ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

MINING ENGINEERING

B.TECH 4 YEAR UG COURSE

(Applicable for the batches admitted from 2018-2019)

REGULATION: R18

(I, II, III & IV Year Syllabus)

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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 objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions. The Part- B consists of 2 questions each carrying 5 marks. For each question there will be "either" "or" choice.

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 (ΣCP) 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 = { $\sum_{i=1}^{N} C_i G_i$ } / { $\sum_{i=1}^{N} C_i$ } …. 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 = { $\sum_{j=1}^{M} C_j G_j$ } / { $\sum_{j=1}^{M} C_j$ } … 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 (at the end of the under graduate programme) ≥ 8.00, 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

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

	Nature of Malpractices/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 student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	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 that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.

3.	Impersonates any other student in connection with the examination.	The student who has impersonated is expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, is cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End 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	In case of students of the college, they is expelled from examination halls and cancellation of their performance in that

	misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	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.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.

9.	If student of the college, who is not a 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.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the 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 the performance in that subject and all other subjects the student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared for including practical examinations and project work 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

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MINING ENGINEERING - R18

COURSE STRUCTURE

I B.Tech. – I Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1	F110A	Mathematics-I	3	1-0-0	4
2	F112A	Basic Electrical Engineering	3	1-0-0	4
3	F110E	Engineering Physics	3	1-0-0	4
4	F113A	Engineering Drawing & Computer Graphics	1	0-0-4	3
5	F1103	Basic Electrical Engineering Lab	0	0-2-0	1
6	F1105	Engineering Physics Lab	0	0-3-0	1.5
		Total	**10**	**3-5-4**	**17.5**

I B.Tech. – II Semester					
S.No.	**Code**	**Course Title**	**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	F120B	English	2	0-0-0	2
4	F120D	Engineering Chemistry	3	1-0-0	4
5	F1201	English Language & Communication Skills Lab	0	0-2-0	1
6	F1205	Programming for Problem Solving Lab	0	0-4-0	2
7	F1206	Workshop & Manufacturing Practices Lab	1	0-4-0	3
8	F1203	Chemistry Lab	0	0-3-0	1.5
		Total	**12**	**2-13-0**	**20.5**

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

(UGC Autonomous)

MINING ENGINEERING - R18

COURSE STRUCTURE

II B.Tech. – I Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1	F218A	Development of Mineral Deposits	4	0-0-0	4
2	F218B	Mining Geology	4	0-0-0	4
3	F218C	Drilling & Blasting	3	1-0-0	4
4	F218D	Mechanics of Solids	3	1-0-0	4
5	F2131	Machine Drawing Practice	0	0-0-3	1.5
6	F2132	Mechanics of Solids Lab	0	0-3-0	1.5
7	F2161	Mining Geology Lab	0	0-2-0	1
8	F210D	Environmental Sciences	2	0-0-0	0
		Total	**16**	**2-5-3**	**20**

II B.Tech. – II Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1	F220A	Mathematics- III	3	1-0-0	4
2	F228A	Underground Coal Mining Technology	3	0-0-0	3
3	F228B	Mine Surveying-I	3	1-0-0	4
4	F228C	Mine Mechanization	3	1-0-0	4
5	F228D	Mechanics of Fluids & Hydraulic Machines	3	1-0-0	4
6	F2212	Fluid Mechanics and Hydraulic Machinery Lab	0	0-3-0	1.5
7	F2281	Mine Surveying -I Lab	0	0-3-0	1.5
8	F220E	Gender Sensitization	2	0-0-0	0
		Total	**17**	**4-6-0**	**22**

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

(UGC Autonomous)

MINING ENGINEERING - R18

COURSE STRUCTURE

III B.Tech. – I Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1	F318A	Underground Metal Mining Technology	4	0-0-0	4
2	F318B	Mine Surveying-II	3	1-0-0	4
3	F318C	Mine Ventilation	3	1-0-0	4
4	F318D	Mineral Processing	3	0-0-0	3
5	F318E	Mineral Economics	3	0-0-0	3
6	F3181	Mine Surveying - II Lab	0	0-3-0	1.5
7	F3182	Mine Ventilation Lab	0	0-3-0	1.5
8	F3183	Summer Internship	0	0-2-0	1
9		Cyber Security	2	0-0-0	0
		Total	**18**	**2-8-0**	**22**

III B.Tech. – II Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1	F328A	Rock Mechanics	3	1-0-0	4
2	F328B	Mine Legislation	4	0-0-0	4
3		**Open Elective-I**	3	0-0-0	3
4		**Professional Elective-I**	3	0-0-0	3
5		**Professional Elective-II**	3	0-0-0	3
6	F3281	Mineral Processing Lab	0	0-3-0	1.5
7	F3282	Rock Mechanics Lab	0	0-3-0	1.5
8		Artificial Intelligence	2	0-0-0	0
		Total	**18**	**1-6-0**	**20**

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

(UGC Autonomous)

MINING ENGINEERING - R18

COURSE STRUCTURE

IV B.Tech. – I Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1		**Open Elective-II**	3	0-0-0	3
2		**Open Elective-III**	3	0-0-0	3
3		**Professional Elective-III**	3	0-0-0	3
4		**Professional Elective-IV**	3	0-0-0	3
5	F4101	Life Skills and Professional Skills Lab	0	0-4-0	2
6	F4181	Industry Oriented Mini Project	0	0-4-0	2
7	F4182	Project Stage I	0	0-8-0	4
		Total	**12**	**0-16-0**	**20**

IV B.Tech. – II Semester					
S.No.	**Code**	**Course Title**	**L**	**T-P-D**	**C**
1		**Open Elective-IV**	3	0-0-0	3
2		**Professional Elective-V**	3	0-0-0	3
3		**Professional Elective-VI**	3	0-0-0	3
4	F4282	Project Stage II	0	0-16-0	8
5	F4281	Seminar	0	0-2-0	1
		Total	**9**	**0-18-0**	**18**

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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

(UGC Autonomous)

MINING ENGINEERING - R18

PROFESSIONAL ELECTIVE COURSES (PEC)

Professional Elective – I

S.No.	Code	Subject	L	T-P-D	C
1	F328C	Surface Mining Technology	3	0-0-0	3
2	F328D	Sustainable Mineral Industry	3	0-0-0	3
3	F328E	Remote Sensing and GIS in Mining	3	0-0-0	3

Professional Elective – II

S.No.	Code	Subject	L	T-P-D	C
1	F328F	Mine Environmental Engineering	3	0-0-0	3
2	F328G	Planning of Surface Mining Projects	3	0-0-0	3
3	F328H	Geostatistics	3	0-0-0	3

Professional Elective – III

S.No.	Code	Subject	L	T-P-D	C
1	F418A	Mine Health & Safety Engineering	3	0-0-0	3
2	F418B	Solid Fuels and Clean Coal Technology	3	0-0-0	3
3	F418C	Advanced Exploration Techniques	3	0-0-0	3

Professional Elective – IV

S.No.	Code	Subject	L	T-P-D	C
1	F418D	Mine Systems Engineering	3	0-0-0	3
2	F418E	Tunneling Engineering	3	0-0-0	3
3	F418F	Long Wall Mining	3	0-0-0	3

Professional Elective – V

S.No.	Code	Subject	L	T-P-D	C
1	F428A	Mine Planning and Design	3	0-0-0	3
2	F428B	Advanced Mining	3	0-0-0	3
3	F428C	Numerical Modelling in Mining	3	0-0-0	3

Professional Elective – VI

S.No.	Code	Subject	L	T-P-D	C
1	F428D	Mine Ground Control	3	0-0-0	3
2	F428E	Rock Slope Engineering	3	0-0-0	3
3	F428F	Eco-friendly Mining	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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.: MIE	**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: (10L)

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 &EIGEN VECTORS: (10L)

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: (10L)

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'sratiotest;Raabe'stest;Cauchy'sIntegraltest;Cauchy'sroottest;logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT – IV: FIRST ORDER ORDINARYDIFFERENTIAL EQUATIONS: (8L)

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 HIGHERORDER: (10L)

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 $xV(x)$; Method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

TEXTBOOKS:

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 textbook of Engineering Mathematics, Laxmi Publications, Reprint,2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11th Reprint,2010.

Course outcomes:

The student will be 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.: MIE	**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:
The Student will

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 characteristics

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.

