and design Roof Trusses-Design of connections

Text Books:

1. Limit State design of Steel Structures by S.K.Duggal, TMH, New Delhi.
2. Design of steel Structure by N.Subramanian, Oxford University Press

References:

1. Design of Steel Structures by S.S.BhaviKatti(By limit state methos), IK International Publishing House Pvt.Limited.
2. Limit state Design of Steel Structure by Dr.V L Shaw, Structures Publications, Pune
3. IS.800:2007-Indian Code Practice for Construction in Steel.

Course Outcomes:

The student will able to:

1. Design the tension members and compression members. slab and gusset type column bases.
2. Design the bending members and built up beams.
3. Design of beam end joints.
4. Design a welded plate girder and various stiffeners.
5. Design the various components of roof trusses.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

ESTIMATION, COSTING AND PROJECT MANAGEMENT

(Professional Elective-I)

Course Objectives:

The student will :

1. understand how to estimate the quantities of work, develop the bill of quantities and arrive at the cost of civil engineering project
2. estimate the detailed quantities of various items of work and their rates in building projects.
3. estimate the quantities of works and evaluate cost of project.
4. understand and apply the concept of valuation for properties
5. understand, apply and create the tender and contract document.

UNIT - I:

General items of work in Building: Standard Units, Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT - II:

Detailed Estimates of Buildings: Rate Analysis, Working out data for various items of work overhead and contingent charges. Reinforcement bar bending and bar requirement schedules.

UNIT - III:

Earthwork for roads and canals.

Estimating the quantities of earthwork for roads and canals.

UNIT - IV:

Contracts: Contracts – Types of contracts – Contract Documents – Conditions of contract. Valuation of buildings. Standard specifications for different items of a building construction.

UNIT - V:

Elements of Management & Network Techniques

Management: Characteristics of Management, Functions of Management, Important and Purpose of Planning Process.

Construction Planning and Scheduling: Introduction, Types of Project Plans, Work Breakdown Structure, Grant Chart, Preparations of Network Diagram- Event and Activity Based and Its Critical Path Method, PERT Method.

Textbooks:

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

Reference Books:

1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.).
3. Estimation, Costing and Specifications by M. Chakrabarti; Laxmi publications.
4. Construction Technology and project management by- S.Mahaboob Basha
5. Hyderbad Schedule of Rates (latest version)

Course Outcomes:

The student will able to:

1. Prepare detailed and abstract estimates for buildings, roads and canals
2. Prepare valuation of buildings.
3. Interpret Contract document of for civil engineering works
4. Formulate construction scheduling and project Management methods.
5. Apply and Create the Tender and Contract document

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B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

AIR POLLUTION AND CONTROL

(Professional Elective-I)

Course Objectives:

The Students will be able to

1. Introduce students to basic concepts of pollution.
2. understand the causes of air pollution.
3. Study about the health related to air pollution.
4. Develop skills relevant to control of air pollution.
5. understand the quality of air.

UNIT–I:

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

UNIT–II:

Effects of Air pollutants on man, material and vegetation; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT–III:

Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_x; NO_x; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

UNIT–IV:

Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control.

Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT-V:

General Methods of Control of NO_x and SO_x emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards.

Text Books:

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

References:

1. Air pollution and control By K.V.S.G. Murali Krishna, Kaushal Publishers. Kakinada.

Course Outcomes:

The students will be able to:

1. Acquired knowledge on the basic elements of causes and occurrence of the air pollution.
2. Have awareness on the different causes of the air pollution.
3. Have awareness about different health related problems caused due to air pollution.
4. Can able to develop concepts in controlling and prevention of air pollution.
5. Able to analyse air quality.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

GROUND WATER DEVELOPMENT AND MANAGEMENT
(Professional Elective-I)

Course Objectives: The student will :

1. Study on Ground Water Occurrence, ground water hydrological cycle, origin of ground water, rock Properties effecting ground water, vertical distribution of ground water, Aquifers, types of aquifers, porosity, Specific yield and specific retention.
2. Study on Ground water movement permeability, Darcy's law storage coefficient transmissivity derivation, ground water flow contour their application.
3. Study on Steady Ground water flow towards a well in confined and unconfined aquifers, Deputises and thermos equation. Yield of an open well Well interface and well test, and Recuperation Test.
4. Study on Unsteady flow towards a well, non-equilibrium equation, thesis solution, Jacob and chows Simplifications, Leaky aquifers and well Interference.
5. Learn groundwater management using advanced tools.

UNIT–I:

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention. Ground Water Movement: Permeability, Darcy‗s law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT–II:

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupuit‗s and Theisms equations, Assumptions, Formation constants, yield of an open well Well interface and well tests – Recuperation Test. Unsteady flow towards a well – Non equilibrium equations – Theis‗ solution – Jocob and Chow‗s simplifications, Leaky aquifers – Well Interference.

UNIT–III:

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation. Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and remote sensing-Artificial Recharge of Ground water along with Case studies.

UNIT–IV:

Well Construction – Drilling Equipment used for Well Construction – Bore log – Interpretation of Log Data.

UNIT-V:

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

Text Books:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

References:

1. Groundwater Hydrology by BOWER, John Wiley & sons.
2. Groundwater System Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers

Course Outcomes:

The student will able to:

1. The student will : be with ground water occurrence, ground water movement equations, surface & subsurface investigations , artificial recharge of ground water, well construction etc.,
2. Estimate aquifer parameters and yield of wells.
3. Determine the process of artificial recharge for increasing groundwater potential.
4. Take effective measures for controlling saline water intrusion.
5. Apply appropriate measures for groundwater management.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

STRUCTURAL HEALTH MONITORING
(Professional Elective-I)

Course Objectives:

The student will :

1. Learn the fundamentals of structural health monitoring.
2. Study the various vibration-based techniques for structural health monitoring.
3. Learn the structural health monitoring using fiber-optic and Piezoelectric sensors.
4. Study the structural health monitoring using electrical resistance and electromagnetic techniques.
5. Study about SHM using electrical resistance

UNIT-I

Introduction to structural health monitoring: Definition of structural health monitoring (SHM) - Motivation for SHM - SHM as a way of making materials and structures smart - SHM and biomimetics - Process and pre- usage monitoring as a part of SHM - SHM as a part of system management - Passive and active SHM - NDE - SHM and NDECS - Variety and multidisciplinary - The most remarkable characters of SHM Birth of the SHM community.

UNIT-II

Vibration-based techniques for SHM: Basic vibration concepts for SHM - Local and global methods - Damage diagnosis as an inverse problem - Model-based damage assessment - Mathematical description of structural systems with damage - General dynamic behavior - State- space description of mechanical systems - Modeling of damaged structural elements - Linking experimental and analytical data - Modal Assurance Criterion (MAC) for mode pairing - Modal Scaling Factor (MSF) - Co- ordinate Modal Assurance Criterion (COMAC) - Damping - Expansion and reduction - Updating of the initial model - Damage localization and quantification - Change of the flexibility matrix - Change of the stiffness matrix - Strain-energy-based indicator methods and curvature modes - MECE error localization technique - Static displacement method - Inverse eigen sensitivity method - Modal force residual method - Kinetic and strain energy-based sensitivity methods - Forced vibrations and frequency response functions - Solution of the equation system - Regularization - Parameter subset selection - Other solution methods - Variances of the parameters - Neural network approach to SHM - The basic idea of neural networks - Neural networks in damage detection - localization and quantification - Multi-layer Perceptron (MLP) - A simulation example - Description of the structure - Application of damage indicator methods - Application of the modal force residual method and inverse eigen sensitivity method - Application of the kinetic and modal strain energy methods -

Application of the Multi-Layer Perceptron neural network - Time-domain damage detection methods for linear systems - Parity equation method - Kalman filters - AR and ARX models - Damage identification in non-linear systems - Extended Kalman filter - Localization of damage using filter banks - A simulation study on a beam with opening and closing crack - Applications - I-40 bridge – Steel-quake structure - Application of the Z24 bridge - Detection of delamination in a CFRP plate with stiffeners.

UNIT-III

Fiber-optic sensors: Classification of fiber-optic sensors - Intensity-based sensors - Phase-modulated optical fiber sensors - or interferometers - Wavelength based sensors - or Fiber Bragg Gratings (FBG) - The fiber Bragg grating as a strain and temperature sensor - Response of the FBG to uniaxial uniform strain fields - Sensitivity of the FBG to temperature - Response of the FBG to a non-uniform uni-axial strain field - Response of the FBG to transverse stresses – Photo-elasticity in a plane stress state - Structures with embedded fiber Bragg gratings - Orientation of the optical fiber optic with respect to the reinforcement fibers - Ingress-egress from the laminate - Fiber Bragg gratings as damage sensors for composites - Measurement of strain and stress variations - Measurement of spectral perturbations associated with internal stress release resulting from damage spread - Examples of applications in aeronautics and civil engineering - Stiffened panels with embedded fiber Bragg gratings - Concrete beam repair

UNIT-IV

SHM with piezoelectric sensors: The use of embedded sensors as Acoustic Emission (AE) detectors - Experimental results and conventional analysis of acoustic emission signals - Algorithms for damage localization - Algorithms for damage characterization - Available industrial AE systems ,New concepts in acoustic emission - State-the-art and main trends in piezoelectric transducer-based acousto-ultrasonic SHM research - Lamb wave structure interrogation - Sensor technology - Tested structures (mainly metallic or composite parts) - Acousto-ultrasonic signal and data reduction methods - The full implementation of SHM of localized damage with guided waves in composite materials - Available industrial acousto- ultrasonic systems with piezoelectric sensors - Electromechanical impedance - E-M impedance for defect detection in metallic and composite parts - The piezoelectric implant method applied to the evaluation and monitoring of visco-elastic properties.

UNIT-V

SHM using electrical resistance: Composite damage - Electrical resistance of unloaded composite - Percolation concept - Anisotropic conduction properties in continuous fiber reinforced polymer - Influence of temperature - Composite strain and damage monitoring by electrical resistance - 0° uni-drectional laminates - Multidirectional laminates - Randomly distributed fiber reinforced polymers - Damage localization.

Low frequency electromagnetic techniques: Theoretical considerations on electromagnetic theory - Maxwell‘s equations - Dipole radiation - Surface impedance -

Diffraction by a circular aperture - Eddy currents - Polarization of dielectrics - Applications to the NDE-NDT domain - Dielectric materials - Conductive materials - Hybrid method - Signal processing - Time-frequency transforms - The continuous wavelet transform - The discrete wavelet transform – Multi-resolution – De-noising - Application to the SHM domain - General principles - Magnetic method - Electric method - Hybrid method.

Textbooks:

1. .Daniel Balageas, Claus-Peter Fritzen and Alfredo Güemes "Structural Health Monitoring", John Wiley-ISTE, London, 2006.
2. Douglas E Adams, "Health Monitoring of Structural Materials and 2.Components - Methods with Applications", John Wiley & Sons, New York, 2007.
3. J.P. Ou, H. Li and Z. D. Duan, "Structural Health Monitoring and Intelligent Infrastructure", Vol.-1, Taylor & Francis, London, 2006.
4. Victor Giurglutiu, "Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc., 2007.
5. M.V. Gandhi and B.D. Thompson, "Smart Materials and Structures," Springer, 1992.
6. .Fu Ko Chang, "Structural Health Monitoring: Current Status and Perspectives", Technomic, Lancaster, 1997

Reference Books:

1. Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes, Structural Health Monitoring,
2. John Wiley & Sons, 2006.Victor Giurgiutiu, Structural Health Monitoring with Piezoelectric wafer Active Sensors, Academic Press, 2008.

Course Outcomes:

The students will be able to:

1. Understand the fundamentals of maintenance and repair strategies.
2. Understand serviceability and durability aspects of concrete.
3. Know the materials and techniques used for repair of structures.
4. Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
5. Use an appropriate health monitoring technique and demolition technique

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

REMOTE SENSING AND GIS LAB
(Professional Elective-II)

Course Objectives:

The student will :

1. The purpose of accurate mapping of all features under different spatial and temporal scales of all kinds of terrain and land under water bodies.
2. The remote sensing is advantageous comparatively to traditional surveying techniques in terms of time, accuracy and output.
3. The purpose of predictions of all scales.
4. GIS software which can be used for collecting, storing and analyzing of data which is useful for real world applications.
5. The purpose of serving the water resource application.

UNIT - I: Introduction to Photogrammetry

Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height, determinations.

UNIT - II:

Remote Sensing – I: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

Remote Sensing – II: Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

UNIT - III:

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

Types of data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

UNIT - IV:

GIS Spatial Analysis: Computational Analysis Methods(CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT - V:

Water Resources Applications-I: Land use/Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics.

Water Resources Applications – II: Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

NOTE: The above topics have to be explained in the laboratory through demonstration and execution.

Text Books:

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

Reference Books:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
3. GIS by Kang – tsung chang, TMH Publications & Co.,

Course Outcomes:

The student will able to:

1. Based on the objective of study a student should have thorough knowledge to choose the remote sensing image from different sensors, resolutions, spatial and temporal scales.
2. Remote sensing gives the provision of understanding and to comprehend large tracks of earth surface with less time and cost but more accuracy.
3. In case of dam construction, for a civil engineer it is must to have knowledge of resource richness of an area, flow rates in stream, channel geometry with respect to time, magnitudes of movement in crust, habitations etc.
4. By GIS the student can communicate to the common man his analysis of different problems developments, benefits by preparing different thematic maps.
5. Remote sensing gives the provision of understanding about water resources management and monitoring.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

URBAN DISASTER – INTELLIGENT CONTROL SYSTEM

(Professional Elective-II)

Course Objectives:

The student will :

1. Classify the various types of disasters, understand the various terminologies.
2. Analyse the various causes of disasters (both natural and man-made) and their impacts.
3. Gain the knowledge of different monitoring profiles (engineering profile and planning profile) to track the urban disasters. And know the means to use the information systems like GIS, MIS in disaster control system.
4. Forecast the different approaches through decision supporting systems, online monitoring systems etc.
5. Understand the Intelligent transport systems for managing the traffic systems

UNIT–I:

Disasters: Types of disaster, significant aspects of disasters, economic impact of disasters, Risk aspects, Hazards and disasters. Urban Disaster and their environmental impacts: Impact of earthquakes, floods, fires, droughts, landslides, Congestion pollution, accident risk on urban environment policies for remedial measures. Technology to forecast their impact.

UNIT–II:

Technology to Track Urban Disasters: Monitoring profile – cameras, sensors and communication systems engineering profiles – total station, terrestrial scanners, and other survey equipment. Planning Profile – Impact on Urban Disasters: Planning profile – GPS, satellite technology and photographic technique

UNIT–III:

Information systems: Geography information systems – different packages and overview, MIS – Architecture, web enabled communication systems – over view.

UNIT–IV:

Intelligent control system: Technology enabled online monitoring system, post evaluation multi criteria systems, fore casting approaches through decision supporting systems.

UNIT-V:

Intelligent transport systems- traffic signal control systems – Dynamic Traffic light sequence – inductive loop technologies – Video Vehicle Detection – Collision Avoidance Systems – Cooperative Systems on Roads – Container Management System. Disasters – case studies on disaster mitigation measures.

Textbooks:

1. Disasters – Global challenges and local solutions by Rajib Shaw. R.R. Krishna Murthy, University Press.
2. Sensor Technologies & Date requirement of ITS by Lawerence A. Klein.

References:

1. Disaster mitigation – Experiences and reflections – Pradeep sahni, Alka Dhameja, Uma Medhuri, PHI.

Course Outcomes:

The students will be able to:

1. Identify the various disasters and grouping them.
2. Identify the disasters and their impacts in the urban society and forecast the important disasters using various technologies.
3. Enable to learn some technical skills and software packages for monitoring the disasters management.
4. Can able to learn online monitoring with respect to the post evaluation criteria.
5. Can able to learn various controlling systems and disaster mitigation measures

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

SOLID WASTE MANAGEMENT

(Professional Elective-II)

Course Objectives:

The student will :

1. Provide in depth knowledge about handling of solid waste from source to grave.
2. Study about constructing the solid waste treatment system.
3. Study about Waste processing and reuse Processing technologies
4. Understand waste minimization.
5. Understand Solid waste management techniques

UNIT–I:

Introduction to Municipal Solid Waste Definition – Sources and impact of solid waste on environment, Classification of solid waste –composition and its determinants of Solid waste –factors influencing generation quality assessment of solid waste –methods of sampling and characterization.

UNIT–II:

Collection: collection of Solid waste –collection services –collection system ,equipment's – time and frequency of collection –labor requirement –factors affecting collection – analysis of collection system –collection routes –preparation of master schedules . Transfer and Transport: Need for transfer operation- transfer stations-types-transport means and methods location of transport stations-manpower requirement-collection routes: transfer stations election of location, types and design requirements, operation and maintenance.

UNIT–III:

Waste processing and reuse Processing technologies: Biological, chemical conversation technologies and thermal conversion technologies. Reuse of solid waste energy recovery – incineration- solidification and stabilization of hazardous waste- treatment of biomedical wastes.

UNIT–IV:

Waste disposal techniques Introduction, composting, principles of composting, factors affecting composting, vermin composting, waste to energy technique- Landfill technique and design and operating procedure of landfill.

UNIT-V:

Solid waste management techniques Solid waste management Hierarchy, waste avoidance / waste prevention, Definition of source reduction, waste reduction at source using 5r's Technique, solid waste management rules and regulations

Text Books:

1. A.D. Bhide and B.B.Sundaresan, —Solid waste management-Collection,Processing and disposal‖, Mudrashilpa offset printers,Nagpur, 1st edition, 2001
2. Techobanoglous Thiesssen Ellasen, — Solid Waste Engineering Principles and Management‖, McGraw-Hill 1997.126

References:

1. K. Sasi Kumar & S.Gopi Krishna, —Solid Waste Management‖.
2. Tchobanoglous, Theissen & Vigil, — Integrated Solid Waste Management‖, McGraw Hill Publication, 1st Edition, 1997.
3. R.E.Landrefh and P.A.Rebers, — Municipal Solid Wastes-Problems & Solutions‖, Lewis Publications, 1st edition,1997

Course Outcomes:

The student will able to

1. Understand the components of solid waste management and the laws governing it.
2. Acquires the knowledge of design, operation and maintenance of landfills, incinerators and composting units.
3. Understand Reducing the amount and toxicity of material entering the waste flow (minimization).
4. Acquires the knowledge in Reusing of waste material
5. Understand Recycling of waste that cannot be used and recovery of resources.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

FEM FOR CIVIL ENGINEERING
(Professional Elective-II)

Course Objectives:

The student will :

1. To provide the fundamental concepts of the theory of the finite element methods and proficiency in the application of finite element method to realistic engineering problems through the use of a general purpose finite element method.
2. To study the element shapes, nodes, and nodal degree of freedom.
3. To teach students how to perform 1-D and 2-D structural analysis using finite element methods.
4. To understand the elemental nodal procedure such as CST, Lagrange – Serenalipity elements.
5. To understand the use of the basic finite elements for structural applications for 4-node Iso-parametric, Axi-symmetric element and also to study the solution techniques for static loads.

UNIT–I:

Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation. Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with Axi-symmetric loading.

UNIT–II:

One Dimensional FEM: Stiffness matrix for bar element - shape functions for one dimensional element – one dimensional problem.

UNIT–III:

Two Dimensional FEM: Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates.

UNIT–IV:

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements. Isoparametric formulation: Concepts of, isoperimetric elements for 2D analysis formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements – Lagrangian and Serenalipity elements. To understand the elemental nodal procedure such as CST, lagrangian – Serenalipity elements.

UNIT-V:

Axi-symmetric analysis: Basic Principles-Formulation of 4-node Iso-parametric Axisymmetric element. Solution techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Text Books:

1. Finite Elements Methods in Engineering by Tirupati.R. Chandrupatla and Ashok D. Belegundu - Pearson Education Publications.
2. Finite element analysis by S.S. Bhavikatti-New age international publishers.

References:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of finite element analysis by P.Seshu – Prentice Hall of India.

Course Outcomes:

The student will able to:

1. Develop a basic understanding of the limitations of FEM and understand the possible error sources in its use.
2. Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
3. An ability to derive equations in finite element methods for 1D and 2D problems.
4. An ability to formulate and solve basic problems in structural mechanics using different elements.
5. An ability to apply knowledge of mathematics to model engineering systems.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**0**	**0-2-0**	**1**

HIGHWAY ENGINEERING LAB

Course Objectives: The student will :

1. To gain the practical knowledge of properties of Highway materials and surveys.
2. To learn the procedure of testing bituminous material as per standard code recommendations.
3. To relate the material characteristic to various application of construction.
4. Bitumen and & its engineering behavior
5. Concept of traffic behavior

LIST OF EXPERIMENTS:

I. ROAD AGGREGATES:

1. Aggregate Crushing Value Test.
2. Aggregate Impact Test.
3. Specific Gravity and sieve analysis.
4. Los Angeles Abrasion Value Test.
5. Flakiness and elongation Indices of coarse Aggregates.

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Marshal stability Test.

III. TRAFFIC STUDIES

1. Traffic volume Counts.
2. Spot speed studies.

Note: At least any Eight (8) experiments have to be conducted out of available Eleven (11) experiments.

Course Outcomes:

The student will able to:

1. Practically student can provide or identify properties of highway materials.
2. Exposure to a variety of established material testing techniques.
3. Identify engineering properties of aggregate.
4. Find out peak hour traffic & peak time for a given location on the road.
5. Calculate design speed, maximum speed & minimum speed limits of a location through spot speed.

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B.Tech. CE	**L**	**T-P-D**	**C**
III Year - II Semester	**0**	**0-2-0**	**1**

COMPUTER AIDED DESIGN AND DRAFTING LAB

Course Objectives:

The student will :

1. A student will able to know how to apply engineering drawing using computers
2. Describe the significance of structural software and its main features.
3. Impart the knowledge to the students on the structural software package for the analysis and design of concrete and steel structures.
4. Able to do Detailing of RC elements using AUTO CAD
5. To understand the general concepts of engineering drawing and general principles on a CAD

EXPERIMENT 1: Model generation in ETABS

EXPERIMENT 2: Load generation and load cases

EXPERIMENT 3: Analysis of simply supported beams

EXPERIMENT 4: Analysis of continuous beams

EXPERIMENT 5: Analysis of cantilever beams

EXPERIMENT 6: Analysis of plane frames for dead and live loads

EXPERIMENT 7: Detailing of RC beam using AUTOCAD

EXPERIMENT 8: Detailing of RC slab using AUTOCAD

EXPERIMENT 9: Detailing of RC column and footing using AUTOCAD

EXPERIMENT 10: Detailing of RC staircase using AUTOCAD

Course Outcomes:

The student will able to:

1. analyse and interpret the results of a structural analysis &design software
2. design the structural elements like beam, frame
3. analyse & design buildings by using structural software etabs/ staad pro
4. draw detailing of rc elements using auto cad.
5. to draft the plan, elevation and sectional views of the buildings, industrial structures, framed buildings using computer software.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

ADVANCED STRUCTURAL ENGINEERING

(Professional Elective –III)

Course Objective:

The student will :

1. Conversant with the design principles of critical structures using limit state approach.
2. Understand the design principles of special structures like column strips.
3. Understand the design principles of special structures like Circular Water Tanks
4. Understand the design principles of silos and bunkers
5. Understand the design principles of Steel Gantry Girders**.**

UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles& Design of Counter Fort Retaining walls.

UNIT – II

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat Slabs-Check for one way and two way shears

Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

UNIT – III

Design of RCC Circular Water Tanks.

UNIT – IV

Design of silos and bunkers

UNIT – V

Design of Steel Gantry Girders.

TEXT BOOKS:

1. Advanced R.C.C by KrishnamRaju, CBS Publishers & distributors , New Delhi.
2. Advanced RCC by Varghese , PHI Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by KrishnamRaju, Univ.Press , New Delhi
4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi

REFERENCES:

1. R.C.C Designs by Sushilkumar , standard publishing house.
2. Fundamentals of RCC by N.C.Sinha and S.K.Roy, S.Chand Publications, New Delhi.
3. N. Krishna Raju, Design of Bridges, Oxford & IBH Publishing Company Pvt. Ltd, New Delhi. Fourth edition 2009.

Course Outcomes:

The student will able to:

1. Design retaining walls and Counter Fort Retaining walls.
2. Design column strips and Flat Slabs
3. Design water tanks.
4. Design silos and bunkers.
5. Design Steel Gantry Girders.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

TRAFFIC ENGINEERING AND MANAGEMENT

(Professional Elective-III)

Course Objectives:

The student will :

1. Study the importance of traffic characteristics and different methods of traffic Surveys
2. Study about highway capacity and the factors affecting it, traffic flow
3. Study about parking studies
4. Know about traffic control and regulations
5. Study about traffic signs, road markings and road accidents

UNIT - I:

Traffic Characteristics

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

Traffic Surveys

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

UNIT – II:

Highway Capacity

Definition of Capacity – Importance of capacity – Concept of Level of Service - Different Levels of Service- Factors affecting Capacity and level of service

Theory of Traffic Flow

Definition of traffic flow-relationship between the variables-fundamental diagram of traffic flow-linear relationship between speed and concentration

UNIT – III:

Parking Studies

Types of parking facilities – On-street and Off-Street Parking Facilities- Parking Studies- Parking Inventory. Study – Parking Survey by Patrolling Method- Analysis of Parking Data and parking characteristics- Multi Storey Car Parking Facility-Design standards.

UNIT – IV:

Traffic Control & Regulation

Traffic Problems in Urban areas- Importance of Traffic Control and regulation- Traffic Regulatory Measures- Channelization- Traffic Signals- Saturation Flow – Signal Design by Webster Method – Signal Phasing and Timing Diagrams.

Traffic and Environment

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

UNIT – V:

Traffic Signs and Road Markings

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

Highway Safety

Road accidents – Types of Road accidents- Causes – Engineering Measures to reduce Accidents- Enforcement Measures – Educational Measures- Road Safety Audit- Principles of Road Safety Audit.

Textbooks:

1. Traffic Engineering and Transportation planning – L.R kadiyali – Khanna publishers.
2. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall (India).

Reference Books:

1. Transportation Engineering – An Introduction – C. J. Khisty, Prentice Hall of India.
2. Principles of Transportation Engineering – Partha Chakroborthy, Animesh Das – Prentice Hall of India.
3. Highway Engineering and Traffic Analysis-Mannering and Kilareski, John wiley Publications

Course Outcomes:

The student will able to:

1. Understand the Basic characteristics of Traffic
2. analyze highway capacity and design traffic flow pattern
3. Design different types parking
4. Design signals by Webster method.
5. Carry out surveys involved in traffic control.

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UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

BRIDGE ENGINEERING
(Professional Elective - III)

Course Objectives:
The students will :

1. Study different types of bridges, forces that act on bridges, Design of bridge and its elements
2. Learn the hydraulic, geological and geo-technical aspects in bridge design.
3. Study about the detail the bridge deck and box girder systems, steel and composite bridges.
4. Study about the sub-structures, bridge bearings and various long span bridges.
5. Study about the Bearings, joints, types of foundation.

UNIT-I

Introduction: Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.

Standard Specifications for Roads and Railways Bridges: General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

UNIT-II

Design Consideration for R. C. C. Bridges: Various types of R.C.C. bridges (brief description of each type), design of R.C.C. culvert and T-beam bridges

UNIT-III

Design Consideration for Steel Bridges:

Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

UNIT-IV

Hydraulic & Structural Design:

Piers, abutments, wing-wall and approaches.

UNIT -V

Brief Description: Bearings, joints, types of foundation.

Text Books:

1.Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub.N.Delhi.

2. Design of Bridges, N.Krishna Raju, Oxford & IBH, N.Delhi.

3. Bridge Deck Analysis, R.P.Pama & A.R.Cusens, John Wiley & Sons.

4. Design of Bridge Structures, T.R.Jagadish & M.A.Jairam, Prentice Hall of India, N.Delhi

Reference Books:

1.Design of Concrete Bridges by M.G. Aswani, V.N. Vazirani and M.M. Ratwani.

2.Bridge Deck Behaviour by E.C. Hambly.

3.Design of Bridges by V.V. Sastry, Dhanpat Rai & Co

Course Outcomes:

The student will able to:

1. Able to perform hydraulic design, geometrical parameters of bridge and bridge bearings
2. Design slab bridge, T-beam bridge, abutments and piers
3. Understand the fundamentals and codes of practice of bridge design.
4. Design the bridge deck and box girder systems using appropriate method.
5. Devise the steel truss and composite steel-concrete bridges.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

IRRIGATION AND HYDRAULIC STRUCTURES
(Professional Elective - III)

Course Objectives:

The student will :

1. Build on students' background in irrigation and hydraulics.
2. Understand water resources systems and various channel system.
3. Develop the skills on modeling of earth dams and spillways.
4. Develop skills in diversion head works.
5. Provide the knowledge in the design of dams and canals operation.

UNIT - I:

Necessity and importance of irrigation:

Advantages and ill effects of irrigation, types of irrigation, methods of application of irrigation water, Indian agriculture soils, methods of improving soil fertility- crop rotation, preparation, land fall irrigation, standards of quality for irrigation water, Duty and Delta, factors affecting Duty-Design discharge for a water course. The depth and frequency of irrigation

UNIT - II:

Gravity dams : Forces acting on a gravity dam, causes of failure of earth dam, elementary profile and particle profile of the gravity dam, limiting height of a low gravity dam, factors of safety- stability analysis, foundation of a gravity dam, drainage and inspection galleries.

UNIT - III:

Earth dams: Types of earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam- in graphical method, measures for control of seepage.

Spillways: Types of spillways, design principles of ogee spillways-spillway gates. Energy dissipaters and stilling basins significance of jump, high curve and tail water rating curve-USBR and Indian types of strolling basins.

UNIT - IV:

Diversion headworks: Types of diversion headworks-weirs and barrages, layout of diversion headwork-components. Causes and failures of weirs and barrages in permeable foundations-silt ejectors and silt excluders weirs on permeable foundations-creep theory-Bligh's ,lane and koala's theories, Determination of uplift pressure-various correction factors- design principles of weirs on permeable foundations using creep theory-exit gradient, upstream and downstream sheet piles-launching apron.

UNIT - V:

Canal falls: Types of falls and there location, design principles of notch fall and sarada type fall. Canal regulation works, principles of design of distributor and head regulators, canal cross regulator-canal outlets , types of canal modules, proportionality sensitivity and flexibility.

Cross drainage works: Selection of site, design principles of aqueduct, siphon aqueduct and super passage. Design of type II aqueduct (under tunnel)

Text Books:

1. Irrigation and water power engineering by B.C.PUNMIA, standard publishers 2001.
2. Hydrology by Ragunath.H.M, Willey,Eastern limited New Delhi 2000.

Reference Books:

1. Elementary hyrology by VP Singh,PHI publications.
2. Irrigation and water resources and water power by PN MODI standard book house.
3. Irrigation water management by DK Majundar,Printice hall of indra.

Course outcomes:

The student will able to:

1. Determine the depth and frequency of irrigation water required for the given crop.
2. Design various channel systems.
3. Acquire knowledge about cross drainage works and its design.
4. Design different types of canal falls.
5. Design head and cross regulator structures.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

GROUND IMPROVEMENT TECHNIQUES
(Professional Elective-IV)

Course Objectives:

The students will :

1. Introduce the various methods of improvement methods of engineering properties of the soil.
2. Introduce the application of engineering methods to ground improvement techniques.
3. Study applications of geotextiles in various civil engineering projects and use of micropiles in the soil stabilization.
4. Apply different methods of soil reinforcement like soil anchors, rock bolts and soil nails in cohesive and granular soils.
5. Design dewatering systems to prevent significant groundwater seepage into the excavation and to ensure stability of excavation side slopes.

UNIT - I: INTRODUCTION TO GROUND IMPROVEMENT:

Introduction, Need and objectives, in situ and laboratory tests to characterize problematic soils, mechanical, hydraulic, physical, chemical, electrical, thermal methods and their applications.

UNIT - II: MECHANICAL MODIFICATION:

Principles, Deep compaction techniques- blasting, vibro compaction, dynamic tamping and compaction piles.

UNIT-III: HYDRAULIC MODIFICATION:

Dewatering methods of dewatering-sumps, single and multi-stage well points-vacuum well points-horizontal wells-foundation drains-blanket drains-pit area for selection of fill material around drains-electro-Osmosis method.

UNIT IV: PHYSICAL AND CHEMICAL MODIFICATION:

Methods of stabilization-mechanical-cement-lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum, Grouting, objectives of grouting, Shotcreting and Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting

UNIT - V: MODIFICATION BY INCLUSIONS AND CONFINEMENT:

Reinforced Earth: Principles, components of reinforced earth, factors governing design of reinforced earth walls, design principles of reinforced earth walls. Soil Nailing, Rock anchoring, Micro piles.

Geo synthetics: Geo textiles, types, functions and applications, geo grids and geo membranes, functions and applications.

Text Books:

1. Engineering Principles of Ground Modification, McGraw-Hill International Edition Hausmann M.R
2. Ground improvement techniques, Purushotham Raj. laxmi publications, New Delhi

Reference Books:

1. Ground improvement, Moosely M.P (1993) Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Ground control and improvement, John Wiley and sons, New York, USA.
3. Designing with Geo synthetics, Robert M.Koerner, Prentice Hall New Jersey, USA.

Course Outcomes:

The student will able to:

1. Understand the needs and objectives of ground improvement techniques
2. To acquire the knowledge of laboratory and in situ tests for soil improvement projects
3. Acquire the knowledge of surface compaction, admixture stabilisation of expansive soil etc.
4. Analyze the importance of Shotcreting and grouting Technology
5. Understand modification by inclusions and confinement

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT

(Professional Elective-IV)

Course Objectives :

The student will :

1. Study Fundamentals of construction technology, Construction Records, Documents, Quality, safety.
2. Study on Construction methods, earthwork, piling, concrete and concreting, formwork, Fabrication and Erection. Excavators, rollers, Dozer Scrapers, handling equipment, concrete.
3. Equipment, handling equipment, cranes draglines and Clamshells.
4. Study on Quality control, Contract Management, Construction Planning
5. Study on Project Scheduling, PERT, CPM Resources levelling.

UNIT - I:

Fundamentals of Construction Technology – Construction Activities – Process – Construction Schedule –

Construction Records – Documents - Codes and Regulations. Material, Equipment and scheduling.

UNIT - II:

Construction Method – Earthwork ,excavators ,rollers, doers, Scrapers – Handling Equipment – Draglines and Clamshells -Concrete Equipment – Handling Equipment – Cranes – Piling – Concrete and Concreting – Form work – Fabrication and Erection. Mechanized Construction – Construction Equipment.

UNIT - III:

Quality -Quality Control, Assurance and Safety – ISO – 9000 Quality Systems –

Safety -Principles on Safety – Personnel, Fire and-Electrical Safety – Environment Protection – Concept of Green Building. Air condition and HVAC systems.

UNIT - IV:

Contract Management – Project Estimation – Types of Estimation – Contract Document – Classification – Bidding –Procurement Process. Construction Claims, Dispute and Project Closure – Source of Claim – Claim Management – Dispute Resolution –Arbitration – Construction Closure – Contract Closure – Documentation.

UNIT - V:

Construction Planning – Project Planning Techniques – Planning of manpower,

Equipment Economics- Finance. Project – PERT – CPM, Resource leveling.

Text Books:

1. Construction Technology by Subir K. Sarkar, Subhajit Saraswati / Oxford University Press, 2009.
2. Construction Project Management - Theory and Practice, Nirajjha, Pearson Education, 2010.

Reference Books:

1. Construction Planning, Equipment and Methods by Peurifacy, Schexnayder, Shapira TMH, 2010.
2. Project Planning and Control with PERT and CPM – B.C. Punmia, K.K. Khandelwala – Laxmi Publication.

Course Outcomes:

The student will able to:

1. Understand fundamentals of construction technology
2. Planning & management including project planning pert-cpm and construction claims and the student is at option to choose this subject depending on his future interest among the three subjects under open elective.
3. The students will have a clear idea about constructions aspects they will come to know about the management skill of construction projects, planning of different stages of works in order to complete the task within the stipulated period.
4. The students can understand the quality and quantity control different machinery used for the construction.
5. Contract and tendering floating methods arbitration aspect of projects etc.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

Airports, Railways and Waterways
(Professional Elective-IV)

Course Objectives:

The student will :

1. Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
2. Introduce component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail.
3. Study the Concept of Geometric Design of Railway Track
4. Study about Track maintenance and Operation
5. Study of harbors, features, planning and design of port facilities.

UNIT – I

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 - II

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, Subgrade and Embankments, Ballast less Tracks.

UNIT – III

Geometric Design of Railway Track

Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT – IV

Track maintenance and Operation

Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.

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. Venkataramaiah C (2016), "Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

Reference Books:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportaion Engineering by R. Srinivasa Kumar, University Press India

Course Outcomes:

The student will able to:

1. An ability to design of runways and taxiways.
2. An ability to design the infrastructure for large and small airports
3. An ability to design various crossings and signals in Railway Projects.
4. knowledge about the Track maintenance and Operation**.**
5. An ability to plan the harbors and ports projects including the infrastructure required for new ports and harbors.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

URBAN TRANSPORTAION PLANNING
(Professional Elective-IV)

Course Objectives:

The student will :

1. Study about transport facilities
2. Understand about trip generation and factors affecting it.
3. Understand Importance of trip distribution data
4. Gain knowledge about Modal split analysis
5. Gain knowledge about highway networks and routes

Pre-requisites: Transportation Engineering

UNIT I:

Transport Planning Process: Scope – interdependence of land use and traffic – systems approach to transport planning – Transport surveys – definition of study area – zoning survey - types and methods – inventory on transport facilities - inventory of land use and economic activities.

UNIT II:

Trip Generation: Factors governing trip generation and attraction rates – multiple linear regression analysis – category analysis – critical appraisal of techniques.

UNIT III:

Trip Distribution Methods: Presentation of trip distribution data - PA matrix to OD matrix – Growth factor methods - gravity model and its calibration – opportunity model

UNIT IV:

Modal split analysis: Influencing factors – Earlier modal split models: Trip end type and trip interchange type – limitations – Disaggregate mode choice model – Logit model - binary choice situations – multinomial logit model – model calibration .

UNIT V:

Route assignment: Description of highway network – route choice behavior – shortest path algorithm – assignment techniques – all nothing assignment – multi path assignment – capacity restrained assignment – diversion curves.

Textbooks:

1. Kadiyali, LR (1987), Traffic Engineering and Transportation Planning, Khanna Publishers, New Delhi.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. McGraw Hill Book Company, New York

Reference Books:

1. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd.
2. NPTEL videos on Urban Transportation Planning, Dr. V. Tamizh Arasan, IIT Madras Paul.H.Wright (1995),
3. Transportation Engineering – Planning & Design, John Wiley & Sons, New york.
4. John W Dickey (1995), Metropolitan Transportation Planning, Tata McGraw-Hill publishing company Ltd, New Delhi.