TEXTBOOKS :

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill, 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.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.: MIE	**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. Understand the basic concepts and Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
2. Understand the concepts found in Mechanics, Harmonic Oscillations, Acoustics and Ultrasonics, Dielectric and Magnetic Properties, wave Optics, Lasers, Fiber Optics and a broad base of knowledge in physics.
3. Understand the scientific method, so that they may use the training beneficially in their higher pursuits.
4. Learn 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 fibre 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. **(10H)**

UNIT-II: Acoustics and Ultrasonics:

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

Introduction to Ultrasonics, production of Ultrasonics, Piezo Electric method, Properties of Ultrasonic waves, use of Ultrasonics for non-destructive testing**. (10H)**

UNIT-III: Dielectric and Magnetic Properties:

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

Introduction to magnetism, origin of magnetic movement, Bohr Magneton, Classifications of Dia, Para, Ferro, Anti-ferro and Ferri-Magnetic materials on the basis of

magnetic movement, hysteresis loop, soft and hard magnetic materials.**(10H)**

UNIT-IV: Wave Optics:

Huygens' 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 Fresnel and Fraunhofer diffraction , Fraunhofer diffraction from a single slit, Diffraction grating- resolving power, Polarization, Brewster's angle, Double refraction, Nicol's prism**.(10H)**

UNIT-V: Lasers and Fiber 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.

Fiber Optics: Introduction, Construction and working principle of Optical fiber, Acceptance angle, Acceptance cone and Numerical aperture, Types of optical fibers, Applications of optical fibers.

TEXTBOOKS:

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning
2. Engineering Physics, Gaur and Gupta, McGrawHills.
3. Optics, Ajoy Ghatak, 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 Press
4. P.K. Palanisamy, "Engineering Physics", Scitech Publications, Fourth edition.

Course outcomes:

The student will be able to:

1. The knowledge of Physics relevant to engineering is critical for converting ideas into technology.
2. Understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to new innovations and improvements.
3. gain knowledge on the mechanism of physical bodies upon the action of forces on them, the generation, transmission and the detection of the waves, Optical Phenomena like Interference, diffraction, the principles of lasers and Fiber Optics.
4. Various chapters establish a strong foundation on the different kinds of characters of several materials and pave a way for them to use in at various technical and engineering applications.
5. Gain knowledge on Lasers and fiber optics enable the students to come forward to various systems like communications, solar cell, photo cells and so on.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

ENGINEERING DRAWING & COMPUTER GRAPHICS
(Theory and Lab)
(COMMON TO ME, ECE & MIE)

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 graphic tools 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(2Lecture 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:ORTHOGRAPHICPROJECTIONSAND 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 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:ISOMETRICANDORTHOGRAPHIC 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)

TEXTBOOKS :

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), TEXTBOOK on Engineering Drawing, Scitech Publishers
2. Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication.

Course outcomes:

The student will be able to:

1. Able to understand engineering drawing and its place in society
2. Exposed to the visual aspects of lines and planes
3. Exposed to visualization of solids
4. Exposed to representation of 3D objects through isometric and orthographic views
5. Exposed to use modern tools for engineering graphics.

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UGC AUTONOMOUS

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

BASIC ELECTRICAL ENGINEERING LAB
(COMMON TO CE, ME, CSE & 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.

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 transformers: 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 be able to:

1. Get an exposure to basic electrical laws.
2. Relate the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters
4. Inspect the basic characteristics of transformers
5. Inspect the basic characteristics of Dynamic electrical machines.

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

ENGINEERING PHYSICS LAB
(COMMON TO CE, ME &MIE)

Course Objectives: The Student will

1. Demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
2. Demonstrate competency and understanding of the concepts found in Mechanical, Electric and Electronic materials a broad base of knowledge in physics.
3. Solve Experimental problems that potentially draw an experimental knowledge in multiple areas of physics.
4. Study applications in engineering like Hall effect, in the field of magnetic materials.
5. Study applications in engineering like Optical fiber, LASER, Photodiode and Solar cell

List of Experiments

1. Melde's experiment:
   To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.
2. Torsional pendulum:
   To determine the rigidity modulus of the material of the given wire using torsional pendulum.
3. Newton's rings:
   To determine the radius of curvature of the lens by forming Newton's rings.
4. Diffraction rating:
   To determine the number of lines per inch of the grating.
5. LCR Circuit:
   To determine the Quality factor of LCR Circuit (Series& Parallel).
6. Stewart's and Gee's Method:
   To determine the Magnetic induction by using circular coil.
7. Sonometer:
   To determine the frequency of AC Supply sonometer.
8. LASER:
   To study the characteristics of LASER sources.
9. Dielectric constant:
   To determine the Dielectric constant of the given material.
10. Optical fiber:
    To determine the Numerical aperture of a given fiber.

NOTE: Any 8 experiments are to be performed

TEXTBOOKS:

1. "Experiments in Engineering Physics" (Physics Lab Manual 4th edition) , Dr. Narendra, L. Mathakari.
2. " Engineering Physics Lab Manual" By Department of Physics JBIET.

Course outcomes:

The student will be able to:

1. Learn the experimental concepts on in Mechanical, Electric and Electronic materials.
2. Get the knowledge of fundamentals of Semiconductor physics, Lasers and fiber optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
4. Exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
5. Be exposed to the phenomena of opto-electronic materials for better in the scientific world.

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UGC AUTONOMOUS

B.Tech.: MIE	**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)

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 – I: CALCULUS (10L)

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) (8L)

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

UNIT – III: MULTIVARIABLE CALCULUS (INTEGRATION)(10L)

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 parallelepiped).

UNIT – IV: VECTOR DIFFERENTIATION (10L)

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(10L)

Line, Surface and Volume Integrals.

Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXTBOOKS:

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 TEXTBOOK of Engineering Mathematics, Laxmi Publications, Reprint, 2008.G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2010.

Course Outcomes:

The student will be 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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UGC AUTONOMOUS

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

(F125A) PROGRAMMING FOR PROBLEM SOLVING
(Common to CE,ME,CSE,IT& MIE)

Course Objectives:
The Student 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 memory, 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 line arguments 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, undef, if, ifdef, ifndef.

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 – 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

TEXTBOOKS:

1. Reema Thareja, Programming in C, Oxford university press.
2. B.A. Forouzan and R.F. Gilberg, C Programming and Data Structures, C engage 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:

At the end of the course, 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.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

ENGLISH

Course Objectives: The students 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 inOral 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

TEXTBOOKS:

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 be able to:

1. Find the nature of diffraction and use LSRW skills in his day to day life conversations.
2. Implement in the construction field.
3. Design different models in manufacturing jeans.
4. Discuss balanced eating habits with everyone.
5. Implement in their own life.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

ENGINEERING CHEMISTRY

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 orbitals. Linear Combination of Atomic Orbitals (LCAO),molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N2,O2, F2, CO and NO. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals 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 complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonation. 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 SN1, SN2reactions. 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 alkyl halides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid. Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

TEXTBOOKS:

1. Engineering Chemistry by P. C. Jain & M. Jain; DhanpatRai PublishingCompany (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 andM.S. Krishnan.

REFERENCES:

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

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 course will enable the student to:

The student 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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UGC AUTONOMOUS

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

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course Objectives:
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.

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:I ntonation-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 GeneraDetails.
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:
1. **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 be able to:

1. Analyze and use correct pronunciation.
2. Make use of stress and intonation properly while speaking and writing.
3. Tell the answers effectively after listening
4. Describe him and others in day to day life situations.
5. Improve in handling debates and oral presentation.

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

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Objectives:
The Student 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. To 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.

c) 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 quince.

d) 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

e) 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.

c) 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 and without a meaning like madam, civic, noon, abcba, etc.)

b) 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 geometric progression: 1+x+x^2+x^3++x^n. For example: if n is 3 and x is 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 function 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 a to i 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 f seek 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 into 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 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:

At the end of the course, 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.: MIE	**L**	**T-P-D**	**C**
I Year -II Semester	**1**	**0-4-0**	**3**

WORKSHOP & MANUFACTURING PRACTICES

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 (1 hour)
7. Welding (arc welding & gas welding), brazing (1 hour)

(II) WORKSHOP PRACTICE: 60 hours

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

Course outcomes:

The student will be able to:

1. Design components with their own hands.
2. acquire practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. Develop small components of their interest by assembly
4. Identify the tools used in workshop & different trades
5. analyze the performance machining works using the required machines and tools

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

(F1203) CHEMISTRY LABORATORY
(Common to CE, ME,CSE,IT &MIE)

Course Objectives:
The Student will

1. Estimate the hardness & chloride content in water to check its suitability for drinking purpose.
2. Determine the rate constant of reactions from concentrations as a function of time.
3. Gain the knowledge about measurement of physical properties like adsorption and viscosity.
4. 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

LIST OF EXPIREMENTS

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 Fe2+ by Potentiometry using KMnO4
7. Estimation of amount of Cu+2 by Colorimetry
8. Estimation of amount of KMnO4 by Colorimetry
9. Synthesis of Aspirin and Paracetamol
10.Determination of acid value of coconut oil
11. Thin layer chromatography calculation of Rf values. ortho 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.