Course Outcomes:

The student will able to:

1. Plan transport facilities based on various factors
2. Analyse trip generation by various techniques
3. Present the trip distribution data
4. Analyse modal split and factor influencing
5. Design highway networks and routes

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

PRESTRESSED CONCRETE
(Professional Elective - V)

Course Objectives:

The students will :

1. Develop an understanding of the necessity of prestressed concrete structures.
2. Develop an understanding of various techniques of prestressing.
3. Develop an understanding of various losses of prestress.
4. Develop an understanding of the analysis of prestressed concrete members.
5. Develop an understanding of the design of prestressed concrete members

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 shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

UNIT - III:

Design of sections for flexure and shear: Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

Analysis of end blocks: by Guyon's method and Mugnel method, Anchorage zone strusses – Approximate method of design – Anchorage zone reinforcement – Transfer of prestress pretensioned members.

UNIT - IV:

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

UNIT - V:

Deflections of prestressed concrete beams: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections.

Text Books:

1. Prestressed Concrete by Krishna Raju; - 5th Edition Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

Reference Books:

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns,
3. John Wiley & Sons. Codes: BIS code on prestressed concrete, IS 1343-2012.

Course Outcomes:

The student will able to:

1. Acquire the knowledge of evolution of process of prestressing.
2. Acquire the knowledge of various prestressing techniques.
3. Develop skills in analysis of prestressed concrete beams, and slabs.
4. Develop skills in design of prestressed concrete beams, and slabs.
5. Develop skills to satisfy the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

REHABILITATION AND RETROFITING OF STRUCTURES
(Professional Elective-V)

Course Objectives:

The student will :

1. Study Deterioration of structures, distress in structures, causes and prevention.
2. Understand Mechanism and types of Damage caused in structures. Mechanism causes and preventive measures of Corrosion in Reinforcement.
3. Study Damage of structure due to fire, fire rating of structures, Phenomena of Desiccation.
4. Study Inspection and testing, symptoms and diagnosis of Distress, Damage Assessment, Repair of Structure, Common types of repairs, repair in concrete Structure, repair in under water structure, strength, Guniting shotcrete, underpinning.
5. Understand Strengthening of structure, strengthening methods retrofitting, Jacketing. Health monitoring of Structures, use of sensors Building Instrumentation.

UNIT - I:

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage.

UNIT - II:

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomenon of Desiccation.

UNIT - III:

Inspection and Testing – Symptoms and Diagnosis of Distress - Damage assessment – Non-Destructive Testing (NDT).

UNIT - IV:

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – Shotcrete – Underpinning.

UNIT - V:

Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing. Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

Text Books:

1. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W. H. Ranso, (1981)
2. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B. A. Richardson, (1991).

Reference Books:

1. Concrete Technology by A.R. Shanta Kumar, Oxford University press.
2. Defects and Deterioration in Buildings, E F & N Spon, London.
3. Non-Destructive Evaluation of Concrete Structures by Bungey.

Course Outcomes:

The student will able to:

1. Understand the defects and deterioration of structures and the methods of Inspection, testing, repair methodologies besides strengthening measures, health monitoring of structures.
2. Acquire knowledge about rehabilitation of structures.
3. Acquire knowledge about repair structures.
4. Understand repairs in under water structures.
5. Understand building health monitoring structures.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

WATERSHED MANAGEMENT
(Professional Elective-V)

Course Objectives:

The student will :

1. study Improvement and restoration of soil quality and thus, raising productivity rates.
2. study Supply and securing of clean and sufficient drinking water for the population.
3. study Improvement of infrastructure for storage, transport and agricultural marketing.
4. study Management of watershed for beneficial development activity like domestic water supply, irrigation, hydropower generation etc.
5. study The risk of floods, droughts and landslides.

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 watershed. Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

UNIT–III:

Measures to control erosion: Contour techniques, Ploughing, furrowing, trenching, building, terracing, gully control, rock fill dams, brushwood dam, gabion. Water harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT–IV:

Land management: Land use and land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils. Ecosystem management: Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

UNIT-V:

Planning of watershed management activities, people participation, preparation of action plan, administrative requirements.

Text Books:

1. Watershed Management by JVS Murthy,-New Age International Publishers.
2. Water Resource Engineering by R.A wurbs and WP James,-Prentice Hall Publishers.

References:

1. Land and Water Management by VVN Murthy,- Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India.

Course Outcomes:

The student will able to:

1. Understand different watershed behavior.
2. Interpret runoff data and quality erosion by using various modeling methods.
3. Understand land use classification and impact of land use changes on hydrological cycle parameters.
4. Manage the watershed for beneficial development activity like domestic water supply, irrigation, hydropower generation etc.
5. Minimizing the risk of floods, droughts and landslides.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

SUSTAINABLE MATERIALS AND GREEN BUILDINGS
(Professional Elective-V)

COURSE OBJECTIVES:

The student will :

1. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems along with the established Indian codes and guidelines.
2. Establish a clear understanding of various renewable and non-renewable sources of energy along with their carbon footprints and enumerates the process of performance testing including building modeling and energy analysis.
3. Discuss about the energy efficient green building materials and to have understanding on the cost-effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
4. Give details on the principles of sustainable development in green building design.
5. Describe the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.

UNIT-I

Sources of Energy:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards, pollution with reference to Global scenario, demand and supply in India, Global efforts to reduce carbon emissions, Performance testing. Building modeling- Energy analysis, Metering, Monitoring.

Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon footprint, Environmental issues, Minimizing carbon emission, Energy retrofits and Green Remodels.

UNIT-II

Green Building Materials: Sustainable Materials, Depletion of natural resources for preparation of building materials, renewable and recyclable resources, energy efficient materials, Embodied Energy of Materials. Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (Voc's), Natural

Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

Green Building Planning and Specifications: Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green

Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste and Water management and Recycling by Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar and Daylight, Plumbing and its Effect on Energy Consumption.

UNIT -III

Concept of Green Buildings: Green building - Definition, Features, Necessity, Initiatives, Green buildings in India, Green building Assessment – Green Building Rating Systems (BREEAM, USGBC, LEED, IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits economic benefits, health and social benefits, Major energy efficiency areas for building, Contribution of buildings towards Global Warming. Life cycle cost of buildings, Codes and Certification Programs.

UNIT-IV

Design of Green Buildings; Sustainable sites, Impact of construction on environment, Life cycle assessment, Principles of sustainable development in Building Design, Design on Bioclimatic and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design, Advanced Green building technologies and innovations.

UNIT - V:

Construction of Green Buildings: Energy efficient construction, Practices for thermal efficiency and natural lighting. Ecofriendly water proofing; Energy conservation building codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings, Life-cycle analysis of green buildings, Case studies of rated buildings (new and existing)

Text Books:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPONPress
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Green Buildings (McGraw hill publication): by Gevorkian

Reference Books:

1. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
2. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
3. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.

Course Outcomes:

The student will able to:

1. Know the underlying principles, history, environmental and economic impacts of green building technology and to identify the criteria for rating systems along with the established Indian codes and guidelines.
2. Identify various Renewable and Non-renewable sources of energy along with their carbon footprints and comprehend the techniques and benefits of building performance testing such as building modeling and energy analysis, monitoring and metering.
3. Recognize the energy efficient green building materials and explain the cost effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. Summarize on the building codes, relevant legislation governing the consumption of resources and emission of environmental pollutants by buildings and be familiar with IGBC green building certification procedure.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

PAVEMENT DESIGN

(Professional Elective - VI)

Course Objectives:

The student will :

1. study factors affecting pavement design
2. understand stresses induced in flexible and rigid pavements
3. study properties of aggregate, bitumen and bituminous mixes
4. understand various design methods of flexible and rigid pavements
5. study construction of pavements and their maintenance

UNIT - I:

Introduction to pavement design: Variables considered in Pavement Design-Types of Pavements-Functions of individual Layers-Factors affecting Pavement Design-wheel Loads-Tire Pressure-Contact Pressure-Equivalent standard axle load (EAL) and Equivalent single wheel load (ESWL) Concepts-Traffic Analysis- Average daily traffic (ADT) and Annual average daily traffic (AADT).

UNIT - II:

Stresses in flexible and rigid pavements: Stresses in Flexible Pavements-Layered Systems Concept-One-layer system-Boussinesq's two-layer system-Burmister's theory of Pavement design.

Stresses in Rigid Pavements-Relative stiffness of slab-modulus of Sub Grade Reaction-stresses due to warping-stresses due to loads-stresses due to friction

UNIT - III:

Material characteristics: Aggregate properties and their Importance-Tests on Aggregates- Bitumen Properties-Tests on Bitumen-requirements of bituminous mix Design-Marshall method of mix design.

UNIT - IV:

Flexible and rigid pavement design: Flexible Pavement Design concepts, Flexible Pavement design methods- CBR method, IRC method and American association of state highway and transportation officials (AASHTO) method.

Rigid Pavement design concepts-IRC method of Rigid Pavement Design-Importance of Joints in rigid Pavements-Types of joints - Design of tie bars and dowel bars.

UNIT - V:

Highway construction and maintenance: Construction: Construction of Bituminous Pavements construction of Cement Concrete Roads-Soil Stabilization-use of Geosynthetics.

Highway maintenance –Pavement failures-failures in flexible Pavements-Rigid Pavement Failures-Pavement Evaluation-Benkelman Beam method

Text Books:

1. Highway Engineering-S.K. Khanna & C.J. Justo, Nemchand & Bros.
2. Principles & Practices of Highway Engineering-Dr L.R.Kadiyali & Dr.N.B Lal, Khanna Publishers.

Reference Books:

1. Principles of Pavement design, Yoder.& Witzorac Mathew, John Wiley & Sons Inc.
2. Pavement Analysis and Design, Yang H. Huang, Prentice Hall Inc.
3. IRC codes for Design of Flexible and Rigid Pavements.

Course Outcomes:

The student will able to:

1. understand and analyze the factors considered in pavement design
2. analyze stresses induced in flexible and rigid pavements
3. know properties of aggregate, bitumen and bituminous mixes
4. design flexible and rigid pavement by various methods
5. able to understand the construction of pavements and their maintenance

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

THEORY AND APPLICATIONS OF CEMENT COMPOSITES

(Professional Elective - VI)

Course Objectives:

The student will :

1. study behavior of composite materials
2. understand the materials as per orthotropic and anisotropic behavior.
3. study strain constants using theories applicable to composite materials.
4. study the mechanical properties of cement composites
5. understand structural elements made of cement composites.

UNIT - I:

Introduction: Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

UNIT – II

Mechanical Behaviour: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

UNIT – III

Cement Composites: Types of Cement Composites, Terminology, Constituent Materials And their Properties, Construction Techniques for Fibre Reinforced Concrete – Ferro cement,

SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT - IV:

Mechanical Properties of Cement Composites: Behavior of Ferro cement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT - V:

Application of Cement Composites: FRC andFerrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants.

Analysis and Design of Cement Composite Structural Elements - Ferro cement, SIFCON and Fiber Reinforced Concrete.

Text Books:

1. Mechanics of Composite Materials, Jones R. M,, 2nd Ed., Taylor and Francis, BSP Books, 1998.
2. Ferro cement – Theory and Applications, Pama R. P., IFIC, 1980.
3. New Concrete Materials, Swamy R.N., 1stEd., Blackie, Academic and Professional, Chapman & Hall, 1983.

Reference Books:

1. Mechanics of Composite Materials, Jones R. M,, 2nd Ed., Taylor and Francis, BSP Books, 1998.
2. Ferro cement – Theory and Applications, Pama R. P., IFIC, 1980.
3. New Concrete Materials, Swamy R.N., 1stEd., Blackie, Academic and Professional, Chapman & Hall, 1983.

Course Outcomes:

The student will able to:

1. Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain- stress behaviour.
2. Classify the materials as per orthotropic and anisotropic behaviour.
3. Estimate strain constants using theories applicable to composite materials.
4. Analyze and design structural elements made of cement composites.
5. Analyze and design structural elements made of cement composites Elements

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

INDUSTRIAL WASTE WATER TREATMENT
(Professional Elective - VI)

Course Objectives:

The student will :

1. Study Different sources of pollution and its effects on natural water bodies.
2. Understand Mechanisms and processes used to treat waters that have been contaminated.
3. Study Re-use or disposal of treated waste water.
4. Understand Characteristics and composition of waste water and manufacturing process of industrial materials.
5. Learn Design, operation and maintenance problems of treatment plants.

UNIT - I:

Sources of Pollution-Physical, Chemical, Organic and Biological properties of Industrial Wastes- Differences between industrial and municipal waste waters-Effects of industrial effluents on sewers and Natural Water Bodies.

UNIT - II

Pre and primary treatment –Equalization, Proportioning Neutralization, will Separation by Plantation –Waste Reduction-Volume Reduction – Strength Reduction.

UNIT – III

Waste Treatment Methods – Nitrification and De-nitrification –Phosphorous removal-Heavy metal removal-Membrane Separation Process- Air Stripping and Absorption Processes- Special Treatment Methods –Disposal of Treated Waste Water.

UNIT - IV:

Characteristics and Composition of Waste Water and Manufacturing Processes of industries like Sugar, Characteristics and Composition of industries like Food Processing industries, Steel , Petroleum Refineries.

UNIT - V:

Characteristics and Composition of Industries like Textiles,Tanneries,Atomic Energy Plants and other Mineral Processing industries –Joint Treatment of Raw industrial waste water and Domestic Sewage – Common Effluent Treatment Plants (CETP) - Location, Design, Operation and Maintenance Problems-Economical aspects.

Text Books:

1. Industrial Waste Water Pollution Control by W.Wesley Eckenfelder - McGraw-Hill.
2. Industrial Waste Treatment by Rao & Datta.

Reference Books:

1. Mark J. Hammer Sr., Mark J. Hammer Jr., "Water & Wastewater Technology", Prentice Hall of India.
2. N.L. Nemerrow –Theories and practices of Industrial Waste Engineering.
3. C.G. Gurnham –Principles of Industrial Waste Engineering.

Course Outcomes:

The student will able to:

1. Identify environmental standards that apply to both direct and indirect industrial discharges.
2. Develop an overall treatment strategy for an industrial waste stream. Specify design criteria for physical, chemical, and biological unit operations and processes necessary to treat an industrial wastewater.
3. Estimate capital and operating costs for industrial waste treatment systems
4. Design a component, system or process to meet desired needs and reduce water pollution.
5. Identify the suitability of the use of treated wastewater and to evaluate the optimal method for the management of wastewater

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech. CE	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

EARTH AND ROCK FILL DAMS AND SLOPE STABILITY

(Professional Elective - VI)

Course Objectives:

The student will :

1. Introduce the various seismic design concepts and current practices for earth dams
2. Understand the importance of failure, damages and protection of earth dams.
3. Study slope stability analysis and types of failures.
4. Apply different methods of slope stability.
5. Understand the requirements of rock fill dams.

UNIT - I:

Earth and rock fill dams: general features, selection of site; merits and demerits of the earth and rock fill dams, classification of earth dams, causes of failure, safe design criteria, instrumentation in earth dams: pore pressure measurements, settlement gauges, inclinometers, stress measurements, seismic measurements

UNIT - II:

Failures, damages and protection of earth dams: nature and importance of failure, piping through embankment and foundations, methods of seepage control through embankments and foundations, design criteria for filters, treatments of upstream and downstream of slopes, drainage control fitter design.

UNIT - III:

Slope stability analysis: Types of failure: Failure surface, planar surfaces, Circular surfaces, non-circular surfaces, limit equilibrium methods, total stress analysis versus effective stress analysis, use of hop's pore pressure parameters, short term and long-term stability in slopes, Taylor charts

UNIT - IV:

Methods of slope stability methods: methods of slices, effect of cracks, vertical cuts, Bishops analysis, Bishops and Morgenstern analysis, non-circular failure surfaces, Janb analysis, slider analysis, seismic stability, stabilization of slopes: slopes reinforcement and photosynthetic/soil nailing/micro piles ectasia treatment(cement time/lime treatment), surface protection(Vegetation/shotcrete)

UNIT - V:

Rock fill dams: Requirements of compacted rockfill, shear strength of rockfill mixtures, rockfill embankments, earth core rock fill dams, stability upstream and downstream slopes.

Text Books:

1. Sherard, Woodward, zienski and Clevenger. Earth and earth rock dams. John Wiley sons 1963.
2. Bharat Singh and Sharma-D -Earth and rock fill Dams ,1999.

Reference Books:

1. Sowers, gf and sashay, h.d Earth and rock fill Dams, Williams, R.C and Venice, TS 1965
2. Abramson, L H Lee, S.N Sharma, S. -slope stability and stabilisation methods john Wiley and sons. (2002)

Course Outcomes:

The student will able to:

1. Describe the behaviour of natural and engineered soil/ rock slopes under various weather conditions.
2. Explain the factors that may affect the stability of slopes.
3. Select an appropriate slope stability analysis methods.
4. Access the potential land slide risk of slopes.
5. Analyse shear strength of rock fill dams.

Open Elective – I

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

ENERGY AUDIT AND GREEN BUILDING
(Open Elective-I)

COURSE OBJECTIVES:

The Student Will:

1. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems along with the established Indian codes and guidelines.
2. Establish a clear understanding of various renewable and non-renewable sources of energy along with their carbon footprints and enumerates the process of performance testing including building modeling and energy analysis.
3. Discuss about the energy efficient green building materials and to have understanding on the cost-effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
4. Give details on the principles of sustainable development in green building design.
5. Describe the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.

UNIT-1

Sources of Energy:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards, pollution with reference to Global scenario, demand and supply in India, Global efforts to reduce carbon emissions, Performance testing. Building modeling- Energy analysis, Metering, Monitoring.

Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon footprint, Environmental issues, Minimizing carbon emission, Energy retrofits and Green Remodels.

UNIT-II

Green Building Materials: Sustainable Materials, Depletion of natural resources for preparation of building materials, renewable and recyclable resources, energy efficient materials, Embodied Energy of Materials. Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (Voc's), Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

Green Building Planning and Specifications: Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste and Water management and Recycling by Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar and Daylight, Plumbing and its Effect on Energy Consumption

UNIT -III

Concept of Green Buildings: Green building - Definition, Features, Necessity, Initiatives, Green buildings in India, Green building Assessment – Green Building Rating Systems

(BREEAM, USGBC, LEED, IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits economic benefits, health and social benefits, Major energy efficiency areas for building, Contribution of buildings towards Global Warming. Life cycle cost of buildings, Codes and Certification Programs.

UNIT-IV

Design of Green Buildings; Sustainable sites, Impact of construction on environment, Life cycle assessment, Principles of sustainable development in Building Design, Design on Bioclimatic and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design, Advanced Green building technologies and innovations

UNIT-V

Construction of Green Buildings: Energy efficient construction, Practices for thermal efficiency and natural lighting. Ecofriendly water proofing; Energy conservation building codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings, Life-cycle analysis of green buildings, Case studies of rated buildings (new and existing)

TEXT BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPONPress
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Green Buildings (McGraw hill publication): by Gevorkian

REFERENCES:

1. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
2. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
3. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.

Course Outcomes:

The student will be able to:

1. Know the underlying principles, history, environmental and economic impacts of green building technology and to identify the criteria for rating systems along with the established Indian codes and guidelines.
2. Identify various Renewable and Non-renewable sources of energy along with their carbon footprints and comprehend the techniques and benefits of building performance testing such as building modeling and energy analysis, monitoring and metering.
3. Recognize the energy efficient green building materials and explain the cost effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.

4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. Summarize on the building codes, relevant legislation governing the consumption of resources and emission of environmental pollutants by buildings and be familiar with IGBC green building certification procedure.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-I)

Course Objectives:

The Students will

1. To impart knowledge on Environmental management and environmental impact assessment.
2. To provide a basic understanding of the EIA process as it is used for research, planning, project or program evaluation, monitoring and regulatory enforcement.
3. To outline the impacts on soil, wetlands, flora, fauna, historical structures and the other socioeconomic environment.
4. To introduce students to the legal, economic, social, administrative and technical process preparing and evaluating environmental impact documents.
5. To assess the air and water quality parameters; predict the impacts and their mitigation measures.