Course outcomes: On Completion of the course students will be able to

1. Determination of parameters like hardness and chloride content in water.
2. Estimate of rate constant of a reaction from concentration – time relationships.
3. Determine of physical properties like adsorption and viscosity.
4. Calculate of R_f 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.: MIE	**L**	**T-P-D**	**C**
II Year -I Semester	**4**	**0-0-0**	**4**

DEVELOPMENT OF MINERAL DEPOSITS

Course Objectives:

1. The course aims at making students to understand the distribution of mineral deposits in India and & introduction to mining methods.
2. To Introduce drilling and blasting for development of mineral deposits by underground and opencast mining methods.
3. To learn about supporting system in underground mines.
4. To learn about how to access a mineral deposit by shafts.

UNIT-I

Introduction to Mining: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology, stages in the life of the mine, introduction to underground and surface mining methods.

UNIT-II

Drilling: Introduction to drilling, factors affecting drilling, types of drilling, drillability, mechanics of drilling, directional drilling, and drilling equipment – selection, their merits, demerits and limitations. Different drilling patterns, Core recovery-core barrels.

Blasting: Fundamentals of Explosive and blasting mechanism, techniques-Primary and Secondary blasting, Solid blasting. Different types of explosives-their applications. Accessories in blasting – Detonators, safety fuse, detonating fuse, non-el, relays, exploder etc.

UNIT-III

Mine Supports: Necessity, Objectives and limitations of mine supports, materials used for supports. Friction and hydraulic props, Roof bolts, chock supports, Roadway support, face supports, side supports, junction supports,
supports in special conditions, setting and withdrawal of supports, systematic supporting

UNIT-IV

Mine Development: Modes of entry into deposits for underground mining- shafts, inclines, adit setc – their fields of applications. Drivage of drifts, organization and cycle of operations, modern methods of drifting and tunneling, road headers, tunnel boring machine.

UNIT-V

Shafts: Location of shaft, shape and size, incline and vertical shafts. Surface arrangements for sinking shafts, tools and equipment, ordinary methods of sinking, drilling, blasting, removal of debris and water, ventilation and lighting, temporary and permanent lining. Widening and deepening of shafts, special methods of shaft sinking: piling, caisson, freezing and cementation method of shaft sinking. Modern techniques of shaft sinking.

TEXTBOOKS

1. Introductory mining engineering- Wiley India (P) Ltd, Howard L. Hartman, Jan M. Mutmansky.
2. Elements of mining technology Vol-I - D.J. Deshmukh

REFERENCE BOOKS:

1 Principles & Practices of Coal Mining, R.D. Singh

2. Roy Pijush Pal, Blasting in ground excavations and mines, Oxford and IBH, 1st ed 1993

3)C.P. Chugh, Drilling technology handbook, Oxford and IBH, 1st edition, 1977

Course outcomes: Students will be able

1. Understand the fundamentals of drilling and blasting for underground and opencast mining.
2. Get the knowledge about supporting systems in underground mines.
3. To Gain knowledge about development of mines.
4. Get knowledge about how to access a mineral deposit by shafts.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINING GEOLOGY

Course Objectives:

1. The course aims at introducing structure geology like faults, folds & joints.
2. To Introduce about theeconomics of geology
3. To learn about processes and formation of ore deposits
4. To learn about occurrence and distribution of important metallic &non-metallic mineral deposits in India
5. To learn about formation of some fossil fuels like coal, petroleum &occurrence of radioactive minerals in India.

UNIT-I

Structural Geology: Definition and scope-Primary and secondary structures: Bedding, lineation, foliation, cleavage, Attitude of beds, Strike and dip of formation. Description and recognition of major structural elements

Folds: Introduction, parts of folds. Nomenclature of folds: Folds: Anticline, Syncline, Symmetrical fold, asymmetrical fold, overturn fold, recumbent fold, Isoclinal fold, homoclinal fold, closed and open folds, drag folds.

Joints: Introduction, definition, Geometrical classification of Joints.

Faults: Introduction, general Characteristics, translational and rotational movements, relative movements, normal and reverse faults. Throw and Heave. Types of faults: Dip Fault, strike fault, diagonal/oblique fault, bedding fault, parallel fault, step fault. Horst and Graben.

Unconformities: Introduction, Kinds of unconformities, recognition of unconformities.

UNIT II

Economic Geology: Aim and scope of economic geology: Definition of ore and gangue. Simple ore, complex ores, tenor, and grade of ore.

Processes and formation of ore deposits: Syngenetic deposits, epigenetic deposits.

Secondary mineral deposits: Oxidation and supergene enrichment deposits, - Mechanical concentration deposits, residual/concentration deposits.

UNIT III

Occurrence and distribution of important metallic mineral deposits in India: Iron– Copper - Lead and Zinc – Manganese – Aluminum – Chromium.

Occurrence and distribution of important nonmetallic mineral deposits in India: Asbestos – kyanite –Sillimanite

UNIT - IV

Coal: Origin and formation, Distribution of important coal fields in India,

Petroleum: Origin, migration, and accumulation of petroleum. Reservoir and caprocks. Structural and stratigraphic traps. Distribution of oilfields in India.

Occurrence and distribution of radioactive minerals in India: Uranium, Thorium, and beryllium.

UNIT V:

Guides for locating ore deposits: a) Physiographic b) Mineralogical c) Lithological d) Stratigraphical and e)structural methods of prospecting. Geological, Geochemical, and geophysical prospecting.

Ground Water: Introduction, Hydrological Cycle, origin and occurrence of ground water, vertical distribution ground water, water table.

Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers. Porosity and permeability of rocks, Darcy's law, experimental verification of Darcy's law. Determination of hydraulic conductivity: Laboratory methods and Tracer Tests and Auger hole Tests.

TEXTBOOKS:

1. Structural Geology – Billings, M.P. Prentice Hall.
2. Economic Mineral Deposits - By Batman, John Wiley & Sons.

REFERENCE BOOKS:

1. Economic Mineral Deposits – By Jensen M.L and Batman A.M, John Wiley & Sons.
2. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.
3. Ground Water Hydrology – By David Keith Todd, Wiley India

Course outcomes: Students will be able

1. Understand the fundamentals of structure geology and its well acquainted with its terminology.
2. Get knowledge about economic geology and process of formation of mineral deposits.
3. Get the knowledge about different formations of ore
4. Distinguish metallic and non-metallic minerals
5. Get knowledge about formation of fossil fuels and occurrence of radioactive minerals

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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II Year -I Semester	**3**	**1-0-0**	**4**

DRILLING & BLASTING

Couse objectives:

1. To familiarize the students with exploratory and production drilling including the factors affecting drilling.
2. To familiarize the students about various factors & mechanics of drilling.
3. To introduce students about explosive and accessories and tools used in underground and opencast mining.
4. To introduce about underground blasting patterns
5. To learn various types of the explosives and blasting techniques used in underground and opencast mining are also explained besides blasting in civil constructions projects.

UNIT-I

Exploratory Drilling: Drilling for Exploration and other purposes; Various types of drilling equipment-Their merits, demerits and limitations; core recovery-single and double tube core barrels, wire line drilling, Directional Drilling, Fishing tools, Bore hole surveying, Bore Hole Logging, Novel and special drilling techniques, Horizontal and Directional Drilling.

Production Drilling: Various methods of drilling-Percussion, Rotary and Rotary Percussive Drilling.

UNIT-II

Drillability: Factors affecting drilling-Thrust, RPM, Flushing etc., Mechanics of drilling: Drillability and Drilling Index, Micro Bit Drilling, Physico-mechanical Properties effecting drillability, Design and Selection of Drills, Bit wear, Reconditioning of Drill Bits; Drill Hole Economics, Case Studies.

UNIT-III

Explosives: Types of Explosives-Small Diameter, Large Diameter. Permitted, Bulk Slurry, SMS, EMS, ANFO, HANFO, LOX, Boosters, Blasting Agents, Mechanics of Blasting, Alternatives to Explosives.

Accessories and Tools: Accessories, Detonators, Safety Fuses, Detonating Cords, Relays, NONEL, Exploders, sequential Blasting Machines and other Short Firing Tools, Testing Explosives, Storage, Transpiration and Handling of Explosives.

UNIT-IV

Under Ground Blasting: Drill Patterns for Underground Excavations, Shafts, Blast Pattern designs, Smooth Blasting, Induced Blasting, Charge Ratios, Rock Fragmentation, Dangers associated with underground blasting, Blasting Economics, Gallery Blasting, Statutory Requirements, Computer Design of Underground blast, Precautionary Measures, Mis fires, Solid Blasting.

UNIT-V

Open Pit Blasting: Methods of blasting in Open Cast Mines, Blast Design, Primary and Secondary Blasting, Fragmentation Studies, Accidents due to Blast in Open Cast and Preventive Measures. Environmental Impact due to Blasting, Ground Vibrations, Fly Rocks, Dust, Fumes, Water Pollution, Dimensional Stone Blasting, Control Blasting, Statutory Requirements, Computer Design of Open Cast Blast.

Blasting for Civil Construction and Trenches: Blasting for Road Constructions, Trenches Cutting in soft and Hard Rocks, Demolition of Building Etc., Under Water Blasting.

TEXTBOOKS:

1. Roy Pijush Pal, Blasting in Ground Excavations and Mines, Oxford and IBHPublications, 1 Edition, 1993
2. C.P.Chugh, Drilling Technology handbook, Oxford and IBH, 1 Edition, 1977.

REFERENCE BOOK:

1. Roy Pijjush Pal, Rock Blasting effect and operation, A.A.Balkema, 1 Edition, 2005.
2. D.J.Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001
3. B.Hamphill Gary, Blasting Operations, Mc Graw Hill, 1 Edition, 1981.

Course Outcomes: The course will enable the student to:

1. Understand the fundamentals of exploratory and production drilling
2. Get knowledge about Drilling mechanism and factors effecting drilling.
3. Get the knowledge about different blasting patterns used in underground mining
4. Understand about blasting in open pit mining.
5. Get knowledge about Blasting for Civil Construction and Trenches

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.: MIE	**L**	**T-P-D**	**C**
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MECHANICS OF SOLIDS

Course Objectives: The student will

1. Understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviours due to different types of loading will be discussed.
2. Understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their location
4. Understand how to calculate normal and shear stresses

UNIT – I

Stresses in axially loaded members, Bars of uniform & varying section – composite bars – Temperature stresses**.**

UNIT - II

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

Deflection of Beams: Deflection of Beams: Introduction- Relation between slope, deflection and radius of curvature- Deflection and slope of a beam subjected to uniform bending moment, Deflection of a simply supported beam carrying a point load at the center, eccentric point load, and a uniformly distributed load. Deflection by using Double integration method, Macauly's method, moment area method and strain energy method.

UNIT-III

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, Tangle sections.

UNIT - IV

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

UNIT - V

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations : $T/J = q/r = N\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure

Thin 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. Thick Cylinders-Lami'sequations, Compound cylinders.

TEXTBOOKS:

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A.Nash,TMH

REFERENCE BOOKS

1. Strength of Materials -By Jindal,Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd.
6. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd
7. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.

Course Outcomes:

1. Analyze the behaviour of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods.
4. Analyze and interpret laboratory data relating to behaviour of structures and the materials they are made of.
5. Expectation and capacity to undertake lifelong learning

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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II Year -I Semester	**0**	**0-0-3**	**1.5**

MACHINE DRAWING PRACTICE

Course Objectives: The student will

1. Understand drawing and develop capacity to represent any object / matter with the help of graphical representation.
2. Develop primary knowledge of working drawing.
3. Produce drawings with orthographic projections of different machine parts.
4. Develop skill to produce assembly drawings.

Machine Drawing Conventions :

Need for Machine Drawings – Introduction to SI Conventions – Introduction to types of Drawings and working Drawings for Machine Parts.

a) Conventional representation of Materials, Common Machine Elements and Parts such as Screws, Nuts, Bolts, Keys, Gears, Bearings, Springs, etc.
b) Types of Sections – Selection of sectional planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centre lines, curved and tapered features.
d) Title boxes - size, location and details - common abbreviations in general usage.

I. Drawing of Machine Elements and Simple Parts

Selection of Views, additional views for the following machine elements and parts with easy drawing proportions.

a. **Screw Threads and Fasteners** - Popular forms of Screw Threads, Bolts, Nuts, Stud Bolts, Tap Bolts, Set Screws.
b. **Keys** – Saddle Keys, Sunk Keys, Feather Keys, Woodruff Keys, Splines
c. **Cotter Joints** – with Sleeves, with Socket and Spigot ends, with Gibs
d. **Pin Joints** – Knuckle Joints
e. **Riveted Joints**: Various types of Riveted Joints for plates.
f. **Welded Joints:** Various types of Welded Joints and Symbols.
g. **Shaft coupling** – Sleeve or Muff Couplings, Flanged Couplings, Universal Couplings, Oldham Coupling.
h. **Pipe Joints**: Cast Iron Pipe Joints, Joints for Hydraulic Pipes, Pipe Fittings.
i. **Pulleys**: Flat Belt Pulleys, 'V' – Belt Pulleys, Rope Pulleys.
j. **Bearings:** Journal Bearings – Solid, Bushed and Collared Journal Bearings, Pivot or Foot-Step Bearings.

II. AssemblyDrawings:

Drawings of Assembled Views for the part drawings of the following using conventions and easy drawing proportions**.**

a) **Engine Parts:** Steam Engines: Stuffing Box, Cross Head, Eccentric. Petrol Engine: Connecting Rod, Piston Assembly.

b) **Other Machine Parts:** Screws Jack, Plain Machine Vice, Plummer Block, Tailstock.

c) **Valves**: Gate Valve, Screw-down Stop Valve, Spring Loaded Safety / Relief Valve, Feed Check Valve and airlock.

TEXTBOOKS:

1. Machine Drawing: K.L.Narayana, P.Kannaiah & K. Venkata Reddy; New Age Publishers, 5th Edition,2016.
2. Machine Drawing: N.D. Bhatt; Charotar Publications, 47th Edition,2012.

REFERENCE BOOKS:

1. Machine Drawing : Ajeet Singh; TMH Publications, 4th Edition,2010
2. Machine Drawing: P.S.Gill; Kataria Publications, 16th Edition,1996
3. Machine Drawing: Junarkar N.D; PearsonPublication,2009

Course Outcomes:

1. Analyze complex design and drawing systems related to Mechanical Engineering.
2. Make use of appropriate drawing practice tools and design innovative methods.
3. Get motivated to develop new innovative.
4. Improve the ability to work as teams.

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UGC AUTONOMOUS

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

MECHANICS OF SOLIDS LAB

Course Objectives: The student will

1. Understand basic knowledge on the mechanical behavior of materials like aluminum, mild steel, and cast iron.
2. Adopt with the experimental methods to determine the mechanical properties of materials.

LIST OF EXPERIMENTS

1. Tension test
2. Torsion test
3. Spring test
4. Impact test:
   i) Izod Impact ii) Charpy Impact
5. Compression test
6. Hardness test:
   i) Rockwell Hardness ii) Brinnel's Hardness
7. Deflection of Beams:
   i) Cantilever Beam ii) Simply supported Beam
8. Shear test using UTM

Course Outcomes:

1. Identify microstructures and wear properties of engineering materials.
2. Examine the defects in the materials by non-destructive testing
3. Test the important mechanical properties of ferrous and non-ferrous materials.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINING GEOLOGY LAB

Course Objectives: The student will understand

1. The geological concepts, processes, materials, and phenomena are well understandable in the field rather than in the classroom.
2. The important minerals and rocks, models of geological structures.
3. The maps of different kinds in the laboratory.

LIST OF EXPERIMENTS

1. Study of following physical properties: Odour, Streak, Cleavage, Fracture, Lustre, Specific Gravity, Magnetism & Electricity
2. Study of minerals exhibiting Mohs scale of hardness.
3. Megascopic study and identification of important rock forming mineral specimens.
4. Megascopic study and identification of important metallic ores.
5. Megascopic study and identification of important non-metallic ores.
6. Megascopic study and identification of important igneous rocks.
7. Megascopic study and identification of important Sedimentary rocks.
8. Megascopic study and identification of important metamorphic rocks.