UNIT - I:

Basics concepts of EIA: Initial environmental examination, elements of EIA, factors affecting EIA, impact evaluation and analysis, preparation of environmental base map, classification of environmental parameters.

EIA Methodologies: Introduction, Criteria for the selection of EIA methodology, EIA methods, Ad-hoc methods, matrix methods, network method, Environmental Media Quality Index Method (EMQI), Environmental media quality index method, overlay methods, cost/benefit analysis.

UNIT - II:

Impact of developmental activities and land use: Introduction and methodology for the assessment of soil and groundwater, delineation of study area, identification of of activities. Assessment of impact of developmental activities on vegetation and wildlife, environmental impact of deforestation- causes and effects of deforestation.

UNIT - III:

Procurement of relevant soil quality, impact prediction, assessment of impact significance, identification and incorporation of mitigation measures.

EIA of surface water, air and biological environment: Methodology for the assessment of impacts on surface water environment, air pollution sources, generalized approach for assessment of air pollution impact.

UNIT - IV:

Environmental audit and environmental legislation, objectives of environmental audit, types of environmental audit, audit protocel, stages of environmental audit onsite activities, evaluation of audit data and preparation of audit report, post audit activities.

UNIT - V:

Environmental protection Act, The water Act, The air Act (prevention and control of pollution Act), motor act, wild life act. Case studies of preparation of EIAs for various industries.

Text Books:

1. Environmental impact assessment methodologies, by Y.Anjaneyulu, B.S.Publication, Sultan bazaar Hyderabad.
2. Environmental impact assessment, by Alan Gilpin, Cambridge University Press
3. Environmental pollution Control by Dr. H S Bhatia – Galgotia Publications Pvt Ltd, Delhi.
4. Environmental Impact Assessment and Management Publisher, Daya Author: B Hoisetti, A Kumar

Course Outcomes:

The Students will be able to

1. Explain different methodologies for environmental impact prediction and assessment.
2. Understand the elements of environmental impact assessments and processes by which they apply.
3. Carry out scoping and screening of developmental projects for environmental and social assessments.
4. Evaluate EIA reports.
5. Plan EIAs and environmental management plans

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

ENERGY STORAGE SYSTEMS
(OPEN ELECTIVE - I)

Course Objectives:

The Students will

1. To enable the student to understand the need for energy storage, devices and technologies.
2. To understand the emerging needs for Electric Energy storage
3. To analyze the features of various Energy storage Systems
4. To integrate the Energy storage systems with batteries.
5. To understand the behavior of different configurations of Energy storage Systems

UNIT – I: Electrical Energy Storage Technologies
Characteristics of electricity - The roles of Electric Energy Storage - High generation cost during peak- demand periods - Need for continuous and flexible supply - Long distance between generation and consumption- Congestion in power grids - Transmission by cable

UNIT – II: Needs For Electrical Energy Storage
Emerging needs for Electric Energy Storage – Utilization of more renewable energy - less fossil fuel - Smart Grid uses - The roles of electrical energy storage technologies - The roles from the viewpoint of a utility, from the viewpoint of consumers, from the viewpoint of generators of renewable energy.

UNIT – III: Features of Energy Storage Systems
Classification of Electric Energy Storage systems - Mechanical storage systems - Pumped hydro storage (PHS) - Compressed air energy storage (CAES) - Flywheel energy storage (FES) - Electrochemical storage systems - Secondary batteries - Flow batteries - Chemical energy storage, -Hydrogen (H2) - Synthetic natural gas (SNG).

UNIT – IV: Types of Electrical Energy Storage Systems
Electrical storage systems - Double-layer capacitors (DLC) - Superconducting magnetic energy storage (SMES) - Thermal storage systems - Standards for Electric Energy Storage - Technical comparison of EES technologies.

UNIT – V: Applications
Present status of applications - Utility use (conventional power generation, grid operation & service) - Consumer use (uninterruptable power supply for large consumers) - New trends in applications - Renewable energy generation - Smart Grid - Smart Micro grid, Smart House - Electric vehicles - Management and control hierarchy of storage systems - Internal configuration of battery storage systems - External connection of EES systems - Aggregating EES systems and distributed generation (Virtual Power Plant) - Battery SCADA - Aggregation of many dispersed batteries.

TEXT BOOKS:

1. Energy Storage Benefits and Market Analysis' by James M. Eyer, Joseph J. Iannucci and Garth P. Corey.
2. The Electrical Energy Storage by IEC Market Strategy Board

REFERENCE BOOKS:

1. Jim Eyer, Garth Corey: Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Jim Eyer, Garth Corey, Sandia National Laboratories, Feb 2010.

Course Outcomes:

The Students will be able to

1. Understand the concepts of energy storage devices
2. Analyze the characteristics of energy from various sources and need for storage
3. Classify various types of energy storage and various devices used for the purpose
4. Apply the same concepts to real time problems.
5. Differentiate the features of Energy Storage Systems.

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B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

ENERGY AUDITING, CONSERVATION AND MANAGEMENT
(OPEN ELECTIVE - I)

Course Objectives:
The Students will

1. To understand the need of Energy Audit and Energy Conservation Schemes.
2. To know the necessity of conservation of energy.
3. To generalize the methods of energy management.
4. To illustrate the factors to increase the efficiency of electrical equipment.
5. To detect the benefits of carrying out energy audits.

UNIT-I:Basic Principles of Energy Audit: Energy Audit-
Definitions, Concept, Types of audit, Energy index, Cost index, Pie charts, Sankeydiagrams, Load profiles, Energy conservation schemes- Energy audit of industries- Energy savingpotential, Building energy audit

UNIT-II:Energy Management
Principles of energy management, Organizing energy management program, Initiating, Planning,Controlling, Promoting, Monitoring, Reporting, Energy manger, 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, Pf with non linear loads, Effect ofharmonics on power factor, Power factor motor controllers - Good lighting system design andpractice, Lighting control , Lighting energy audit - Energy instruments-Wattmeter, Data loggers,Thermocouples, Pyrometers,Lux 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 worthmethod, Replacement analysis, Life cycle costing analysis- Energy efficient motors-Calculation ofsimple payback method, Net present worth method- Power factor correction, Lighting -Applications of life cycle costing analysis, Return on investment.

TEXT BOOKS:

1. W.R. Murphy & G. Mckay, “Energy Management”, Butter worth, Heinemann Publications, Second Edition, 2009.
2. Paul o’ Callaghan, “Energy Management”, Tata Mc-Graw Hill Book Company- First Edition, 1998.
3. W.C.Turner, “Energy Management Hand Book”, CRC Press, First Edition, 2004.

REFERENCES:

1. John .C. Andreas, “Energy Efficient Electric Motors”, CRC Press, Third Edition, 1992.
2. Great Britain, “Energy Management and Good Lighting Practice: Fuel Efficiency- Booklet Volume 12-EEO, 1989.

Course Outcomes

The Students will be able to

1. Analyze energy audit of industries.
2. Predict management of energy systems.
3. Sequence the methods of improving efficiency of electric motor.
4. Analyze the power factor and to design a good illumination system.
5. Determine pay back periods for energy saving equipment.

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UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

AUTOMOTIVE TECHNOLOGY

(OPEN ELECTIVE - I)

Course Objectives:
The Student will

1. Provide an overview on automobile engineering
2. Learn different fuels and advanced control systems
3. Study the concepts and drive train configurations of electric and hybrid electric vehicles
4. Understand use of intelligent vehicle technologies like navigation in automobiles
5. Provide awareness of safety security and regulations

UNIT-I

Structural systems of automobile– chassis and body, power unit, transmission system, Steering System, Suspension System, Braking System.

Other systems of automobile- Ignition systems, Fuel System, Cooling System, Electrical System.

UNIT –II

Fuels: Types of Fuels-Gasoline fuels, CNG, Biofuels, advantages and limitations.

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.

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.

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-IV

Telematics Systems: Global positioning system, geographical information systems, navigation system.

Comfort Systems: 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.

Emission and noise control regulations- Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

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.
3. Kripal Singh, "Automobile Engineering", Standard Publishers Distributors, Vol. 1, & Vol. 2, 2007

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.

Course outcomes:

The student will be able to:

1. Outline the overview of automobile engineering
2. Identify the different fuels and advanced control systems
3. Develop the concepts and drive train configurations of electric and hybrid electric vehicles
4. Apply the use of intelligent vehicle technologies like navigation in automobiles
5. Aware of safety security and regulations

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UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

MATLAB PROGRAMING LANGUAGE

(Open Elective I)

Course Objectives:

The Student will

1. understand the basic principles of programming and of implementing mathematical concepts in MATLAB.
2. write numerical algorithms with MATLAB Programming language.
3. evaluate the computational results using graphical representations.
4. gain knowledge about advanced MATLAB Programming methods.
5. gain knowledge on Simulink used in MATLAB.

Unit-I : **Introduction To MATLAB**

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).

Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

Unit-II: **Data Flow in MATLAB**

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

Unit-III: MATLAB Programming

Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Unit-IV: **MATLAB Advanced**

Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface).

Matlab- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Unit-V: SIMULINK

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course Outcomes:

The student will be able to

1. translate mathematical methods to MATLAB code.
2. generalize results and represent data visually.
3. apply computer methods for solving a wide range of engineering problems.
4. utilize computer skills to enhance learning and performance in other engineering and science courses.
5. acquire knowledge of Advanced Matlab programming methods and Simulink.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

PRINCIPLES OF COMMUNICATIONS

(Open Elective I)

Course Objectives:

The Students will

1. provide the basic concepts of communication systems.
2. gain knowledge about Amplitude modulation and Angle Modulation.
3. study sampling and pulse modulation methods.
4. study and compare different binary digital modulation techniques.
5. understand the basic concepts of information theory.

UNIT – I: Introduction

Block diagram of Electrical communication system, Radio communication: Types of communications, Analog, pulse and digital types of signals, Noise – Types of noise, sources of noise, calculation of noise in Linear systems and noise figure.

UNIT – II: Amplitude Modulation

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

UNIT – III: Pulse Modulations

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

UNIT – IV: Digital Communication

Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison. Digital Modulation: ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

UNIT – V: Information Theory

Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding Error control coding: Introduction, Error detection and correction codes, block codes, convolution codes.

TEXT BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCE BOOKS:

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

Course Outcomes:

The Students will be able to

1. illustrate the main concepts of analogue and digital communication systems.
2. analyze and design an AM and FM modulator/demodulator.
3. explain, discuss, and compare different binary digital modulation techniques.
4. distinguish different types of noise and explain the effects of noise on communication system.
5. use the basic concepts of information theory.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year – II Semester	**3**	**0-0-0**	**3**

DATA BASE MANAGEMENT SYSTEMS

(Open Elective-I**)**

Course objectives:

The Students will:

1. Understanding of the architecture and functioning of database management systems as well as associated tools and techniques.
2. Understand and apply the principles of data modeling using entity relationship and develop a good database design.
3. Understand the use of structured query language (SQL) and its syntax.
4. Apply normalization techniques to normalize a database.
5. Understand the need of database processing and learn techniques for controlling the Consequences of concurrent data access.

UNIT - I:

Introduction to Data base management systems- Data base System Applications, data base System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor

ER diagrams - Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model

UNIT - II:

Introduction to the Relational Model- Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra- Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

UNIT - III:

Form of Basic SQL Query- Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity‟s – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

Schema refinement- Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

UNIT - IV:

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability– Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.

Recovery and Atomicity- Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

UNIT - V:

Data on External Storage- File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

Advanced Database Management System- Introduction to Distributed Database- Reference Architecture, fragmentation, Allocation, Joins

TEXT BOOKS:

1. Data Base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

REFERENCE BOOKS:

1. Data base Systems design**,** Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems**,** Elmasri Navrate Pearson Education
3. Introduction to Database Systems**,** C.J.Date Pearson Education

Course outcomes:

The Students will be able to:

1. Describe basic concepts of database system.
2. Design a data model and schemas in RDBMS.
3. Use RDBMS for developing industry applications.
4. Be competent in use of structured query language sql.
5. Analyze functional dependencies for designing a robust database

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UGC AUTONOMOUS

	L	T-P-D	C
B.Tech.			
III Year – II Semester	**3**	**0-0-0**	**3**

OPERATING SYSTEMS

(Open Elective-I)

Course objectives:
The Students will :

1. Know the purpose and different types of operating systems.
2. Describe process management and CPU scheduling algorithms.
3. Understand file and directory structures.
4. Understand deadlock prevention and avoidance
5. Explain various memory management and page replacement algorithms.

UNIT - I:

Operating System Overview- Overview of Computer Operating Systems, Operating System Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating System Structures, Operating System Services and Systems Calls, Operating Systems Generation.

Process Management- Process Concepts, Threads, Scheduling-Criteria, Algorithms Evaluation, Thread Scheduling.

UNIT - II:

Concurrency- Process Synchronization, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples, Atomic Transactions.

Memory Management- Swapping, Contiguous Memory Allocation, Paging, Page-Table Structure, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Frames Allocation, Thrashing.

UNIT - III:

Principles of Deadlock- System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Introduction to File System- File System Interface, File Concepts, Access Methods and Directory Structure, File System Mounting, File Sharing and Protection.

UNIT - IV:

File System Implementation- File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance. Case Studies: UNIX, Linux and Windows.

Mass Storage Overview- Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Swap-Space Management, RAID Structure, Stable-Storage Implementation, Tertiary Storage Structure.

UNIT - V:

Protection and Security- Goals of Protection, Principles of Protection, Domain of Protection Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection. Security Problem, Program Threats, System and Network Threats Cryptography as a Security Tool, User Authentication, Computer-Security Classifications.

Advanced Operating Systems- Distributed Operating Systems, Multi-Processor Operating Systems, Real-Time Operating Systems and Mobile Operating Systems.

TEXT BOOKS:

1. Operating System Concepts-Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th Edition, John Wiley.
2. Operating Systems- a Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH.

REFERENCE BOOKS:

1. Principles of Operating Systems-Naresh Chauhan, Oxford Higher Education.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems-Andrew S Tanenbaum, 2nd Edition Pearson, PHI.

Course outcomes:

The Students will be able to:

1. Demonstrate the different operating systems.
2. Apply different CPU scheduling algorithms.
3. Analyze different directory structures.
4. Use deadlock prevention and avoidance algorithms
5. Illustrates the behavior of semaphores and monitors.

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UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

INTRODUCTION TO DATA STRUCTURES
(Open Elective-I)

Course Objectives:
The Students will :

1. Describe the appropriate data structure like linked list to solve problems in real world.
2. Explain the implementation of linear and non linear data structure mechanisms.
3. Discuss the various techniques of tree data structure.
4. Describe graph data structure.
5. Explain several searching and sorting Techniques.

UNIT - I:
Data Structures-Introduction to Data Structures, abstract data types, Introduction to Linear and Non Linear data structures.Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list. Circular linked list implementation, Doubly linked list implementation, insertion, deletion and searching operations. Applications of linked lists.

UNIT - II:
Stacks-Operations, array and linked representations of stacks, stack applications-infix to postfix conversion, postfix expression evaluation. Queues-operations, array and linked representations. Circular Queue operations, Dequeue, applications of queue.

UNIT - III:
Trees – Definition, Binary tree representation, Binary search tree, binary Tree traversals.
AVL tree – operations, Red Black tree.

UNIT - IV:
Graphs-Terminology, sequential and linked representation.
Graph traversals: Depth First Search & Breadth First Search implementation. Spanning trees, Prims and Kruskals method.

UNIT - V:
Searching – Big O Notation, Linear Search and Binary Search.
Sorting-Bubble sort, Insertion Sort, Selection Sort, Merge Sort and Quick sort.

TEXT BOOKS:

1. Data Structures Using C, Reema Thareja, Oxford University Press, 2011 Learning.
2. Introduction to Algorithms, TH Cormen, PHI

REFERENCES BOOKS:

1. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
2. Design methods and analysis of Algorithms, SK Basu, PHI.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

Course Outcomes:

The Students will be able to:

1. Analyze and apply appropriate data structures for solving computing problems.
2. Use linear and non-linear data structures like stacks, queues, trees and graphs.
3. Implement different types of tree data structures.
4. Implement the concepts of graph data structures.
5. Apply the basic searching, sorting Techniques.

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UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

INTRODUCTION TO WEB DESIGN
(Open Elective-I)

Course Objectives

The Students will :

1. Know regarding internet related technologies.
2. Understanding of the current industry support for web technologies.
3. Explain the basic concepts of CSS.
4. Visualize the basic concepts of PHP.
5. Understanding PHP functions and Methods

UNIT-I

Basics in Web Design: Brief History of Internet, What is World Wide Web, Why create a web site, Web Standards, Audience requirement.

Web Design Principles: Basic principles involved in developing a web site, Planning process , Five Golden rules of web designing, Designing navigation bar ,Page design, Home Page Layout, Design Concept.

UNIT-II

Introduction to HTML: What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags, HTML Tables, HTML Forms.

Elements of HTML: Introduction to elements of HTML, working with Text Working with Lists, Tables and Frames, working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

UNIT-III

Introduction to Cascading Style Sheets: Concept of CSS, Creating Style Sheet and types of CSS, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties).

CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Colors, Creating page Layout and Site Designs.

UNIT-IV

Introduction to PHP: Downloading, installing, configuring PHP, The anatomy of a PHP Page. Basic Security Guidelines, Variables, Data Types, Operators and Expressions, Constants, Flow Control Functions; Switching Flow, Loops.

Code Blocks and Browser Output, Objects, Strings Processing, Form processing, Connecting to database, using cookies, dynamic contents.

UNIT-V

Introduction to Web Publishing or Hosting : Creating the Web Site, Saving the site, Working on the web site. Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

TEXT BOOKS:

1. Dietel and Dietel : —Internet and World Wide Web - How to Program‖, 5th Edition, PHI/Pearson Education, 2011
2. Web Technologies: HTML,CSS, XML,Php Black Book.

REFERENCE BOOKS:

1. Chris Bates, —Web Programming, building internet applications‖, 2ndEdition, WILEY,
   Dreamtech, 2008.
2. HTML 5 in simple steps Kogent Learning Solutions Inc, Dreamtech Press
3. Beginning CSS: Cascading Style Sheets for Web Design Ian Pouncey, ichard York Wiley India

Course Outcomes:

The Students will be able to:

1. Develop the application of the HTML for document structure.
2. Develop the skills in analyzing the usable of a website.
3. Create dynamic webpage, using PHP.
4. Using PHP to manipulate Files.
5. Develop the concept of web publishing

J. B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
III Year - II Semester	**3**	**0-0-0**	**3**

INTERNET OF THINGS
(Open Elective – I)

Course Objectives:
The Students will:

1. Understand the basic building blocks of IoT
2. Analyze the difference between M2M and IoT
3. Introduction of Basics of IoT System Management
4. Extend the knowledge in WSN an IoT enabling technology.
5. Acquire knowledge about challenges of IoT and Identify the specific application of IoT.

UNIT–I:
Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates.

UNIT–II:
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

IoT and M2M –Difference between IoT and M2M, SDN, NFV, Difference between SDN and NFV.

UNIT–III:
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

UNIT–IV:
Network & Communication aspects
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT-V:
Challenges in IoT
Design challenges, Development challenges, Security challenges, other challenges

Domain specific applications of IoT
Home automation, Industry applications, Surveillance applications, Other IoT applications

Text Books:

1. Internet of Things – A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Course Outcomes:

The Students will be able to:

1. Analyze the physical and logical design of IoT.
2. Understand the characteristic and communication models of IoT and Compare and contrast M2M and IoT, SDN and NFV
3. Understand the Basics IoT management System
4. Understand the wireless medium issues, MAC protocols, routing protocols
5. Comprehend important challenges of IoT related to design, development and security and Learn about specific application of IoT.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B. Tech.	**L**	**T-P-D**	**C**
III Year II sem	**3**	**0-0-0**	**3**

INTRODUCTION TO MINING TECHNOLOGY
(OPEN ELECTIVE - I)

COURSE OBJECTIVES:

The Student will:

1. introduce about distribution of mineral deposits in India
2. acquaint with different stages of mining process
3. get idea about Drilling and its machinery
4. get idea about Explosives and blasting in mines
5. know about shaft sinking methods, precaution & lining during shaft sinking

UNIT-I:

Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology

UNIT –II:

Stages in the life of the mine - prospecting, exploration, development, exploitation, and reclamation. Access to mineral deposit- selection, location, size and shape (incline, shaft and Adit), brief overview of underground and surface mining methods.