Course Outcomes: At the end of the course, students will be able to:

1. Identify the properties of rock forming and ore forming minerals.
2. Determine the strike and dip of planar features by Clinometer Compass.
3. Identify the folds, faults and unconformities.
4. Understand the importance and uses of topographic and geological maps in the mining profession
5. 5. Understand the unconfined compressive strength of important rocks.

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UGC AUTONOMOUS

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

ENVIRONMENTAL SCIENCES

Course Objectives:

1. Know the importance of Environment is a key to the future of humankind.
2. Global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues
3. Study of environmental studies encourages students to explore the social, aesthetic, ethical, scientific, and technical aspects of environmental issues.
4. Students can apply modelling to understand the behaviour make predictions for future and plan management in view of changing environmental conditions

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.

TEXTBOOKS:

1. TEXTBOOK of Environmental Science and Technology by M.AnjiReddy2007
2. Principles of Environmental Science and Engineering by P. Venugopal Rao.
3. Introduction to Environmental Studies by K. Mukkanti
4. TEXTBOOK of Environmental studies by Kaushik & Anubha kaushik

REFERENCE BOOKS:

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

Course outcomes: After completing the course the students will able to

1. Understand the importance of natural resources and use them efficiently and knowing how to conserve the biodiversity.
2. Imply environmental plan in developing any environmental projects.
3. Apply the environmental legislation in every walk of life and reserve the natural resources for future generations in sustainable manner.

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UGC AUTONOMOUS

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

MATHEMATICS-III

Course Objectives: The student will

1. Learn basic properties of probability and random variables
2. Understand different types of hypothesis and hypothesis testing
3. Learn 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 (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 SECOND ORDER

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

TEXTBOOKS:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna publications, 42nd edition2012
2. Advanced Engineering Mathematics by Jain and S.R.K. Iyangar, Narosa Publications.
3. Numerical Methods by T.K.V. Iyenga r& B.Krishna Gandhi & Others, S.Chand

REFERENCE BOOKS:

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

Course outcomes: After completion of this course the student 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
5. Form to form first order PDE and solution of PDE

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

UNDERGROUND COAL MINING TECHNOLOGY

Couse objectives:

1. To introduce students about coal mine planning and development of unconventional mining methods.
2. To familiarize the students about conventional coal mining methods and machinery associated with it
3. To introduce students about coal extraction with pillar designing.
4. To acquaint students about longwall mining layout.
5. To learn about longwall mining development & mechanisation

UNIT-I

Introduction to Mine Planning; Size of mining property, reserves and production capacity. Opening of Deposits; Developments of mine for in-seam mining and horizon mining (including shaft pillar and their comparison, advantages and disadvantages), division into levels and districts

UNIT-II

Development; General principle of Bord & Pillar Development, their choice, suitability, advantages and disadvantages, layout of Bord & Pillar panel, size of panel, statutory provisions, manual and mechanized system of development: conditions suitable for application of mechanized loader and continuous miners; factor affecting the selection of equipment.

UNIT-III

Pillar Extraction: preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district. Factors affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety.

UNIT-IV

Layout for required outputs, types of machines, personnel and working of thick seams and blasting gallery method. Longwall mining: Longwall methods of working, their choice, suitability, advantages and disadvantages.

UNIT-V

Layout of the workings for the required output, length and orientation of longwall faces, Shape & size of development roadways and gate roads and their maintenance. Mechanized longwall face organization. Mechanized extraction of longwall panel with shearer and plough trepanner; support systems of longwall face and gate roads.

TEXTBOOKS:

1. R.D. Singh – Principles and Practices & Modern Coal Mining, New Age International Publication.
2. Singh, T.N. Singh – Underground Mining & Coal Oxford Publication.

REFERENCE BOOKS:

1. Peng S.S., Chiang H/S. – Longwall mining, John Willey Publication.
2. Mathur S.P. – Mine Planning for Coal, M.J Consultant Publication.
3. Das S.K. – Modern Coal Mining Technology, Lovely Prakashan publication.

Course Outcomes: The course will enable the student to:

6. Understand the fundamentals of mine planning and development
7. Distinguish conventional and unconventional mining methods for extraction of coal deposits.
8. Get the knowledge about different coal extraction procedure
9. Get acquainted with basic longwall mining method
10. Get knowledge about machinery used for development in longwall mining of coal deposits

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

MINE SURVEYING-I

Couse objectives:

1. To introduce students about basics of surveying.
2. To familiarize the students with levelling & contouring
3. To introduce students about determination of area and volumes
4. To acquaint student with theodolite operation and application in surveying
5. To learn about various surveying instruments for surveying

UNIT-I

Overview of Plane Surveying (Chain, compass, and plane table), Objectives, Principles and classifications, use of Field Books.

Distance and Directions: Distance measurements conventions and methods. Use of chain and compass, electronic distance measurements, meridians, Azimuths and Bearings, declination, computation of angles.

UNIT-II

Levelling: Levelling Instruments – component parts, Temporary and Permanent adjustments – methods of levelling – Fly levelling, Differential levelling, Reciprocal levelling.

Contouring: Characteristics and uses of contours, methods of conducting contour surveys – their plotting, contour gradient.

UNIT-III

Areas from field notes, computation of Areas along irregular boundaries and regular boundaries. Embankments and cuttings, determination of capacity of reservoir, volume of borrow pits.

UNIT-IV

Theodolite – description – parts, Temporary and Permanent Adjustments, Measurement of horizontal and vertical angles, Principles of Electronic Theodolite, Trigonometric levelling

UNIT-V

Traversing: Principles of Traversing, open traverse and closed traverse using chain /compass / Theodolite, Plotting and its methods. Closing error-adjustments, different corrections- axis method, Bowditch method, graphical method, Transit method.

Triangulation: Principles of triangulation survey, procedure of triangulation, Base line measurement.

TEXTBOOKS:

1. Surveying **–** Theory and Practice by S.S. Bavikatti
2. Mine Surveying Vol.1,2 & 3 By S. Ghatak

REFERENCE BOOKS:

1. Arthur R. Benton and Philip J Taetly, Elements of Plane Surveying, McGraw Hill- 2000
2. Arora K R Surveying Vol 1 & 2 & 3, Standard Book House, Delhi, 2004.
3. Chandra A M, Plane Surveying, New age International Pvt. Ltd., Publishers, New Delhi, 2002.

Course Outcomes: The course will enable the student to:

6. Understand the fundamentals of surveying
7. Understand the fundamentals of levelling and contouring
8. Calculate areas and volumes of pits
9. Get knowledge about theodolite
10. Get knowledge about traversing and triangulation by using compass, chain and theodolite.

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UGC AUTONOMOUS

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

MINE MECHANIZATION

Unit-I

Prime Mover for Mining Machinery: O.C. engine, hydraulic power, pneumatic power, elements of mechanical power transmission – gear, belt, chain, coupling, clutch and brake.

Rope haulage: Construction of the wire ropes, rope haulages – gravity, direct, balanced direct, main & tail, endless, reversible endless, Suitability of these haulages and their limitations. Dimension of ropes, drums and pulleys, care and maintenance of ropes, changing of haulage ropes, rope splicing, and safety appliances in haulage road, signaling, Statutory requirements of haulages.

Unit-II

Mine Winders: Winding Drum-types and construction, Koepe and Drum winders and their applications, head gear, head gear pulley, shaft fitting – Keps, rope guides, shaft sinking and bells, capping and recapping, cage and suspension gear.

Safety devices in winders-over speed and over wind preventers, slow breaking, depth indicator, Methods of counter balancing rope. Duty cycle. Mechanical and electrical braking. Winding from different levels in shaft.

Unit-III

Man riding system in underground mines. Face Machinery: SDL & LHD – their applications, capacity, operation, fitting, control, and maintenance. Cutter loaders – Shearers, Coal plough and Continuous Miners – their constructional features, applications, capacity, and maintenance.

Unit-IV

Conveyors: Principle types and their operations, installation, shifting, maintenance and applicability, shuttle cars, stage loaders, bridge conveyors, capacity. Aerial Ropeways: Types, construction, Application and operation

Pumps: Types, Construction, operation, characteristics and application, Calculation of size, efficiencies, and capacities. Layout of drainage system.

Unit-V

Drills for Coal and Stone: Various types, their construction and maintenance, Jumbo drills.

Opencast Machinery: Blast Hole Drill, Ripper, Shovel, Dragline, Dumper, Bucket Wheel Excavator, surface Miner – their basic construction, applications, and operation.

Textbooks

1. Deshmukh D.J., Vol. I, II & III Elements of Mining Technology
2. Alemgren G. Kumar – Mine Mechanization and Automation.
3. Introductory Mining Technology – HL Hartman

Reference Books

1. Mason – Coal Mining Series
2. Cherkasky B.M., Pumps Focus Compressors Walkar wending & Transport

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UGC AUTONOMOUS

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

MECHANICS OF FLUIDS & HYDRAULIC MACHINES

Course Objectives:
This course will enable students to:

1. Understand the physical properties of fluids, influence on fluid motion, types of pressures and measurement of pressure.
2. Understand the Kinematics and Dynamics of fluids, different types of flows, Equation of Continuity, Euler's and Bernoulli's equations, Momentum equation and its application
3. Study the Concept of Boundary Layer, Closed conduit flow, pipes in series and parallel, Measurement of flow using Pitot tube, Venturimeter.
4. Learn the principle, operation and performance of different types of hydraulic machines.
5. Acquire sufficient knowledge on working and performance characteristics of Centrifugal pumps and Reciprocating pumps

UNIT 1
Fluid Statics: Dimensions and units – physical properties of fluids – specific gravity – viscosity and surface tension –Vapour pressure and their influence on fluid motion – buoyancy.
Pressure Measurement: Atmospheric, gauge and vacuum pressures – measurement of pressure – Piezometer, U-tube and differential manometers.

UNIT 2
Fluid Kinematics: Stream line, path line and streak lines and stream tube – classification of flows – steady and unsteady, uniform and non-uniform, laminar and turbulent, rotational and irrotational flows – equation of continuity for one dimensional flow and three-dimensional flows.
Fluid Dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line – momentum equation and its application on pipe bend.

UNIT 3
Closed conduit flow: Reynold's experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line – hydraulic gradient line. Measurement of flow: pitot tube, venturi meter, and orifice meter, Flow nozzle.
Boundary Layer Concepts: Definition – thicknesses – characteristics along thin plate – laminar and turbulent boundary layers (No derivation), boundary layer in transition -separation of boundary layer – submerged objects – drag and lift.

UNIT 4
Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes – jet striking centrally and at tip – velocity diagrams, work done and efficiency – flow over radial vanes.

Hydraulic Turbines: Classification of turbines – Heads and efficiencies – impulse and reaction turbines – Pelton wheel – Francis turbine and Kaplan turbine – working proportions – work done, efficiencies – hydraulic design –draft tube theory, functions and efficiency.
Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities – characteristic curves – governing of turbines – selection of type of turbine – cavitation – surge tank –water hammer.

UNIT 5
Centrifugal pumps: Classification – working –work done – barometric head – losses and efficiencies – specific speed – performance characteristic curves – NPSH.
Reciprocating pumps: Working – Discharge – slip indicator diagrams.

Text Books:

1. Dr. P.N. Modi, Dr. S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulics Machines", Standard Book House, 20thEdition, 2015.
2. Er. R.K. Rajput, "Fluid Mechanics and Hydraulic Machines", S. Chand Publications, 6thEdition.

Reference Books:

1. Dr. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", KATSON Publications, 2012
2. D. Rama Durgaiah, "Fluid Mechanics and Machinery", New Age International (P) Ltd, Publishers, Reprint 2004.
3. T.R. Banga, S.C. Sharma, "Hydraulic Machines", Khanna Publishers, 16th Edition, 2016

Course Outcomes:
On completion of the course, the students will be able to:

1. **Understand** the basics of Fluid Properties and evaluate numerical problems on the measurement of pressure.
2. **Apply** the various equations such as the Continuity equation, Euler's and Bernoulli's equations, Momentum equation, etc., to analyse the Kinematics and Dynamics of fluids and solve concern numerical problems
3. **Apply** the concepts of laminar and turbulent boundary layers in closed conduit flow and solve concern numerical problems.
4. **Analyse** the working of Hydraulic Turbines, solve the numerical problems concerning the hydraulic Turbine.
5. **Analyse** the working of Centrifugal pumps, Reciprocating pumps and Solve numerical problems concerning the pumps.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Objectives:

1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flow through pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

LIST OF EXPIREMENTS

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
EXPERIMENT 4: Determination of Coefficient of discharge for a mouthpiece
EXPERIMENT 5: Determination of friction factor of a pipe.
EXPERIMENT 6: Verification of Bernoulli's theorem.
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:

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyse a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
4. To select and analyse an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINE SURVEYING -I LAB

Course Objectives:

1. To familiarize with the various surveying instruments.
2. To familiarize with the various surveying methods.

LIST OF EXPIREMENTS

1. Ranging a line, measuring the distance between two points, pacing.
2. Chain triangulation, booking, calculation of areas and plotting.
3. Traversing with compass.
4. Calculation of RL's – Simple Levelling Technique.
5. Fly levelling & Reduction of levels using Rise & Fall method and Height of instrument methods.
6. Profile levelling and plotting the section.
7. Contouring
8. Calculation of volume of a dump using reduced levels.
9. Measurement of Horizontal angle.
10. Measurement of vertical angle.
11. Theodolite traversing.

Course Outcomes: At the end of the course, students will be able to

1. Do the range between the two points and measure the distance between two points
2. Conduct the chain triangulation survey
3. Determine the area by using different methods.
4. Determine the elevation of a given point.
5. Use the instruments used in the surveying.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

GENDER SENSITIZATION

Course Objectives: At the end of the course, students will:

1. Understand caste system
2. Learn women's work, its politics.
3. Understand about relationships, responsibilities and gender identities

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 war, 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.

TEXTBOOKS:

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

Course outcomes: After completing the course the students will able to:

1. Describe the basic structure of caste system in India and the major four categories to which all castes belong, elimination of ignorance and archaic indoctrination to make the world a better place for both men and women.
2. Understand the responsibility of being good citizens overcoming social evils, and the significance of gender equality.
3. Describes the basic structure of caste system in India and the major four categories to they belong.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

B.Tech.: MIE	**L**	**T-P-D**	**C**
III Year -I Semester	**4**	**0-0-0**	**4**

UNDERGROUND METAL MINING TECHNOLOGY

UNIT-I Mine Development

Introduction: Formation of Ore Deposits, difference between underground coal mining and metal mining, Metal Mining terminology, Mineral resource, and mineral reserve

Development: Stages of mineral development, Principles for mine development, Level interval, Different types of openings-primary, secondary & tertiary

UNIT-II Raise and raising methods

Different types of raising methods- Open raising, compartment raising, raising by jora lift, raising by longhole drilling, alimak raise climbing, raise borers, and drop raising and their merits & demerits.

UNIT-III Stopes and stoping methods

Stope development – development of stopes, ore pass, ore chutes, finger raises, haulage requirements etc.

Stoping methods: Classification of stoping methods, factors influencing the choice of stoping methods, Different stoping methods for different applications

Room & Pillar stoping, Sublevel Open Stopping, Shrinkage method of Stoping

Cut & Fill method of Stoping, Sublevel Caving, Block Caving – Applications, Stoping procedure, merits, and demerits

UNIT-IV Special methods and Auxiliary operations

Special methods of working of thin deposits – Top Slicing, VCR method, Longwall method, Square set stoping and stull method.

Auxiliary operations in stoping operations - groundbreaking, mucking, ventilation, supporting, haulage, and dumping.

Dilution of ore in stoping operations, classification of dilution and the effects of dilution

UNIT-V Economics of metal mining & In-situ leaching

Economic analysis for the assessment of viability of a mineral deposit- feasibility report, Economic considerations of stoping operations .

In-situ leaching: Principles of in-situ leaching, procedure of recovery of minerals by ISL, scope and limitation of in-situ leaching.

TEXTBOOKS

1. Elements of Mining Technology Vol.2- D.J. Deshmukh, Lovely prakashan publishers
2. Introductory Mining Engineering – H.L. Hartman

REFERENCE BOOKS:

1. Underground Mining Methods handbook
2. Underground Mining Methods and Technology – Elsevier Science publication.
3. Karmakar H. – Mine working Vol. I & II, Lovely Prakashan, Dhanbad.

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UGC AUTONOMOUS

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

MINE SURVEYING – II

Unit-I: TACHEOMETRY

Tacheometric Surveying: Use of the Theodolite for tacheometric Surveying – Principles, Stadia and tangential methods, measurements of heights and distances by tacheometry, Distance and Elevation formulae for Staff vertical and normal positions.

Unit-II: CURVES

Setting Out Curves: Types of curves, Elements of curves, design and setting out, simple and compound curves, surface, and underground curves.