UNIT-III:

Drilling: Types of drills, drilling methods, electric, pneumatic and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

UNIT-IV:

Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

UNIT –V:

Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

TEXTBOOKS:

1. R. P. Pal, Rock blasting effect and operation, A. A. Balkema, 1st Ed, 2005.
2. D. J. Deshmukh, Elements of mining technology, Vol. 1, Central techno, 7th Ed, 2001.

REFERENCE BOOKS:

1. 1. C. P. Chugh, Drilling technology handbook, Oxford and IBH, 1st Ed, 1977.
2. 2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

COURSE OUTCOMES:

The student will be able to:

1. Learn about distribution of mineral deposits in India
2. Learn about stages on mining process
3. Learn about drilling and its machinery
4. Understand about explosives, blasting and blasting mechanism
5. Understand about shaft sinking methods, precautions and lining of shafts

Open Elective - II

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

WASTE MANAGEMENT
(Open Elective-II)

Course Objectives:

The Students will:

1. provide in depth knowledge about handling of solid waste from cradle to grave.
2. It also provides the knowledge of designing and constructing the solid waste treatment system.
3. Provides the residue disposed of in an environmentally sound way.
4. Provides students depth knowledge in waste minimization.
5. provides knowledge in design and maintenance of different units

UNIT - I:

Introduction

Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes Municipal waste, industrial waste, plastic waste, electronic waste, bio-medical waste and hazardous waste - Characteristics of Solid Wastes: Physical, chemical and biological characteristics-Problems due to improper disposal of solid waste.

UNIT II:

Functional Elements of Solid Waste Management

Waste generation and handling at source-onsite storage-Collection of solid wastes Collection methods and services-storage of solid waste- guidelines for collection route layout.

UNIT - III: Transfer and Transport of Wastes

Transfer station-types of vehicles used for transportation of solid waste-Processing and segregation of the solid waste- various methods of material segregation.

Processing and Transformation of Solid Wastes

Recycling and recovery principles of waste management- Composting: definition methods of composting-advantages of composting- Incineration: definition methods of incineration advantages and disadvantages of incineration.

UNIT - IV: Treatment and Disposal of Solid Waste

Volume reduction, Open dumping, land filling techniques, Landfills: classification Design and Operation of landfills, Land Farming, Deep well injection.

UNIT - V: Waste Minimization

Introduction to waste minimization, waste minimization techniques-5R (refuse, reduce, reuse, recover, recycle), municipal waste minimization, industrial waste minimization.

Text Books:

1. Solid and hazardous waste management by M.N.Rao and Razia sultana, BS publications
2. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

Reference Books:

1. Integrated Solid Waste Management by Tchobanognous.
2. Environmental engineering by Y.Anjaneyulu, B.S publication.
3. Environmental Pollution Control Engineering by C.S. Rao; Wiley Eastern Ltd., New Delhi.
4. Environmental engineering by Gerad Kiley, Tata Mc Graw Hill

Course Outcomes:

Students will be able to

1. Understand the components of solid waste management and the laws governing it
2. Acquires the knowledge of design, operation and maintenance of landfills, incinerators and composting units.
3. Reducing the amount and toxicity of material entering the waste flow (minimization)
4. Reusing as much material as practicable;
5. Recycling the waste that cannot be used and recovery of resources

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

ESTIMATION, QUANTITY SURVEY & VALUATION
(Open Elective-II)

Course Objective

The Students will:

1. Understand how to estimate the quantities of work, develop the bill of quantities and arrive at the Cost of civil engineering Project
2. Estimate the detailed quantities of various items of work and their rates in building projects.
3. Estimate the quantities of works and evaluate cost of project.
4. Understand and apply the concept of Valuation for Properties
5. Understand, Apply and Create the Tender and Contract document.

UNIT - I:

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating

UNIT II:

Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedules

UNIT - III:

Earthwork for roads and canals.

UNIT - IV:

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

UNIT - V:

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

Text Books:

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

Reference Books:

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

Course Outcomes:

The Students will be able to

1. Prepare detailed and abstract estimates for buildings, roads and canals
2. Prepare valuation of buildings.
3. Interpret Contract document of for civil engineering works
4. To study on Valuation of buildings, Standard specifications for different items building construction
5. Formulate construction scheduling and project Management methods.

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

ELECTRIC AND HYBRID VEHICLES
(OPEN ELECTIVE - II)

Course Objectives:
The Student will

1. understand working of different configurations of electric vehicles, and its components
2. understand hybrid vehicle configuration and performance analysis.
3. Introduce the transmission configuration and its analyze the characteristics
4. analyze the different speed control techniques
5. design and evaluate the sizing of components in hybrid vehicles.

UNIT-I : ELECTRIC VEHICLES
Introduction to Electric Vehicles – History of Electric and Hybrid Vehicles - Components - vehicle mechanics - Roadway fundamentals - vehicle kinetics - Dynamics of vehicle motion - Propulsion System Design.

UNIT-II : BATTERIES
Basics - Types - Parameters - Capacity - Discharge rate - State of charge - state of Discharge - Depth of Discharge - Technical characteristics - Battery pack Design - Properties of Batteries.
Fuel Cells - Types - Fuel Cell Electric Vehicle.

UNIT-III: DC & AC ELECTRICAL MACHINES
(Speed control Techniques)
Motor and Engine rating – Requirements – Speed control techniques of DC machines in Electric Vehicles – Speed control techniques of Three phase A/c machines -Induction machines- Permanent Magnet Machines, Switched Reluctance Machines.

UNIT-IV: ELECTRIC VEHICLE DRIVE TRAIN
Transmission configuration - Components - gears, differential, clutch, brakes regenerative braking- motor sizing- Gear Ratio – Torque speed characteristics - EV Motor Sizing Initial Acceleration - Rated Vehicle Velocity - Maximum Velocity - Maximum Gradability.

UNIT-V: HYBRID ELECTRIC VEHICLES
Types of Hybrid Vehicles - series and parallel Hybrid Electric Vehicles, series- parallel configuration - Internal Combustion Engines - Reciprocating Engines - Practical and Air-Standard Cycles - Air-Standard Otto Cycle - Air-Standard Diesel Cycle - Example IC Engines in HEVs - Design - Drive train - sizing of components.

TEXT BOOKS:

1. Iqbal Hussain, “Electric & Hybrid Vehicles - Design Fundamentals”, Second Edition, CRC Press, 2011
2. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.

REFERENCES:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals”, CRC Press, 2010.

2. Sandeep Dhameja, “Electric Vehicle Battery Systems”, Newnes, 2001

Course outcomes:

The student will be able to:

1. Understand the working of different configurations of electric vehicles, hybrid vehicles and its components.
2. Apply the basic concepts of batteries and Motors in the design of Electric and Hybrid Vehicles.
3. Differentiate the modes of operation of Hybrid Vehicles.
4. Analyze the performance of hybrid vehicles.
5. Design the basic parameters of Electric and Hybrid Electric Vehicles.

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

MATERIALS IN ELECTRICAL SYSTEMS
(OPEN ELECTIVE - II)

Course Objectives:
The Student will

1. understand the importance of various materials used in electrical engineering
2. obtain a qualitative analysis of their behavior and applications.
3. analyze the process used in manufacturing of integrated circuits
4. perform the calculations on cables on various aspects
5. evaluate the characteristics of HV and EHV cable.

UNIT-I : Materials
Conductors-free electron theory and electron scattering Di electrics Polarization, solid, liquid and gas dielectrics Insulators-Classification, Application in electric devices.

UNIT-II : Magnetic materials
Classification based on orientation of magnetic dipoles, Optoelectronic materials, Semiconductors-simple and compound, Refractory Materials. Solders and contacts, Super conductivity and super conducting materials.

UNIT-III: Components
Resistors and Capacitors. Display units:-LED, LCD and Monitors. Effect of environment on components.

UNIT-IV: Processes
Basic processes used in the manufacture of integrated circuits such as Epitaxy, masking, photolithography, diffusion, oxidation, Etching, metallization, Scribing, wire bonding and Encapsulation. Induction and Dielectric heating. Electron beam welding and cutting..

UNIT-V: Cables
Calculations of capacity of cables, charging current, stress, grading, heating of cables, Construction and characteristics of HV & EHV cable

TEXT BOOKS:

1. S.O. Kasap, Principles of Electrical Engineering Materials," MGH.
2. Mahajan, Principles of growth and processing of semiconductors," MGH.
3. Decker, Electrical Engineering Materials," PHI.

REFERENCES:

1. Dhir, Electronic components and Materials Principles manufacturing and Maintenance," TMH.
2. Allison, „Electronic Engineering Materials and Devices," TMH.
3. Ruska N Scot, Microelectronic processing – an introduction to the manufacture of integrated circuits," MGH.

Course outcomes:

The student will be able to:

1. Understand various types of materials and their properties in various conditions.
2. Evaluate magnetic materials and their behavior.
3. Evaluate semiconductor materials and technologies.
4. Acquire Knowledge on Materials used in electrical engineering and applications.
5. Design the components and observe the effect of these components on environment.

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B. Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

FUNDAMENTALS OF OPERATIONS RESEARCH

Open Elective - II

Course Objectives:
The Student will

1. Get the basic knowledge of formulation, Solve the LPP models using graphical and mathematical applications.
2. Identify the optimal way of developing various transport models, Choose the appropriate assignment of men and machinery to perform various tasks
3. Understand the optimal sequencing for a machine or for a job when there are m machines and n jobs; understand the concept of replacing machine at the appropriate
4. Understand the strategies in the business environment and decide the strategy to get maximum value of the game. Understand the inventory in an industry or business organization and its importance.
5. Define waiting time at any point to get the desired service for a single channel service and multi-channel service.

UNIT – I Introduction - Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II

Transportation problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem

UNIT – III

Sequencing – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely-Group Replacement.

UNIT – IV

Theory of games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

UNIT – V

Waiting lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Simulation: Definition – types of simulation models- applications, advantages and disadvantage. Brief introduction of simulation languages – inventory and queuing problems using random numbers

TEXT BOOKS:

1. Operation Research/J. K. Sharma /Mac Milan.
2. Introduction to O.R/Hillier & Libermann (TMH).

REFERENCES:

1. Operations Research: Methods and Problems / Maurice Saseini, Arhur Yaspanand Lawrence Friedman
2. Operations Research /A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi / Pearson Education
3. Operations Research / Wagner/ PHI Publications.
4. Operations Research / ACS Kumar/Yesdee

Course outcomes:

The student will be able to:

1. Allocate and distribute material, machine, man hour, money and number of men in any service and manufacturing industry.
2. Allot optimum quantities to various destinations from different sources with minimum cost. Assign the required men and machines to perform the given tasks.
3. Determine the number of items to be produced and the product mix. Schedule and sequence production runs by proper allocation of machines and men to get maximum gain or profit.
4. Compute the economic order quantity in different scenario to minimize inventory cost. Determine the quantity to be ordered when there are quantity discounts on the price.
5. Determine the number of service channels required to keep minimum waiting time at optimum service cost. Determine the shortest path for a given route and to solve the inventory and capital management problems.

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

(F41OF) Digital Systems Using VHDL

(Open Elective -II)

COURSE OBJECTIVES

The Students will:

1. Learn how a Hardware Description Language (HDL) is used to describe and implement hardware.
2. Learn how to simulate and test that hardware and optimise their designs.
3. Learn in-depth study of combinatorial and sequential hardware systems and the use of finite state machines in the design of sequential systems.
4. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
5. To implement combinational and sequential circuits using VHDL.

UNIT I

Review of Logic Design Fundamentals: Combinational Logic, Boolean Algebra and Algebraic Simplification, Karnaugh maps, Designing with NAND and NOR Gates, Hazards in Combinational Networks, Flip-flops and latches, Mealy Sequential Network, Equivalent States and reduction of State Tables, Sequential Network Timing, Setup and Hold Times, Synchronous Design, Tristate Logic and Buses.

UNIT II

Introduction to VHDL: VHDL Description of Combinational Networks, Modeling Flip-flops using VHDL Process, VHDL Models for a Multiplexer, Compilation and Simulation of VHDL Code, Modeling a Sequential Machine, Variables, Signals and Constants, Arrays, operators, Functions, Procedures, Packages and Libraries, VHDL Model for a 74163 Counter.

UNIT III

Designing with Programmable Logic Devices: Read-Only Memories, Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs) , Other Sequential Programmable Logic devices(PLDs),Design of a Keypad Scanner.

Design of Networks for Arithmetic Operations: Design of a Serial Adder with Accumulator, State Graphs for Control Networks, Design of a Binary Multiplier, Multiplication of Signed Binary Numbers, Design of a Binary Divider.

UNIT IV

Digital Design with SM Charts: State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative Realizations for SM Charts using Microprogramming, Linked State Machine.

Designing with Programmable gate Arrays and Complex Programmable Logic Devices: Xilinx 3000 Series FPGAs, Designing with FPGAs, Xilinx 4000 Series FPGAs, Using a One-Hot

State Assignment, Altera Complex Programmable Logic Devices(CPLDs),Altera FLEX 10K Series CPLDs.

UNIT V

Floating-Point Arithmetic: Representation of Floating-Point Numbers, Floating-point Multiplication, Other Floating-Point Operations.

Hardware Testing and Design for Testability: Testing Combinational Logic, Testing Sequential Logic, Scan Testing, Boundary Scan, Build-In Self-Test**.**

TEXTBOOKS:

1. Charles H,Roth ,“Digital system design using VHDL” , 2nd Edition, PWS publishing co.
2. Zainalabedin Navabi, “VHDL analysis and modeling of digital systems”,2nd Edition, MGH, 2004.

REFERENCE BOOKS:

1. Stphen Brown, "Fundamental of Digital logic with VHDL Design", Tata McGraw Hill, 2008.
2. J.Bhaskar ,“A VHDL primer”,3rd edition 2004, Prentice Hall of India Limited.
3. Michael D.Ciletti, “Advanced Digital design with Verilog HDL”, 2nd Edition, PHI Ltd, 2005.

COURSE OUTCOMES

The Students will be able to:

1. develop a digital logic and apply it to solve real life problems.
2. practice combinational and sequential digital circuits using different styles of modeling of VHDL.
3. analyze, design and implement sequential logic circuits.
4. employ digital system design using PLD.
5. simulate and implement combinational and sequential circuits using VHDL systems.

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

(F41OG) IC TECHNOLOGY

(Open Elective -II)

COURSE OBJECTIVES:

The Student will

1. understand the basic building blocks of linear and digital integrated circuits.
2. Familiarize with op-amp applications of active filters and oscillators.
3. gain the theory about applications of analog multipliers and PLL.
4. demonstrate the working of ADC and DAC.
5. understand few special functionalities of combinational and sequential integrated circuits.

UNIT I: INTEGRATED CIRCUITS

Classification, Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics, 741 Op-Amp and its Features, Concept of Virtual Ground ,Modes of operation-inverting, non-inverting, differential.

UNIT II: OP-AMP APPLICATIONS

Basic Applications of Op-Amp, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converters, Sample & Hold Circuits, Differentiators and Integrators, Comparators, Schmitt Trigger, Multivibrators.

UNIT III: ACTIVE FILTERS & OSCILLATORS

Introduction, First Order and Second Order Low Pass, High Pass and Band Pass Filters, Active Band Reject and All Pass Filters.

Principle of Operation and Types of Oscillators – RC, Wien Bridge and quadrature type. Waveform Generators – Triangular, Saw Tooth, Square Wave.

UNIT IV: TIMERS & PHASE LOCKED LOOPS

Introduction to 555 Timer, Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger, PLL - Introduction, Block Schematic, Principles and Description of Individual Blocks of 565, VCO. Introduction to Voltage Regulators, Features of 723 Regulator.

UNIT V: D-A AND A- D CONVERTERS

Introduction, Basic DAC Techniques - Weighted Resistor Type, R-2R Ladder Type, Inverted R-2R Type. Different types of ADCs – Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type. DAC and ADC Specifications.

TEXT BOOKS:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 3rd Ed., 2008.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.

REFERENCE BOOKS:

1. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.
2. Op-Amps and Linear Integrated Circuits – Concepts and Applications by James M.Fiore, Cengage/ Jaico, 2/e, 2009.
3. Operational Amplifiers and Liner Integrated Circuits by K.Lal Kishore – Pearson, 2008.

COURSE OUTCOMES:

The Student will be able to:

1. model operational amplifiers with linear and digital integrated circuits.
2. design op amp as active filters and oscillators.
3. reconstruct and relate circuits using operational amplifiers for various applications.
4. examine OP Amp to work as a converter.
5. design special function integrated circuits.

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B.Tech.	**L**	**T-P-D**	**C**
IV Year – I Semester	**3**	**0-0-0**	**3**

COMPUTER NETWORKS

(Open Elective-II)

Course objectives:
The Students will :

1. Recognize various layering approaches for networking and understand the functionalities of physical layer.
2. Identify the data link layer protocols, multi access protocols, Ethernet technologies and various internetworking devices.
3. Examine design issues of network layer, services provided to above layer and routing, and congestion control protocols.
4. Examine IP protocol, addressing, various protocols like CIDR, ICMP,ARP and RARP of internet Layer and examination of transport layer services.
5. Examine Transport layer protocols like TCP, UDP, RPC and various congestion controlling mechanisms, including application layer services, protocols like HTTP, FTP, E-Mail etc.

UNIT - I:
Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.
Physical Layer: Guided transmission media, wireless transmission media.

UNIT - II:
Data Link Layer: design issues, Framing, Error Detection and Error Correction, Block Coding, Hamming Distance, CRC, Flow control and error Control.
Protocols: Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols..
Connecting Devices: Repeaters, Hubs, Switches, Gateways and **Bridges -** Learning and Spanning tree bridges.
Multi Access protocols- Random access - . ALOHA, CSMA, CSMA/CD and CSMA/CA, Controlled access, Channelization. Ethernet IEEE 802.3, IEEE 802.5, IEEE 802.11

UNIT - III:
Network Layer: Network layer design issues, Store and forward packet switching, connection less and connection oriented network services.
Internetworking: Protocols-IPV4 and IPV6**,** Logical Addressing-IPV4, IPV6, Tunnelling and Packet Fragmentation.
Address Mapping: ARP, RARP, DHCP, ICMP and IGMP.

Routing Algorithms: Shortest Path Finding and Distance Vector Routing Algorithms.

UNIT - IV:
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), The TCP Connection Establishment, The TCP Connection Release, Crash recovery, The TCP sliding window, The TCP congestion control, Improving Quality of Service Techniques: Leaky Bucket Algorithm.

UNIT - V:

Application Layer: Introduction, services, Application layer paradigms.

Applications: DNS, WWW, HTTP, FTP, E-MAIL, TELNET, SNMP, SSH.

TEXT BOOKS:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

REFERENCES BOOKS:

1. "Computer Networks", 5E, Peterson, Davie, Elsevier
2. "Introduction to Computer Networks and Cyber Security", Chawan - HwaWu, Irwin, CRC Publications.
3. "Computer Networks and Internets with Internet Applications", Comer .

Course outcomes:

The Students will be able to:

1. Demonstrate the networking concepts, various Layering approaches and their functionalities.
2. Understand the protocols of Data Link layer, how a medium can be shared among multiple devices, Ethernet technologies and internetworking devices used.
3. Work on fragmentation, assigning of logical address and judge on routing, congestion.
4. Demonstrate the working of IP Protocol, other protocols of internet layer and services of transport layer.
5. Explain the transport layer and application layer protocols, their working.