Unit-III: MINE SURVEY & CORRELATION

Mine Survey: Verticality of shafts, measurement of depth of shafts, Importance of national grid and its advantages, survey of installations of mine structures.

Correlation: Purpose and importance of correlation. Correlation methods- Co-planation method, Weiss triangle method, Weiss quadrilateral method, two shaft method, Correlation through drift

Unit-IV: ADVANCED SURVEYING TECHNIQUES

Total Station : Description, uses, different measurements by total station, types of Surveys by Total station, Mapping of sites by Total Station Surveys

Photogrammetry: Principles of photogrammetry, Aerial Photographs, scale of vertical photographs, Terrestrial Photogrammetry, Mapping.

Global Positioning System: Definition, Principle, operations, and applications.

Geographical Information System: Definition, Principle, Components and Operation, Applications.

Remote Sensing – basic Principles, Integration of RS and GIS, Applications

Unit-V: ASTRONOMY & THEORY OF ERRORS

Geodetic Astronomy: Latitude, Longitude, Declination, Altitude, Azimuth, Hour circle, hour angle, other terminology; Time conversion from degrees to hours and hours to degrees.

Theory of Errors – Classification of errors, terminology, different methods for adjustments of angles, levels – normal equation method, method of differences & method of correlates.

Textbook:

1. Surveying – Theory and Practice by S.S.Bhavikatti, I.K.International publishing House.
2. Surveying Vol.2,3 by S.Ghatak, Lovely Prakashan Book house

REFERENCES:

11. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill-2000

Arora K R "Surveying (Vol 1,2 &3), standard Book House, Delhi, 2004.

Chandra A M. "Plane Surveying" New age International Pvt. Ltd. Publisher, New Delhi, 2002

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINE VENTILATION

Unit-I

Atmospheric air-its composition, mine air –its composition and variation, origin, occurrence, physical, chemical, and physiological properties and monitoring of mine gases, various types of damps. Sampling and analysis of mine air. Methane drainage and methane layering of gases.

Unit-II

Heat and humidity: Sources of heat in mines, effect of heat and humidity, psychometric, Kata thermometer, methods of improving of cooling power of mine air. Air conditioning basic vapour cycle, representative layout.

Unit-III

Air flow through mine openings: Laws of air flow, resistance of air ways, equivalent orifice, distribution of air, flow control devices. Natural Ventilation: Calculation of NVP from air density, artificial aids to natural ventilation.

Unit-IV

Mechanical ventilation: Principal type of mine fans and their suitability, merits, limitation, efficiency, and characteristics. Selection of mine fan, fan testing, output control in fans, series and parallel operation of mine fans.

Auxiliary fan, duct, matching of fan to the duct system. Reversal of air current. Fan drift, evasee, diffuser, booster fans, face ventilation.

Unit-V

Ventilation planning: Standard of ventilation including permissible air velocities.

Ascensional, descensional, homotropal, anti-tropal ventilation. Center and boundary ventilation- layouts and comparison. Quantity and pressure requirement. Ventilation layout for coal mining and metal mining. Calculation of air quantity and total mine head required for ventilating a mine. Introduction to Network analysis: Hardy-Cross method, Ventilation survey.

Textbooks:

1. Mine Environment and Ventilation-G.B. Mishra
2. Mine Ventilation and Air Condition-HL Hartman

Reference Books:

1. Vatukuri V.S & Lama R.D. - Environmental Engineering in Mines.
2. Dhar B.B. – Mining and Environment.

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UGC AUTONOMOUS

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

MINERAL PROCESSING

Unit-I

Introduction: Scope, objectives and limitations of mineral processing, liberation and beneficiation characteristics of minerals and coal.

Size Separation: Laboratory size analysis – particle size analysis, particle size and shape, sieve analysis and interpretation.

Unit-II

Comminution: Principles of Comminution, stages in Comminution, Theory and practices of crushing and grinding; different types of crushing and grinding equipment – their applications and limitations.

Industrial screening- screen performance, factors affecting screen performance, different types of screens.

Unit-III

Classification – Principles of classification, mechanical classifiers and hydro cyclones.

Gravity concentration- Principles of gravity concentration, Gravity Concentration Methods: Jigging, tables, gravity separators.

Dense media separation – dense medium, typical dense media separation – theory, applications and limitations, efficiency of DMS.

Unit-IV

Froth Floatation: Physio-chemical principles, reagents, and machines, floatation of sulphides, oxides and coal.

Electrical Methods of Concentration: Principles, fields of applications and limitations.

Magnetic methods of concentration Principles, Fields of Application and Limitation, types of magnetic methods of concentration

Unit-V

Dewatering: Sedimentation- types, thickening, filtration and drying.

Tailing and disposal- Methods of tailing disposals

Flow Sheets: Simplified flow sheets for coal, zinc, iron, and manganese ores.

Textbooks:

1. Mineral Processing – BA Wills
2. Introduction to Mineral Processing – V. Malleswar Rao

Reference Book:

1. Mineral Beneficiation – A concise basic course by DV Subba Rao
2. Mineral Processing – S.K. Jain.
3. Principles of Mineral dressing – AM Gaudin

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINERAL ECONOMICS

UNIT-I

The Mineral Industry: Economic characteristics of the mineral industry in India and world , the place of minerals in the national and international economy.

UNIT-II

Brief survey of India's mineral resources in the world setting with special reference to its need and deficiencies.

UNIT-III

Mining companies and mine Accounts: Structure, formation and capitalization, principles of book-keeping as applied to the mining industry presentation of accounts, balance sheets and profit and loss accounts, Depreciation DCF, IRR. Mine Valuation: Mineral reserves mining reserve and profit examination and report on mines.

UNIT-IV

Mineral property planning valuation of mines, Mine properties, mine investments. Project planning and project evaluation. Sampling: Principles of sampling off prospect sampling methods classification and description, statistical and geo statistical techniques in mine sampling, sampling and grading of coal.

UNIT-V

Assaying: Five methods of assaying for gold and silver cupellation Scarification, etc. wet assaying, theory, principle methods of wet assaying of copper aluminium, lead, zinc, Iron Manganese and Chromium ores. In situ assay. Preparation of Assay Plans: Longitudinal section, calculation or ore reserve.

TEXTBOOKS:

1. R. T. Deshmukh, Mineral and Mine Economics, Myra Publ., Nagpur, 1986
2. R. K. Sinha and N. L. Sharma, Mineral Economics, Oxford & IBH Pub., 3rd ed, 1970

REFERENCE BOOKS:

1. O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai Delhi, 1993
2. R. N. P. Arogyaswamy, Courses in Mining Geology, Oxford and IBH Pub., 2nd ed, 1973
3. S. Krishnaswamy, India's Mineral Resources, Oxford & IBH pub., 2nd ed, 1972
1. 4. P. K. Jain, Financial management, Tata McGraw Hill, 1981

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

MINE SURVEYING – II LAB

1. Finding Horizontal & Vertical distance by Tachometry
2. Curve ranging by offsets from long chord
3. Curve ranging by Rankine method
4. Curve ranging by Tachometric method
5. Study of mine plans using signs and conventions in CMR 1957/MMR1961, statutory provisions of mine plans
6. Finding the height of an in accessible object – Trigonometric levelling
7. Correlation by co-planation method using Theodolite
8. Correlation by single shaft Weisbach method using theodolite
9. Correlation by single shaft Weiss quadrilateral method using theodolite
10. Measurement of REM, RDM by total station
11. Traversing by Total station

Textbooks/Reference Books

1. Surveying – Theory and Practice by S S. Bhavikatti, I K International publishing House
2. Ghatak “Mine Surveying and Levelling Vol.2”
3. Punimia “Surveying” Vol. II and III
4. Basak “Surveying and Levelling”

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
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B.Tech.: MIE	**L**	**T-P-D**	**C**
III Year -I Semester	**0**	**0-3-0**	**1.5**

MINE VENTILATION LAB

List of Experiments

1. Constructional features and operation of Flame safety lamp
2. Constructional features and operation of Methane Detector
3. Constructional features and operation of Multi gas Detector
4. Constructional features and operation of Hygrometer & Kata Thermometer
5. Constructional features and operation of Anemometer/Velometer/smoke tube
6. Gas analysis using Orsat Apparatus
7. Study of Pressure Gauges used in Ventilation Systems
8. Study of Ventilation System in Bord & Pillar development panel
9. Study of reversal of Ventilation System
10. Study of operation of fans in Series and Parallel
11. Study and analysis of Ventilation Network Circuit

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

CYBER SECURITY

(Common to ECE, CIVIL, ME & MIE)

Course objectives:

The Student will:

1. Recognize cybercrimes and how they are planned
2. Identify the vulnerabilities of mobile and wireless devices.
3. Examine the crimes in mobile and wireless devices and Acts.
4. Understand about Computer Forensics.
5. Explore the Cyber Security- Organization Implications

UNIT I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing. Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT II

Cyberspace and the Law & Cyber Forensics Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT III

Cybercrime: Mobile and Wireless Devices Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Device. Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV

Cyber Security: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cyber Crime & Cyber Terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT V

Privacy Issues, Cybercrime: Examples and Mini-Cases: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc. Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text Books

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F

Course outcomes:

The Student will be able to:

1. Identify the AI based problems.
2. Apply AI techniques for representing the basic problem.
3. Apply Advanced AI techniques to solve the problem.
4. Analyze Learning and explain various learning techniques.
5. Discuss and use of expert system.