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	L	T-P-D	C
B.Tech.			
IV Year - I Semester	**3**	**0-0-0**	**3**

PYTHON PROGRAMMING

(Open Elective-II)

Course objectives:

The Students will :

1. Learn how to design and program Python applications.
2. Learn how to use lists, tuples, and dictionaries in Python programs.
3. Learn how to identify Python object types, Components, decision statements, pass arguments in Python.
4. Learn how to build and package Python modules for reusability, design object oriented programs with Python classes, use class inheritance in Python for reusability.
5. Learn how to use exception handling in Python applications for error handling

UNIT - I:

Programming paradigms; Structured programming vs object oriented programming, OOPs fundamentals- class, object, abstraction, encapsulation, polymorphism, and inheritance; Introduction to Python Getting started to Python- an interpreted high level language, interactive mode and script mode. Variables, Expressions and Statements Values and types, Variables and keywords, statements, evaluating expressions, operators and operands, order of operations, composition. Functions function calls, type conversion, type coercion, pre-defined functions, composition, user define functions, flow of execution, passing parameters, function parameters and scope. Conditionals and recursion modulus operator, Boolean expression, logical operators, conditional execution, alternative execution, chained and nested conditionals, return statement; Recursion, infinite recursion.

UNIT - II:

Python data structures Strings Creating, initializing and accessing the elements; String operators, comparing strings using relational operators; String functions and methods. **Lists:** Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements; List operations; List functions and Methods, list parameters, nested lists, Matrices.

Dictionaries

Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, dictionary operations traversing, appending, updating and deleting elements, Dictionary functions and methods.

Tuples

Mutability and tuples, Immutable concept, creating, initializing and accessing the elements in a tuple, Tuple functions.

UNIT - III:

Object oriented programming using Python: creating python classes, classes and objects: user defined compound types, attributes, instances as arguments, instances as return values, objects are mutable, copying; classes and functions: pure function, modifiers; Exceptions: raising exceptions, handling exceptions, exception hierarchy.

UNIT - IV:

Classes and methods: object oriented features, optional arguments, initialization method, operator overloading and polymorphism. Inheritance: Basic Inheritance: extending built-ins, overriding and super; Multiple inheritance: the diamond problem, different sets of arguments.

UNIT - V:

Files handling and Exceptions: Text files, writing variables, Directories, Pickling;
Database Programming in Python: Connection module, connect MySQL Data base, perform DDL, DML and DQL operations.

Text Books:

1. **Python 3 Object Oriented Programming,** Dusty Phillips, Packet Publishing, 2010.
2. **Programming in Python 3** - A complete Introduction to the Python Language-Second Edition, Mark Summerfiels, Addison-Wesley 2010.

Reference Books:

1. **Programming Python- 4th Edition**, Mark Lutz, O'Reilly, 2011.
2. **Object-Oriented Programming in Python**, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

Course outcomes:

The Students will be able to:

1. Describe to design and program Python applications.
2. Analyse and conversion of to use lists, tuples, and dictionaries in Python programs.
3. Explain the concept to identify Python object types, Components ,decision statements, pass arguments in Python.
4. Apply decision for building and package Python modules for reusability, design object-oriented programs with Python classes, use class inheritance in Python for reusability.
5. Apply file handling and Exception handling Concepts in real world using python

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B.Tech :	**L**	**T-P-D**	**C**
IV Year I- Semester	**3**	**0-0-0**	**3**

COMPUTER ORGANIZATION
(Open Elective-II)

COURSE OBJECTIVES:

The Students will :

1. understand the basic operations of the computer system.
2. know the functioning of CPU and the control unit
3. analyze various algorithms for arithmetic operations in the computer.
4. understand different hierarchical memory systems including cache memory and virtual memory.
5. Recognize different ways of communicating with input/output devices and standard I/O interfaces.

UNIT-I :

Basic structures of Computers: Computer Types, Functional unit, Basic operational concepts, Bus structures, software, Performance, multiprocessors and multi computers.
Data Representation: Fixed point representation, Floating point representation, Error detection codes.

UNIT-II:

Register Transfer and Micro operations: Register transfer language, Register transfer, Bus and memory transfers, Arithmetic micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic computer organization and Design: Instruction codes, computer registers, computer instructions, Timing and control, instruction cycle.

UNIT-III:

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point arithmetic operations, Decimal arithmetic unit, Decimal arithmetic operations.

UNIT-IV:

The Memory System: Basic concepts, Semiconductor RAM memories, Read-Only memories, speed, Size and Cost, Cache memories, performance considerations, Virtual memories, Secondary storage.

UNIT-V:

Input/output Organization: Accessing I/O Devices Interrupts, Interrupt hardware, Enabling and disabling interrupts, Direct memory access, Buses, interface circuits, Standard I/O interfaces.

TEXT BOOKS:

1. ComputerOrganization-CarlHamacher,ZvonkoVranesic,SafwatZaky,VthEdition,McGraw Hill.
2. Computer System Architecture-M.Moris Mano, IIIrd Edition, Pearson/PHI

REFERENCE BOOKS:

1. Computer organization and architecture-William stallings, Sixth Edition, Pearson/PHI
2. Structures Computer Organization-Andrew S.Tanebaum,4th Edition PHI/Pearson.

COURSE OUTCOMES:

The Students will be able to:

1. Illustrate basic operations of the computer system.
2. Apply knowledge of CPU and the control unit.
3. Apply various algorithms for arithmetic operations in the computer.
4. To classify different memory systems.
5. Produce knowledge on input/output organization.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

HUMAN COMPUTER INTERACTION
(Open Elective-II)

Course Objectives:
The Students will :

1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Recognize how a computer system may be modified to include human diversity.
3. Select an effective style for a specific application.
4. Design mock ups and carry out user and expert evaluation of interfaces.

UNIT I
Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT II
Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT III
Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT IV
Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT V
Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia

REFERENCE BOOKS:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.

Course Outcomes:

The Students will be able to:

1. Explain the human, Computer components functions regarding interaction with computer
2. Demonstrate Understanding of Interaction between the human and computer components.
3. Use Paradigms, HCI in the software process.
4. Implement Interaction design basics.

J. B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	L	T-P-D	C
IV Year - I Semester	3	0-0-0	3

INTRODUCTION TO EMBEDDED SYSTEMS

(OPEN ELECTIVE-II)

Course Objectives:

The Students will:

1. Understand the basic concepts of embedded systems and 8051 microcontrollers.
2. Compare and contrast the basics of assembly programming language.
3. Identify the unique characteristics of real-time systems
4. Analyze the general structure of a real-time system and define the unique design problems and challenges of real-time systems.
5. Acquaint the embedded software development tools and various advanced architectures.

UNIT–I:

Embedded Computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples.

UNIT–II:

The 8051 Architecture: Introduction, 8051 micro controller hardware, input/outputports and circuits, external memory, counter and timers, serial data input/output, interrupts.

Basic Assembly Language Programming Concepts: The assemblylanguage programming process, programming tools and techniques, programming the 8051. Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions.

UNIT–III:

Introduction to Real-Time Operating Systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

Basic Design Using a Real-Time Operating System: Principles, semaphores and queues, hard real-time scheduling considerations, saving memory and power, an example RTOS like uC-OS (open source).

UNIT–IV:

Embedded Software Development Tools: Host and target machines, linker/locators for embedded software, getting embedded software into the target system

Debugging Techniques: Testing on host machine, using laboratory tools, an example system.

UNIT-V:

Introduction to advanced Architectures: ARM and SHARC, processor and memory organization and instruction level parallelism; networked embedded systems: bus protocols, I^2C bus and CAN bus; internet-enabled systems, design example-elevator controller.

Text Books:

1. Wayne Wolf (2008), Computers as Components-principles of embedded computer system design, Elseveir, New Delhi, India.
2. Kenneth J. Ayala (2008), The 8051 Microcontroller, 3rd edition, Cengage Learning, India.

References:

1. David E. Simon (1999), An Embedded Software Primer, Pearson Education, India.
2. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
3. Raj Kamal (2004), Embedded Systems, Tata McGraw hill, India.

Course Outcomes:

The Students will be able to:

1. Program an embedded system
2. Analyze Interfacing with keyboard, A/D & D/A conversions, serial data Communication, LCD and LED display.
3. Illustrate Tasks, Semaphores, Message queues, pipes, Timer functions.
4. Design embedded systems and real-time systems
5. Compare and contrast ARM, SHARC, internet enabled systems.

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B. Tech.	**L**	**T-P-D**	**C**
IV Year I sem	**3**	**0-0-0**	**3**

INTRODUCTION TO SURFACE MINING

(OPEN ELCTIVE II)

COURSE OBJECTIVES:

1. To introduce surface mining terms and applicable conditions
2. To acquaint with different machinery used in surface mining
3. To get idea about Drilling and blasting of surface ore bodies.
4. To get idea about lighting, dust and slopes in surface mines.
5. To know about ore and waste transportation.

UNIT-I: Definition, Terminology, Applicability and limitations of surface mining, Classification, Advantages and dis-advantages of surface mining.

UNIT-II : Introduction to surface mining machinery: Equipment selection; Working with rippers, shovels, draglines, shovel-dragline combination; bucket wheel excavator. Disposal of OB/waste material

UNIT-III:

Drilling & blasting**:** Drilling mechanism, drilling patters, Drill bits Explosives, Blasting accessories, Bulk explosives, problems in blasting.

UNIT-IV: Basics of Mine lighting, Sources of dust in surface mining, dust control, and slope stabilization

UNIT-V: Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator. Impacts on environment due to surface mining

TEXTBOOKS:

1. D.J. Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001.
2. Principles & Practices of Coal Mining, R.D. Singh

REFERENCE BOOKS

1. Surface Mining Technology, by Prof S.K.Das, Lovely Prakashan, Dhanbad

COURSE OUTCOMES:

The student will be able to:

1. Understand about surface mining terms and conditions of applicability
2. Learn about different machinery used in surface mining
3. Learn drilling and blasting in surface mining
4. Understand mine lighting, dust and slopes in surface mining
5. Understand the transportation of ore and waste in surface mining.

Open Elective - III

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	L	T-P-D	C
IV Year - I Semester	3	0-0-0	3

ELEMENTS OF CIVIL ENGINEERING
(Open Elective-III)

Course Objectives:

The Students will

1. understand different methods of surveying for various applications.
2. familiarize with various types of building materials.
3. understand transportation and traffic management.
4. Gain knowledge of water sources, supply& its treatment.
5. Study about Highway development in India, Necessity for Highway planning, different road development plans.

UNIT - I:

Introduction, history of the civil engineering, sub – disciplines of civil engineering.

UNIT II:

Surveying

Introduction, divisions of surveying, classification of surveying, principles of surveying. Linear measurements and errors–introduction, methods of linear measurements, chaining instruments, types of error and correction. Compass surveying – introduction, angular measurement using compass, whole circle bearing and reduced bearing, fore bearing and back bearing. Traverse surveying –introduction, chain and compass traversing, closing error and adjustments. Levelling– introduction, types of levelling instruments, dumpy level, adjustment of level, levelling staff.

UNIT - III:

Building Materials and Construction

Materials: Introduction to construction materials like ferrous and nonferrous metals, alloys, Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Types of building, different loads considered in building design, types of foundation in building, other developments and constructions of buildings.

UNIT - IV:

Fire and Earthquake Protection in Building Introduction, fire protection in building, structural and architectural safety requirements of resistive structures, fire resistive properties of building materials, fire exit requirements, force and acceleration on building due to earthquake, building response characteristics, building drift.

UNIT - V:

Water Supply, Sanitary and Electrical Works in Building

Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

Highway Engineering:

Introduction, historical background of road or highway, classification of roads, pavements and roads, traffic control mechanism.

TEXT BOOKS:

1. Elements of Civil Engineering Author: Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering Author: Dr. R.K. Jain and Dr. P.P. Lodha Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I Author: Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain16th Edition Publisher: Laxmi Publication Delhi.
4. Building drawing Author: M.G.Shah, C.M.Kale and S.Y.Patki Publisher: Tata McGraw Hill.

Reference Books:

1. Surveying Theory and Practice (7th Edition) Author: James M Anderson and Edward M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling Author: R. Subramanian Publisher: Oxford University.
3. Building drawing Author: M.G.Shah, C.M.Kale and S.Y.Patki Publisher: Tata McGraw Hill.
4. Civil Engg. Drawing Author: S. C. Rangwala Publisher: Charotar Pub. House Anand.

Course Outcomes:

Students will be able to

1. Carry out simple land survey and prepare maps showing the existing details.
2. Find out area of irregular shaped plane areas.
3. Understand building plan, elevation and section.
4. Get acquainted with construction materials and transportation systems.
5. Understand transportation and traffic problems.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

DISASTER MANAGEMENT
(Open Elective-III)

Course Objectives:

The Student will:

1. provide basic conceptual understanding the difference between the hazard and a disaster.
2. gain knowledge about the various disasters and their impacts.
3. provide basic understanding about the hazard and vulnerability profile of India.
4. have conceptual understanding about the disaster management phases.
5. gain approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, Disasters, disaster prevention and risk reduction.

UNIT - I:

Concept of Disaster, Different approaches ,Concept of Risk, Levels of Disasters ,Disaster Phenomena and Events (Global, national and regional) ,Hazards and Vulnerability, Natural and man-made hazards, response time, frequency and forewarning levels of different hazards, Characteristics and damage potential or natural hazards, hazard assessment ,Dimensions of vulnerability factors, vulnerability assessment Vulnerability and disaster risk ,Vulnerabilities to flood and earthquake hazards.

UNIT II:

Disaster Management Mechanism, Concepts of risk management and crisis managements. Disaster Management Cycle, Response and Recovery Development, Prevention, Mitigation and Preparedness ,Planning for Relief.

UNIT - III:

Capacity Building: Concept, Structural and Non-structural Measures ,Capacity Assessment; Strengthening Capacity for Risk reduction ,Counter-Disaster Resources and their utility in Disaster Management ,Legislative Support at the state and national levels.

UNIT - IV:

Coping with Disaster ,Coping Strategies; alternative adjustment processes, Changing Concepts of disaster management ,Industrial Safety Plan; Safety norms and survival kits, Mass media and disaster management.

UNIT - V:

Planning for disaster management, Strategies for disaster management planning, Steps for formulating a disaster risk reduction plan, Disaster management Act and Policy in India. Organizational structure for disaster management in India, Preparation of state and district disaster management plans .

TEXT BOOKS:

1. Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2. Carter, W.N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

REFERENCES:

1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
2. Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.
3. Goswami, S.C Remote Sensing Application in North East India, Purbanchal Prakesh, Guwahati, 1997.

Course Outcomes:

The Students will be able to

1. Acquired knowledge on various types of disasters and hazards.
2. Distinguish between the hazard and a disaster can be analysed.
3. Acquired knowledge on the various approaches of Disaster Risk Reduction (DRR)
4. Ability to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
5. Develop ability to respond to different disasters.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

ELECTRIC COSTING AND ESTIMATION
(OPEN ELECTIVE - III)

Course Objectives:
The Student will

1. emphasize the estimation and costing aspects of all electrical equipment,
2. design and estimation of wiring
3. design overhead and underground distribution lines,
4. classify types of substations and illumination
5. understand the Installation and costing of Electrical Equipment.

UNIT-I : Design Considerations of Electrical Installations
Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT-II : Electrical Installation for Different Types of Buildings and Small Industries
Electrical installations for residential buildings – estimating and costing of material, Electrical
installations for commercial buildings, Electrical installations for small industries.

UNIT-III: Overhead and Underground Transmission and Distribution Lines
Introduction, Supports for transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT-IV: Substations
Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substations – Floor mounted type.

UNIT-V: Design of Illumination Schemes
Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes LED, CFL and OCFL differences.

TEXT BOOKS:

1. "K. B. Raina, S. K. Bhattacharya", "Electrical Design Estimating and Costing", NewAge International Publisher, 2010.
2. "Er. V. K. Jain, Er. Amitabh Bajaj", "Design of Electrical Installations", UniversityScience Press.

REFERENCES:

1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS:4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage notexceeding 650 V), Indian Standard Institution, IS: 3106-1966.
5. Code of Practice for earthling, Indian Standard Institution, IS: 3043-1966.
6. Code of Practice for Installation and Maintenance of induction motors, IndianStandard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650Volts), Indian Standard Institution, IS: 2274-1963.
8. "Gupta J. B., Katson, Ludhiana", "Electrical Installation, estimating and costing", S.K. Kataria and sons, 2013

Course outcomes:

The student will be able to:

1. Understand the design considerations of electrical installations.
2. Design electrical installation for buildings and small industries.
3. Analyze the feasibility of type of substation
4. Understand the performance of various materials used for transmission and distribution
5. Identify and design the various types of light sources for different applications.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

POWER PLANT ENGINEERING
(OPEN ELECTIVE - III)

Course Objectives:
The Student will

1. provide the knowledge on principles of solar radiation & solar energy collection & storage and applications.
2. prepare graduates to express the Knowledge on wind energy, geo-thermal energy, and ocean energy plants.
3. understand the behaviour of different power plants.
4. analyse different types of steam cycles and it's efficiencies in a steam power plant.
5. Expose on principle of safety and environmental issues.

UNIT-I : Thermal Power Plants
Basic thermodynamic cycles, various components of steam power plant- Layout- Pulverized coal burners- Fluidized bed combustion - Coal Handling systems - Ash handling systems - Forced draft and induced draft fans- Boilers- Feed pumps- Super heater- Regenerator - Condenser- Dearearators - Cooling tower

UNIT-II Hydro-electric Power Plants(Elementary Aspects)
Layout- Dams -Selection of water turbines – types - Pumped storage hydel plants

UNIT-III: Nuclear Power Plants(Elementary Aspects)
Principles of nuclear energy- Fission reactions - Nuclear reactor-Nuclear power plants

UNIT-IV: Gas and Diesel Power Plants(Elementary Aspects)
Types, Open and closed cycle gas turbine, Work output & thermal efficiency, Methods to improve performance-reheating, Inter-coolings, Regeneration-Advantage and disadvantages - Diesel engine power plant, Component and layout.

UNIT-V: Non-Conventional Power Generation:(Elementary Aspects)
Solar energy collectors, OTEC, Wind power plants, Tidal power plants and geothermal resources, Fuel cell, Thermoelectric power generation.

TEXT BOOKS:

1. Arora and Domkundwar, -"A Course in Power Plant Engineering", Dhanpat Rai and Co.Pvt. Ltd., New Delhi.
2. P.K. Nag,-"Power Plant Engineering", Tata McGraw Hill, Second Edition, Fourth reprint 2003.

REFERENCES:

1. Bernhardt G.A. Skrotzki and William A. Vopat, -"Power Station Engineering and Economy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002.
2. G.D. Rai, -"An Introduction to Power Plant Technology", Khanna Publishers, Delhi-110 005.
3. M.M. El-Wakil, -"Power Plant Technology", Tata McGraw Hill, New Delhi, 1984.

Course outcomes:

The student will be able to:

1. Describe basic working principles of gas turbine and diesel engine power plants.
2. Define the performance characteristics and components of such power plants.
3. List the principal components and types of nuclear reactors.
4. List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems.
5. Estimate different efficiencies associated with power plant systems

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS

B. Tech. ME	**L**	**T-P-D**	**C**
IV Year -I Semester	**3**	**0-0-0**	**3**

FUNDAMENTALS OF ROBOTICS

Open Elective - III

Course Objectives: The Student will

1. understand the theoretical aspects of Robotics
2. acquire practical experience in the field of Robotics through design projects and case studies.
3. understand the importance of robots in various fields of engineering.
4. understand trajectory planning and types of motion
5. expose to various robots and their operational details.

UNIT-I: Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator.

Components of Industrial robotics-precession of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

UNIT-II: Grippers - Mechanical Gripper-Grasping force-Engelberger-g-factors-mechanisms for actuation, Magnetic gripper, vaccume cup gripper-considerations in gripper selection & design. Industrial robots specifications. Selection based on the Application.

UNIT-III: Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots

UNIT-IV: Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in

operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme. Control- Interaction control, Rigid Body mechanics, Control architecture-position, path velocity, and force control systems, computed torque control, adaptive control, and Servo system for robot control.

UNIT-V: Programming of Robots and Vision System-Lead through programming methods-Teach pendent- overview of various textual programming languages like VAL etc.

Introduction to Mobile Robots: A brief history of mobile robotics, applications and market. Recent advances in the mobile robotics for RISE (Risky Intervention and Surveillance

Environment) applications.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Mc Graw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

REFERENCES:

1. Theory of Applied Robotics /Jazar/Springer.H. Asada and J. J. E. Slotine, "*Robot Analysis and Intelligence*", Wiley Inter-Science. 1986
2. Robotics / Ghosal / Oxford

Course outcomes: The student will be able to

1. apply the basic components of robots.
2. differentiate types of robots and robot grippers.
3. model forward and inverse kinematics of robot manipulators.
4. analyze forces in links and joints of a robot.
5. programme a robot to perform tasks in differential applications.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

DIGITAL SYSTEMS USING VERILOG

(Open Elective -III)

COURSE OBJECTIVES

The Students will

1. understand the constructs and conventions of the Verilog HDL programming.
2. Industrial-standard design software for coding, synthesis and simulation.
3. Learn in-depth study of combinational and sequential hardware systems and the use of finite state machines in the design of sequential systems.
4. understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
5. implement combinational and sequential circuits using VHDL.

UNIT I: Review of Logic Design Fundamentals

Combinational Logic, Boolean Algebra and Algebraic Simplification, Karnaugh maps, Designing with Nand and Nor Gates, Hazards in Combinational Networks, Flip-flops and latches,Mealy Sequential Network, Equivalent States and reduction of State Tables, Sequential Network Timing, Setup and Hold Times, Synchronous Design, Tristate Logic and Buses.

UNIT II: Introduction to Verilog

Computer-Aided Design, Hardware Description Languages, Verilog Description of Combinational Circuits, Verilog Modules, Assignments, Procedural Assignments, Modeling Flip-Flops Using Always Block, Always Blocks Using Event Control Statements, Delays in Verilog, Compilation, Simulation and Synthesis of Verilog Code, Data Types and Operators, Simple Synthesis Examples for Multiplexers, Modeling Registers and Counters Using Verilog Always Statements, Behavioral and Structural Verilog, Constants, Arrays, Loop in Verilog, Testing in Verilog Model.

UNIT III: Introduction to Programmable Logic Devices

Brief Overview of Programmable Logic Devices, Simple Programmable Logic Devices(SPLDs),Complex Programmable Logic Devices(CPLDs),Field-Programmable Gate Arrays(FPGAs), Problems.

Design Examples

BCD to 7-Segment Display Decoder, A BCD Adder, 32-Bit Adders, Traffic Light Controller, State Graphs for Control Circuits, Scoreboard and Controller, Array Multiplier.

UNIT IV: SM Charts and Microprogramming

State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Microprogramming, Linked State Machine.

Designing with Field Programmable Gate Arrays

Implementing Functions in FPGAs, Implementing Functions Using Shannon's Decomposition, Carry Chains in FPGAs, Examples of Logic Block in Commercial FPGAs, Dedicated memory in FPGA, Dedicated Multipliers in FPGAs, Cost of Programmability.

UNIT V:Floating-Point Arithmetic

Representation of Floating-Point Numbers, Floating-point Multiplication, Floating-point Additions, Other Floating-Point Operations.

Hardware Testing and Design for Testability

Testing Combinational Logic, Testing Sequential Logic, Scan Testing, Boundary Scan, Build-In Self-Test.

TEXTBOOKS:

1. By Charles Roth, Lizy K. John, Byeong Kil Lee,"Digital System Design using Verilog".
2. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd edition.

REFERENCE BOOKS:

1.T.R.Padmanabhan & Bala Tripura sundari, "Design through Verilog HDL", WSE2004 IEEE press.

2.Fundamentls of Digital Logic with Veilog design by Stephen Brown, Zvonkoc Vranesic, TMH, 2nd edition, 2010.

3. Digital Logic Design using Verilog , State machine & synthesis for FPGA, Sunggu Lee, Cengage Learning ,2009.

4. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.

COURSE OUTCOMES

The Students will be able to:

1. describe, design, simulates and synthesize the computer hardware.
2. practice verilog hardware description language.
3. develop program codes for synthesis-friendly combinational and sequential logic incorporating the concept of sustainability of design and development.
4. analyze, design and implement sequential logic circuits.
5. construct digital system design using PLD.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
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B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

ADVANCED COMPUTER ARCHITECTURE

(Open Elective -III)

COURSE OBJECTIVES:

The Student will

1. understand the fundamentals of computer design and technology trends.
2. familiarize with the Instruction level parallelism.
3. gain knowledge about memory design and virtual memory.
4. know about architectures of multiprocessors and storage systems.
5. analyze the Inter connection networks and design of clusters.

UNIT-I

Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design. Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler.

UNIT-II

Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP. ILP software approach- compiler techniques- static branch protection - VLIW approach - Hardware support for more ILP at compile time- Hardware verses Software Solutions.

UNIT-III

Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

UNIT-IV

Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading. Storage systems- Types – Buses - RAID- errors and failures- bench marking a storage device- designing a I/O system.

UNIT-V

Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster.

TEXT BOOKS:

1. Computer Architecture and Parallel Processing, Kai Hwang and A Briggs International edition Mcgraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.
3. Parallel Computer Architecture, A Hardware/Software Approach, david E Culler, Jaswinder Pal Singh, Anoop Gupta, Elseveir.

REFERENCE BOOKS:

1. Computer Architecture, A quantitative approach, 3rd edition, John L Hennessy and David A Patterson Morgan Kufmann (an imprint elsevier).

COURSE OUTCOMES:

The Students will be able to

1. understand the fundamentals of computer design and technology trends.
2. expertise with the Instruction level parallelism.
3. illustrate the concepts of memory design and virtual memory.
4. obtain knowledge on architectures of multiprocessors and storage systems.
5. design the Inter connection networks and design of clusters.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV- I Semester	**3**	**0-0-0**	**3**

SOFTWARE ENGINEERING

(Open Elective-III)

Course objectives:

The Students will :

1. Analyze basic Software engineering methods.
2. Describe software engineering layered technology and Process frame work.
3. Design software architecture and UML modeling
4. Recognize testing approaches such as unit testing and integration testing.
5. Demonstrate software evolution and related issues such as version and risk management

UNIT - I:

Introduction to Software Engineering: The evolving role of Software, changing nature of Software, Software Myths.
A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.
Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

UNIT - II:

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document**.**
Requirements Engineering Process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.
System Analysis Models: Context models, behavioral models, data models, object models, structured methods

UNIT - III:

Design Engineering: Design process and Design quality, Design concepts, the design model.
Creating an architectural design: Software architecture, Data design, Introduction to UML, Importance of modeling, Principle of modeling, Concepts of modeling and architecture.
Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution.
Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT - IV:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.
Metrics for Process and Products: Software Measurement, Metrics for software quality.
UNIT - V:

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering A Practitioner's Approach, Roger S Pressman, 6th edition. McGraw-Hill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson education.

REFERENCE BOOKS:

1. The Unified Modeling Language, User Guide by Grady Booch, James Rambaugh, Ivar Jaccobson.
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008

Course outcomes:

The Students will be able to:

1. Apply software engineering principles and techniques
2. Evaluate requirements for a software system
3. Apply the process of analysis and design using the object-oriented approach
4. Write test cases for different requirement and implement testing.
5. Evaluate different version and risk management

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UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
IV Year I- Semester	**3**	**0-0-0**	**3**

JAVA PROGRAMMING
(Open Elective-III)

Course Objectives:
The students will :

1. Describe with constructors and string handling functions.
2. Explain Inheritance and Polymorphism.
3. Discuss Exception handling and Multithreading.
4. Review Applet Programming, Event Handling and scripting.
5. Discuss Collection frame work in java and Files.

UNIT – I

OOP concepts – Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms

Java programming - History of Java, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow - block scope, conditional statements, loops, break and continue statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection,

String handling: String, StringBuffer, StringTokenizer.

UNIT – II

Inheritance - Inheritance hierarchies, super and sub classes, Member access rules, super keyword, preventing inheritance: final classes and methods, the Object class and its methods

Polymorphism- dynamic binding, method overriding, abstract classes and methods.

Interfaces – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Inner classes – Uses of inner classes, local inner classes, anonymous inner classes, static Inner classes, examples.

Packages-Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages.

UNIT – III

Exception handling – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multithreading - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer pattern.

UNIT – IV

Event handling - Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Examples: handling a button click, handling mouse events, Adapter classes.

Applets – Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets, applet security issues.

UNIT – V

Collection Framework in Java – Introduction to Java Collections, Overview of Java Collection frame work, Generics, Commonly used Collection classes– Array List, Vector, Hash table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, calendar and Properties

Files – streams- byte streams, character streams, text Input/output, binary input/output, random access file operations, File management using File class.

Connecting to Database - JDBC Type 1 to 4 drivers, connecting to a database, querying a database and processing the results, updating data with JDBC.

TEXT BOOKS:

1. Java Fundamentals – A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
2. Java The complete reference, 8th editon, Herbert Schildt, TMH.

REFERENCE BOOKS :

1. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java: How to Program P.J.Deitel and H.M.Deitel, PHI.
2. Object Oriented Programming through Java, P.Radha Krishna, Universities Press.
3. Thinking in Java, Bruce Eckel, Pearson Education
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford Univ. Press.

Course Outcomes:

The Students will be able to:

1. Apply constructors and string Handling.
2. Demonstrate Inheritance and Polymorphism.
3. Choose Exception handling and Multithreading.
4. Practice applet Programming Solve Event Handling.
5. Choose Collection frame work and files.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
IV Year I- Semester	**3**	**0-0-0**	**3**

SOFTWARE PROJECT MANAGEMENT
(Open Elective-III)

COURSE OBJECTIVES:

The Students will:

1. Discuss the conventional and contemporary software project management principles.
2. Understand the ability to assess and plan project schedule and assign resources
3. Select an appropriate project development methodology among various alternating processes.
4. Identify project risks, understand the responsibilities, monitor and track project deadlines and the capability to work in a team environment.

UNIT-I

Conventional Software Management: The waterfall model, conventional software management performance.

Evolution of Software Economics: Software Economics.

Improving Software Economics: Reducing software product size, Improving software processes, Improving team effectiveness, Improving automation, Achieving required quality.

UNIT-II

The old way and the New way: The principles of conventional software engineering, Principles of modern software management.

Life Cycle Phases: Engineering and Production stages, Inception, Elaboration, Construction, Transition phases.

Artifacts of the Process: The artifact sets, Management artifacts, Engineering artifacts, Programmatic artifacts.

UNIT-III

Model Based Software Architectures: A Management perspective and Technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major milestones, Minor milestones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process.

UNIT-IV

Project Organizations and Responsibilities: Line-of-business organizations, Project organizations.

Process Automation: Automation building blocks.

Project Control and Process Instrumentation: The seven core metrics, Management indicators, quality indicators, life cycle expectations, and pragmatic software metrics.

UNIT-V

Future Software Project Management: Modern project profiles, next generation software economics, modern process transitions.

Tailoring the Process: Process discriminants.
Case Study: The command centre processing and display system-replacement (CCPDS-R)

TEXT BOOKS:

1. Software Project Management, Walker Royce: Pearson Education, 2005
2. Software Project Management, Joel Henry: Pearson Education

REFERENCE BOOKS:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005

COURSE OUTCOMES:

The Student is able to:

1. Describe the conventional s/w management and explain how to improve s/w economics
2. Understand and discuss the key phases of project management and the key skills associated with each.
3. Explain the concept of workflows and checkpoints of the processes.
4. Discuss the responsibilities in the project organization.
5. Distinguish between conventional project and modern project profiles.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**

INTRODUCTION TO INTELLIGENT SYSTEMS
Open Elective - III

Course Objectives:

At the end of the course, students will learn:

1. Understand In-depth of specialist bodies of knowledge within the engineering discipline.
2. Establish engineering methods to complex engineering problem solving.
3. Be Fluent application of engineering techniques, tools and resources

UNIT–I:

Introduction To Artificial Intelligence: Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem, characteristics, Production system characteristics -Specialized production system

UNIT–II:

Representation Of Knowledge: Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic Structured representation of knowledge.

UNIT–III:

Knowledge Inference: Knowledge representation -Production based system, Frame based system.

UNIT–IV:

Inference - Backward chaining, forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT-V:

Expert Systems: Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge, Heuristics.

Text Books:

1. Kevin Night, Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Tata McGraw-Hill Education Private Limited, 3rd edition, 2009, ISBN: 978-0070678163.
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2nd edition, 2007.ISBN, 0132097680.

References:

1. Peter Jackson, “Introduction to Expert Systems”, Pearson Education, 3rd edition, 2007. ISBN-13: 978-0201876864
2. Stuart Russel, Peter Norvig , “AI – A Modern Approach”, Pearson Education, 2nd edition, ISBN-13: 978-0137903955

Course Outcomes:

The Students will be able to:

1. Gain basic understanding of the underlying principles and philosophy of computational intelligence systems Technologies.
2. Be capable of constructing intelligent systems (in software) that perform useful engineering tasks

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UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - I Sem	**3**	**0-0-0**	**3**

INTRODUCTION TO GEOLOGY

(OPEN ELECTIVE III)

COURSE OBJECTIVES:

The Student will:

1. introduce rock types and their physical properties
2. acquaint with different structures occurring in rocks
3. get idea about Ground water, and aquifers
4. get idea about coal formation and its stages.
5. know about minerals occurring in India.

UNIT-I:

Introduction, Definitions, Importance of geology in mining, Types of rocks, Physical properties of rocks.

UNIT-II:

Structural Geology: Definition, terminology, and Primary and secondary structures: Bedding, lineation, foliation, cleavage, Strike and dip. Definition of faults, folds and joints and their types, Unconformities and its kinds.

UNIT-III:

Ground Water: Introduction, Hydrological Cycle, origin and occurrence of groundwater, water table. Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers.

UNIT-IV:

Coal: Stages of formation, composition, theories of formation of coal.

UNIT-V:

Occurrence and distribution of important metallic mineral deposits in India: Iron – Copper, - Lead and Zinc – Manganese – Aluminum – Chromium.

Occurrence and distribution of important non-metallic mineral deposits in India: Asbestos – kyanite – Sillimanite.

TEXTBOOKS:

1. Structural Geology – Billings, M.P. Prentice Hall.
2. Engineering geology –by Dr. Chennkeshavulu.

REFERENCE BOOKS:

1. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.

COURSE OUTCOMES:

The student will be able to:

1. Understand about rocks and their properties
2. Learn about different structures occurring in rocks
3. Understand about ground water, water table and aquifers
4. Learn about coal and its formation theories
5. Distinguish metallic and non-metallic minerals.

Open Elective - IV

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UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

INDUSTRIAL WASTE WATER TREATMENT
(Open Elective-IV)

COURSE OBJECTIVES:

The Students will:

1. Distinguish between the quality of domestic and industrial water requirements and Wastewater quantity generation
2. Understand the industrial process, water utilization and waste water generation
3. Impart knowledge on selection of treatment methods for industrial wastewater
4. Acquire the knowledge on operational problems of common effluent treatment plants.
5. Gain knowledge on different techniques and approaches for minimizing the generation and application of Physio chemical and biological treatment methods for recovery, reuse and disposal of industrial wastewater.

UNIT – I:

Sources of Pollution - Physical, Chemical, Organic & Biological properties of Industrial Wastes- Difference between industrial & municipal waste waters - Effects of industrial effluents on sewers and Natural water Bodies.

UNIT – II:

Pre & Primary Treatment - Equalization, Proportioning, Neutralization, Oil separation by Floating-Waste Reduction-Volume Reduction-Strength Reduction

UNIT-III:

Waste Treatment Methods - Nitrification and De-nitrification-Phosphorous removal -Heavy metal removal - Membrane Separation Process - Air Stripping and Absorption Processes - Special Treatment Methods - Disposal of Treated Waste Water.

UNIT-IV:

Characteristics and Composition of waste water and Manufacturing Processes of Industries like Sugar, Characteristics and Composition of Industries like Food processing Industries, Steel, and Petroleum Refineries

UNIT-V:

Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries – Joint Treatment of Raw Industries waste water and Domestic Sewage – Common Effluent Treatment Plants(CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects

TEXT BOOKS:

1. Metcalf & Eddy, “Wastewater engineering Treatment disposal reuse”, Tata McGraw Hill.
2. Eckenfelder, W.W., “Industrial Water Pollution Control”, McGraw-Hill

REFERENCE BOOKS:

1. M.N. Rao and Dutta – Industrial Waste.
2. Mark J. Hammer, Mark J. Hammer, Jr., “Water & Wastewater Technology”, Prentice Hall of India.
3. N.L. Nemerrow –Theories and practices of Industrial Waste Engineering. C.G. Gurnham – Principles of Industrial Waste Engineering

COURSE OUTCOMES:

The Students will be able to

1. Learn a firm foundation and knowledge of mathematics, science and engineering principles and the ability to apply the knowledge.
2. Define and reason about fundamental concepts of waste water treatment
3. Design and conduct experiments and the ability
4. To analyze the data, interpret results and draw conclusions.
5. Design a component, system or process to meet desired needs and imposed constraints.

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

AIR POLLUTION AND CONTROL
(Open Elective-IV)

Course Objectives:

The Students will

1. introduce students to basic concepts of pollution.
2. gain the knowledge of causes of air pollution.
3. gain the knowledge of health related to air pollution.
4. develop skills relevant to control of air pollution.
5. Understand the quality of air.

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

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

UNIT–III: Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_x; NO_x; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

UNIT–IV: Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control.
Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT-V: General Methods of Control of NO_x and SO_x emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.
Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards.

Text Books:

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

References:

1. Air pollution and control By K.V.S.G. Murali Krishna, Kaushal Publishers. Kakinada.

Course Outcomes:

The Students will be able to

1. Acquired knowledge on the basic elements of causes and occurrence of the air pollution.
2. Have awareness on the different causes of the air pollution.
3. Have awareness about different health related problems caused due to air pollution.
4. develop concepts in controlling and prevention of air pollution.
5. Analyse the quality of air.

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UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

DISTRIBUTED GENERATION AND MICROGRID
(OPEN ELECTIVE - IV)

Course Objectives:
The Student will

1. illustrate the concept of distributed generation
2. analyze the impact of grid integration.
3. study concept of Micro grid and its configuration
4. understand the Economic and control aspect of DGs
5. find optimal size, placement and control aspects of DGs

UNIT-I : Need for Distributed Generation
Renewable sources in distributed generation - Current scenario in distributed generation - Planning of DGs – Siting and sizing of DGs – Optimal placement of DG sources in distribution systems.

UNIT-II : Grid Integration of DGs
Different types of interfaces - Inverter based DGs and rotating machine based interfaces - Aggregation of multiple DG units - Energy storage elements - Batteries, ultra capacitors, flywheels.

UNIT-III: Technical Impacts of DGs
Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems

UNIT-IV: Economic and Control Aspects of DGs
Market facts, issues and challenges - Limitations of DGs - Voltage control techniques, Reactive power control, Harmonics, Power quality issues - Reliability of DG based systems – Steady state and Dynamic analysis.

UNIT-V: Introduction to Micro-grids
Types of micro-grids – Autonomous and non-autonomous grids – Sizing of micro-grids - Modeling & analysis - Micro-grids with multiple DGs – Micro-grids with power electronic interfacing units - Transients in micro-grids - Protection of micro-grids – Case studies

TEXT BOOKS:

1. H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000.
2. M.Godoy Simoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.

REFERENCES:

1. Robert Lasseter, Paolo Piagi, ' Micro-grid: A Conceptual Solution', PESC 2004, June 2004.
2. F. Katiraei, M.R. Iravani, 'Transients of a Micro-Grid System with Multiple Distributed Energy Resources', International Conference on Power Systems Transients (IPST'05) in Montreal, Canada on June 19-23, 2005.
3. Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson, 'Facility Microgrids', General Electric Global Research Center, Niskayuna, New York, Subcontract report, May 2005.

Course outcomes:

The student will be able to:

1. Find the size and optimal placement DG
2. Analyze the impact of grid integration and control aspects of DGs
3. Model and analyze a micro grid taking into consideration the planning and Operational issues of the DGs to be connected in the system
4. Describe the technical impacts of DGs in power systems.
5. Implement the micro grids and their control schemes

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B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

RENEWABLE ENERGY SOURCES
(OPEN ELECTIVE -IV)

Course Objectives:
The Student will

1. understand the various types of renewable energy sources.
2. analyze the principle and operation of direct energy conversion.
3. understand and analyze the hybrid energy systems.
4. apply the renewable energy sources to real world electrical and electronics problems.
5. apply the renewable energy sources to real world electrical and electronics applications.

UNIT-I : Principles of Solar Radiation
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

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

UNIT-III: Wind Energy
Sources and potentials, Power from wind, Properties of air and wind, Types of wind turbines, Operating characteristics, Betz criteria.
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.
UNIT-IV: Geothermal Energy
Resources, types of wells, methods of harnessing the energy, potential in India
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V: Direct Energy Conversion
Need for DEC, Carnot cycle, limitations, and principles of DEC
Environmental effects of energy conversion systems:
Pollution from coal and preventive measures, Steam stations and pollution, Pollution free energy systems

TEXT BOOKS:

1. Non-Conventional Energy Sources /G.D. Rai, khanna publications.
2. Renewable Energy Sources /Twidell&Weir CRC Press .

REFERENCES:

1. Renewable Energy resources /Tiwari and Ghosal/Narosa
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Renewable Energy sources and emerging technologies by D.P. Kothari, K.C. Singhal, P.H.I
5. Systems" -Academic Press, 1st Edition 2009.

Course outcomes:

The student will be able to:

1. Understand the need of utilization of alternate energy resources.
2. Discuss the collection of solar energy, storage of solar energy and its applications.
3. Illustrate the potential of Wind and bio mass as a renewable source.
4. Understand the potential of geothermal energy and ocean energy as a renewable source.
5. Discuss the direct energy conversion systems.

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UGC AUTONOMOUS

B. Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

Open Elective - IV

DIGITAL MANUFACTURING

Course Objectives:
The Student will

1. Understand the need of digital fabrication
2. Understand about Two dimensional layer by layer techniques
3. Know about extrusion based systems, post processing and the software issues involved in digital fabrication
4. Know the applications of 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: Stereo-lithography (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, and 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, EmandAbouel 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.

Course outcomes:

The student will be able to:

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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

EMBEDDED SYSTEM DESIGN

(Open Elective-IV)

COURSE OBJECTIVES:

The Student will

1. understand the characteristics of embedded systems and application areas.
2. explain the core of embedded system and gain the knowledge of Embedded Software.
3. analyze ARM Cortex processor and its architecture.
4. gain knowledge on software aspects of embedded systems.
5. understand various communication protocols in Embedded Systems.

UNIT-I

The concept of embedded systems design, Embedded microcontroller cores, embedded memories. Examples of embedded systems, quality attributes- Design metrics - challenges. Embedded Hardware: Processor embedded into a system- Processor selection- embedded hardware units and devices.

UNIT-II

Embedded Software: An overview of programming languages- challenges and issues related to embedded software development.

Co-design-development process: Design cycle - Embedded software development tools- Target Machines - Linker/Locators - Embedded Software on Target system -Issues in co-design.

UNIT-III

ARM® Cortex™- M0+ processor: Overview - Architecture - Features- interfaces- configurable options-Modes of operation and Execution and Instruction Set- FRDM KL25Z Architecture - Interfacing of I/O devices with FRDM KL25Z.

UNIT-IV

Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

Technological aspects of embedded systems: Interfacing between analog and digital blocks, signal conditioning, digital signal processing.

UNIT-V

Communication protocols: Network Embedded Systems- Serial Bus Protocols- Parallel Bus Device Protocols, Parallel Communication Network Using ISA,PCI, PIC-X and Advanced Buses- Internet Enabled Systems, Network protocols- Wireless and Mobile System Protocols.

TEXT BOOKS:

1. Shibu K.V, “Introduction to Embedded Systems”, McGraw Hill.
2.J.W.Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

REFERENCE BOOKS:

1. Raj Kamal, “Embedded Systems”, TMH.
2. Frank Vahid, Tony Givargis, “Embedded System Design”, John Wiley.
3. Lyla, “Embedded Systems”, Pearson, 2013.
4. David E. Simon, “An Embedded Software Primer”, Pearson Education.

COURSE OUTCOMES:

The student will be able to

1. define the characteristics of embedded systems, classification and application areas.
2. obtain knowledge on Embedded software and Co-design development.
3. familiarize the working of ARM Cortex processor.
4. develop knowledge on software aspects of embedded systems.
5. employ various communication protocols in Embedded Systems.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

SOFTWARE DEFINED RADIO

(Open Elective-IV)

COURSE OBJECTIVES:

The Students will:

1. study fundamentals and state of the art concepts in software defined radio.
2. Understand the concepts of Radio Resource Management.
3. Understand the reconfiguration of the network elements.
4. Remember the object oriented representation of radio and network resources.
5. Study of radio resource management in heterogeneous networks.

UNIT -I

Introduction: The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues the Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design. RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II

Profile and Radio Resource Management : Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile , Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure, XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Classmarks, Dynamic Classmarks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data.

UNIT -III

Radio Resource Management in Heterogeneous Networks : Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks, Measuring Gain in the Upper Bound Due to JRRM, Circuit Switched System, Packet-Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems.

UNIT -IV

Reconfiguration of the Network Elements : Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks.

Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer,

Optimized Reconfiguration, Optimization Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals.

UNIT -V

Object – Oriented Representation of Radios and Network Resources: Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAK easy-JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, Kambiz Madani, WILEY 2003.
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger,Kambiz. Madani, Nancy Alonistioti, 2003, Wiley.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Engineering–Joseph Mitola, III, 2000, John Wiley & Sons.

COURSE OUTCOMES:

The students will be able to:

1. illustrate the design principles of software defined radio.
2. analyze the analog RF components as front end block in implementation of SDR.
3. visualize digital hardware architectures and development methods.
4. familiarize the radio recourse management in heterogeneous networks.
5. remember the object oriented representation of radio and network resources.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

E-COMMERCE

(Open Electives-IV**)**

Course objectives:

The Students will :

1. Gain knowledge about the main objective and at the same time need is transaction on your web store. Of, course if you are selling products online what you require are customers. If you are getting good reach ability then your business will definitely grow. Therefore one of the objectives is high reachability.
2. Solve conversions i.e., if people are coming on your web store and purchasing something then it will calculate as conversions and from the number of people who are buying stuff from your web store we can calculate the conversion rate.
3. Provide customer satisfaction i.e., customer is the main part of any e-commerce business so it's very important to make your customer happy and satisfied by providing quality and desirable products, on time delivery, 24*7 customer support, and timely sale & best deal offers you can make your customer happy. It is one of the main objectives of e-commerce.
4. Receive social popularity i.e., unless and until you are not famous and popular among people you cannot establish your brand. Social presence with omni channel and digital marketing is essential for any e-commerce business.
5. Understand the infrastructure for E-Commerce.

UNIT-I:

Introduction, Electronic Commerce Framework, The Anatomy of E-Commerce applications, E-Commerce Business Models.

E-Commerce Consumer applications, E-Commerce organization applications.

UNIT-II:

Consumer Oriented Applications, mercantile process models, mercantile models from the consumer's perspective, Mercantile from the merchant's perspective.

Types of Electronic Payment Systems, Digital Token-Based Electronic Payment Systems, Smart Cards & Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk & Electronic Payment Systems, Designing Electronic Payment Systems.

UNIT-III:

Electronic Data Interchange, EDI Applications in Business, EDI implementation, MIME, and value added networks.

Intra organizational E-Commerce, Macro forces and Internal Commerce, Work flow automation and Coordination, Customization and Internal Commerce, Supply Chain Management(SCM).

UNIT-IV:

Making a business case for a Document Library: Digital document types, Corporate Data warehouses.

Advertising and Marketing: The new age of Information Based Marketing, advertising on Internet, charting the Online marketing process, Market Research.

UNIT-V:

Consumer Search and Resource Discovery, information search and Retrieval, Electronic commerce catalogs or directories, Information Filtering.

Multimedia and Digital video, Key Multimedia concepts, Digital Video & Electronic Commerce, Desktop Video Processing, Desktop Video Conferencing.

Text Books

1. "Frontiers of electronic commerce" – Kalakota, Whinston, Pearson
2. "E-Commerce", S.Jaiswal – Galgotia

References

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison-Wesley.
2. Goel, Ritendra "E-commerce", New Age International
3. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education

Course outcomes:

The Students will be able to:

1. Demonstrate an understanding of the foundations and importance of e-commerce.
2. Demonstrate an understanding of retailing in e-commerce by:
    a. Analyzing branding and pricing strategies,
    b. Using and determining the effectiveness of market research.
    c. Assessing the effects of disintermediation.
3. Analyze the impact of e-commerce on business models and strategy.
4. Describe internet trading relationships including business-to-business, intra-organizational.
5. Describe the infrastructure for E-Commerce.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year – II Semester	**3**	**0-0-0**	**3**

BIG DATA ANALYTICS

(Open Elective-IV)

Course objectives:

The Students will :

1. Understand the basics of Big Data and Big data Platform
2. Attain the knowledge of Big Data analytics, Approaches and Tools
3. Describe MapReduce fundamentals and HDFC File system
4. Differentiate between Hadoop and RDBMS concepts
5. Apply analytics on Structured and Unstructured Data.

UNIT-I

Big Data Analytics : What is big data, History of Data Management ; Structuring Big Data ; Elements of Big Data ; Big Data Analytics; Distributed and Parallel Computing for Big Data;

Big Data Analytics:What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools

UNIT-II:

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

UNIT-III:

Understanding MapReduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop

Introduction of HDFS: Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS

UNIT-IV:

Big Data Technology Landscape and Hadoop : NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors;

HDFC (Hadoop Distributed File System): HDFC Daemons, read,write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN

UNIT-V:

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;
Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools

TEXT BOOKS:

1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black Book™ , DreamTech Press, 2015 Edition.
3. BUSINESS ANALYTICS 5e , BY Albright |Winston

REFERENCE BOOKS:

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss,ShakuAtre, " Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, " Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012

Course Outcomes:
The Students will be able to:

1. Know the basics of Big Data and its environment
2. Achieve the knowledge of Big Data analytics Tools and its Approaches
3. Define MapReduce fundamentals and HDFC Architecture
4. Distinguish between Hadoop and RDBMS concepts
5. Illustrate analytics on Structured and Unstructured Data.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
IV Year II- Semester	**3**	**0-0-0**	**3**

COMPUTER FORENSICS
(Open Elective-IV)

Course objectives:

The Students will :

1. Understand Computer forensics fundamentals.
2. Analyze various computer forensics technologies.
3. Know the principles of effective digital forensics investigation techniques.
4. Identify methods for data recovery.
5. Understand the methods for preservation of digital evidence.

UNIT I

Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensics Technology, Types of Law Enforcement - Computer Forensic Technology - Types of Business Computer Forensics Technology. Computer Forensics Evidence and Capture: Data Recovery Defined- Data Back-up and Recovery- The Role of Back-up in Data Recovery- The Data Recovery Solution.

UNIT II

Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options – Obstacles – Types of Evidence – The Rules of Evidence- Volatile Evidence- General Procedure – Collection and Archiving – Methods of Collection – Artifacts – Collection Steps – Controlling Contamination: The chain of Custody.

Duplication and preservation of Digital Evidence: Preserving the Digital Crime Scene – Computer Evidence Processing Steps – Legal Aspects of Collecting Preserving Computer Forensics Evidence. Computer Image Verification and Authentication: Special Needs of Evidential Authentication – Practical Consideration – Practical Implementation.

UNIT III

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data – hiding techniques, performing remote acquisitions.

Network Forensics: Network Forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honey net project.

UNIT IV

Processing crime and incident scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a

search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.
Current computer forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software.

UNIT V

E-Mail investigations: Exploring the role of E-mail in investigation, exploring the role of the client and server in E-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.
Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.
Working with windows and DOS Systems: Understanding file systems, exploring Microsoft File Structures, Examining NTFS Disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS Startup tasks, virtual machines.

TEXT BOOKS

1. Computer forensics, computer crime investigation by John R.Vacca, Firewall Media, New Delhi.
2. Computer forensics and investigations by Nelson, Phillips Enfinger Steuart, CENGAGE Learning.

REFERENCE BOOKS

1. Real Digital Forensics by Keith J.Jones, Rechard Bejtlich, Curtis W.Rose, Addison-Wesley Pearson Education.
2. Forensic compiling, A Tractitioneris Guide By Tony Sammes and Brain Jenkinson, Springer International Edition.
3. Computer Evidence Collection & Presentation by Christopher L.T.Brown, Firewall Media.

Course Outcomes:

The Students will be able to:

1. Utilize a systematic approach to computer investigations, various forensic tools, and collect digital evidence.
2. Perform digital forensics analysis upon Windows, MAC and LINUX operating systems, email investigations.
3. Analyze and carve image files both logical and physical
4. Explain guidelines for investigation reporting.
5. Apply the implications of anti-forensics to the digital forensics investigator

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech :	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

E-DISASTER MANAGEMENT
(Open Elective-IV)

Course Objectives

The Students will :

1. Explain various disasters and their impacts.
2. Describe storage networking technologies such as FC-SAN, NAS, IP-SAN and data archival solution – CAS.
3. Identify different storage virtualization technologies and their benefits.
4. Understand and articulate business continuity solutions including, backup technologies, and local and remote replication.
5. Identify parameters of managing and monitoring storage infrastructure and describe common storage management activities and solutions.

UNIT - I:

Introduction to Disasters: Information Availability, Causes of Information Unavailability, Measuring Information Availability.

Consequences of Downtime; Failure Analysis, Single Point of Failure, Fault Tolerance, Multipathing Software.

UNIT II:

Backup and Recovery: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations.

Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies.

UNIT - III:

Local Replication: Source and Target, Uses of Local Replica, Data Consistency, Local Replication Technologies, Restore and Restart Considerations Creating Multiple Replicas, Management Interface.

Remote Replication: Modes of Remote Replication, Remote Replication Technologies Network Infrastructure.

UNIT - IV:

Securing the Storage Infrastructure: Storage Security Framework, Risk Triad, Assets, Threats, Vulnerability. Storage Security Domains, Securing the Application Access Domain. Securing the Management Access Domain, Securing Backup, Recovery, and Archive (BURA) , Security Implementations in Storage Networking SAN , NAS, IP SAN.

UNIT - V:

Monitoring the Storage Infrastructure: Parameters Monitored, Components Monitored , Monitoring Examples , Alerts, Storage Management Activities , Availability management , Capacity management , Performance management ,Security Management.

Reporting, Storage Management Examples, Storage Infrastructure Management Challenges, Developing an Ideal Solution, Storage Management Initiative, Enterprise Management Platforms.

Text Books:

1. Information Storage and Management: Storing, Managing, and Protecting Digital Information, Ganesh Rajaratnam,EMC Education Services. Wiley Publications.
2. Executive Guide to Preventing Information Technology Disasters By Richard Ennals. Springer.

Reference Books:

1. Information Management & Computer Security, Port Elizabeth Technikon, Port Elizabeth, MCB UP Ltd.
2. Information Security Management Systems, Godesberger Allee, BSI.

Course Outcomes

The Students will be able to:

1. Apply important storage technologies and their features such as availability, replication, scalability and performance.
2. Show employs project teams to install, administer and upgrade popular storage solutions.
3. Illustrate virtual servers and storage between remote locations.
4. Use the knowledge of Disaster Management Phases.
5. Implement the parameters of managing and monitoring storage infrastructure and describe common storage management activities and solutions.

J. B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

INTRODUCTION TO NEURAL NETWORKS
Open Elective - IV

Course Objectives:
The Students will learn:

1. Understand the differences and similarities neural network, human brain and feedback systems
2. Learn the different learning techniques
3. Familiar with the concept of single layer perceptron and its algorithms.
4. Familiar with the concept of multilayer perceptron and its algorithms
5. Know the self-organisation mapping techniques.

UNIT–I:
Introduction: What is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

UNIT–II:
Learning Process: Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

UNIT–III:
Single layer perceptron's: Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perception-convergence theorem, Relation between perception and Bayes classifier foe a Gaussian Environment.

UNIT–IV:
Multilayer Perceptron's: Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, computer experiment, feature detection.

UNIT-V:
Self –Organization Maps: Two basic feature mapping models, Self-Organization maps, SOM algorithm.

Hopfield models: Hopfield models, computer experiment.

Text Books:

1. Neural networks A comprehensive foundation, Simon Hhaykin, PHI edition.
2. Artificial neural networks-B.Vegnanarayana Prentice Halll of India P Ltd 2005.

References:

1. Neural networks in Computer intelligence, Li Min Fu TMH 2003.
2. Neural networks James A Freeman David M S kapurapearson education 2004.

Course Outcomes:

The Students will be able to:

1. Know differences and similarities between neural network, human brain and feedback systems
2. Get the knowledge of different learning techniques
3. Describe the concept of single layer perceptron and its algorithms.
4. Describe the concept of multilayer perceptron and its algorithms.
5. Analyse the self-organisation mapping techniques.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

B.Tech.	**L**	**T-P-D**	**C**
IV Year - II Semester	**3**	**0-0-0**	**3**

INTRODUCTION TO MINE ENVIRONMENT

(OPEN ELECTIVE IV)

COURSE OBJECTIVES:

The Students will:

1. introduce about atmospheric, mine air & their limitations
2. acquaint with spontaneous heating and explosions in coal mines
3. get idea about sources of dust, and its control in mines
4. get idea about miners' diseases & lighting in mines
5. know about reclamation of mines, impact of mining on environment & sustainable mining

UNIT-I:

Atmosphere and mine air composition. Origin of gases, properties, limitations of gases in underground mines

UNIT-II:

Spontaneous Combustion: Factors, control measures.

Explosions: Causes of firedamp explosion, preventive measures against firedamp explosion.

UNIT-III:

Dust: Sources in underground and opencast mines, standards and control measures.

UNIT-IV:

Miners diseases, Lighting standards in underground and opencast mines**.**

UNIT-V:

Reclamation, plantation of surface mines, Impact of mining on environment & sustainable mining.

TEXTBOOKS:

1. Elements of Mining Technology (VOL-2) – by D.J. Deshmukh.
2. Surface Mining – by S.K. Das.

REFERENCE BOOKS:

1. Mine Ventilation – by G.B. Mishra.

COURSE OUTCOMES:

The student will be able to:

1. Learn about atmospheric and mine air
2. Learn about spontaneous combustion and explosion in coal mines
3. Understand about dust sources and its control in mines
4. Learn about miners' diseases, mine lighting and its standards
5. Learn about reclamation of mines, impacts of mining on environment and sustainable mining