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

ROCK MECHANICS

Unit-I

Physico-mechanical properties of rocks, Elastic and time dependent behavior, Rock mass classification.

Unit-II

Theories of rock failure, Stress analysis, In-situ stress and stress distribution around mine openings.

Ground failure and pressure on supports, Stability of wide openings, Design of supports in mine workings.

Unit-III

Subsidence: Causes and impacts of subsidence, Mechanics of surface subsidence, discontinuous and continuous subsidence. Monitoring, prediction, control and management of subsidence.

Unit-IV

Instrumentation and measurement of In-situ stresses and rock strength, Photo-elasticity and scale model studies.

Unit-V

Mechanics of rock burst and bumps, Stability of slopes.

Basics of numerical methods in geomechanics with applications.

Textbooks:

1. Coal Mining ground Control by Peng.
2. Rock Mechanics by Jumikis
    1.

Reference Books:

1. Fundamental of Rock Mechanics by Jager & Cook.
2. Rock Mechanics – Brounden

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B.Tech.: MIE	**L**	**T-P-D**	**C**
III Year -II Semester	**4**	**0-0-0**	**4**

MINE LEGISLATION

Unit-I

Introduction to mining laws and legislation, General principles of mining laws, development of mining legislation of India.

Mines Act 1952 – Definitions, Provisions related to committees, accidents, diseases, safety and welfare, Manager, Powers of inspectors

Unit-II

CMR/MMR – important provisions related to duties of manager/Asst manager, notice of accident and diseases, underground workings and opencast workings, Provisions related to blasting, ventilation and mine atmosphere, Safety management system, winding, haulage, machinery, and mine lighting

IER-Indian electricity rules applicable to mines

MMDR- New amendments in 2015, restriction on undertaking prospecting and mining operations, provisions related to mining area, lease period, lease extension, transfer of mineral concessions , National mineral exploration trust(NMET) and District mineral foundation (DMF)

Workman's compensation act – Importance and necessity, Important provisions

Unit-III

Mineral Concession Rules. – Provision for procedure of granting and renewal of reconnaissance/prospecting/mining permit, environment protection measures

Mineral Conservation & Development Rules – Provisions related to reconnaissance /prospecting and mining operations, Environmental measures

Vocational Training Rules – Initial and refresher training provisions,

Important provisions of Mineral Auction Rules 2015, Payment of Wages Act, and Explosives act, Rescue Rules

Unit-IV

Different statutory permissions require to operate an underground and opencast mine.

Safety organization; role of management, supervisors and workers; pit safety committees; workmen's inspector; role of safety officers. First aid station and first aid room

Classification of Accidents; Statistics, causes and prevention of accidents. Accidents rate in Indian mines. Accident enquiries and reports, Occupational diseases in mining.

Unit-V

Sustainable development in mines.

Social Impact of mining and its management.

Development of safety consciousness; interest, publicity and propaganda for safety, audio-visual aids, safety drives campaigns.

Textbooks

1. Mines Act 1952 by LC Kaku
2. CMR 2017
3. MMR 1961

Reference Books:

1. MVTC Rules
2. DGMS circulars
3. Intent and Content of Mine Legislation – Rakesh and Prasad.

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

SURFACE MINING TECHNOLOGY
(Professional Elective-I)

Unit-I : Basic concept of Surface Mining

Status of surface mining in India. Selection between surface mining and underground mining, Preliminary evaluation of surface mining prospects; stripping ratio – concepts and significance, mine life.

Opening up of deposits with Box Cut: Factors affecting selection of site of box-cut, Production benches – formation parameters and factors affecting their selection.

Unit-II : Preparation for Excavation

Working principle of ripper and Scraper—their cycle of operation, application, and limitation. Drilling, types of blast hole drills, performance parameters of drills, estimation of number of drill for a given mine production. Problems associated with drilling and blasting.

Excavation and Transportation: Cyclic methods—shovel-dumper, pay-loader, dragline.

Continuous methods – bucket wheel excavator, bucket chain excavator, continuous surface miner, conveyors. Principle and operation of these machines, their advantages and limitations capacity calculations, maintenance. Other equipment-dozer, grader, loader, scraper, dumper, maintenance of open pit equipment crusher.

Unit-III : Design and organization

Basic design principle of large opencast mines and their organizational structure. Mechanical quarries over underground developed zones.

Unit-IV : Placer Mining and Seabed Mining

Ground sluicing, Hydra licking and Dredging Exploitation systems of ocean mineral resources.

Unit-V

Relevant provisions of coal mines and metalliferous mines regulation; Environmental problems due to surface mining and their remedial measures. Recent developments in the deployment of heavy earth moving machineries in the surface mines.

Textbooks:

1. Surface Mining Technology S K Das.
2. Surface Mining – GB Misra
3.

Reference Books:

1. Singh R.D. – Principles and Practices & Modern Coal Ming
2. Mathur S.P. – Mine Planning for Coal.
3. Introductory Mining Technology – HL Hartman

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

SUSTAINABLE MINERAL INDUSTRY
(Professional Elective-I)

UNIT-I

Concept of Sustainable development for mining industry-Sustainable development –a perspective of mineral professional community. International sustainability reporting and tools for measurement of sustainability. Milos statement on Sustainable mineral industry. Legislative measures for sustainable development- MMRD Act- star rating of Indian mines (Non-coal), Environmental responsibility – Corporate social responsibility. District mineral fund , its collection, utilisation etc.

UNIT-II

Current status of mining practices and their impact on sustainability. Mining and environmental frame work , National mineral policies in mineral based countries. Indian national mineral policy, its historical development with the changing goals and sustainable practices. Issues of leases , auctions for mineral development in India.

UNIT-III

Clean coal technologies, Coal bed methane, Abondoned coal mine methane, Underground gasification of coal. Leaching of old dumps and recovery of metals. Recyling of metals. Application of new techniques for sustainable development.

UNIT-IV

Mine water- Water conservation Acts and rules in India.New Initiatives in mines. Underground mine water, Water pollution and control measures, Phyto-remediation, Sewage and effluent treatment plants, their use and benfits.Waste management- processing of overburden material for underground stowing and innovative methods for utilisation of waste from mines.

Air quality in open pit mines, dust control measures, noise levels- pollution, monitoring and control.

Bio-divrsity- Land reclamation and plantation. Mine closure plan- Collection and disbursement of Mine closure fund for both open pit and underground mines in India.

UNIT-V

Best mining practices for Sustainable mining.- Case studies .Innovative practices for achievement of sustainability. Benefits of sustainability.

Textbooks:

1. Guidelines of MOEF and Climate change,- Annual reports of MOEF&CC, Ministry of Mines, Ministry of Coal in India,
2. Sustainable mining practices –A global perspective by Vasudevan Rajaram, Subijoy Dutta, Krishna Paremeswaran,ISBN-90-5809-689-0

Reference Books:

1. MMRD Act 2015 and amendments, Ministry of Mines
2. Mineral concession Rules

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

REMOTE SENSING AND GIS IN MINING
(Professional Elective-I)

UNIT-I

Remote Sensing Process: Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles, Planck's Law, Stefan's law, properties of solar radiant energy, atmospheric windows.

UNIT-II

Physical Basis of Remote Sensing: Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infrared thermal microwave wavelengths, interaction at ground surface and, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

UNIT-III

Platform and Sensors: Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun synchronous orbits, sensors for visible near infrared wavelengths, profilers, images, scanners, radiometers, optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio, comparison of satellite/ aerial platforms and sensors and remote sensing data products, land sat and TM, SPOT, IRS, ERS; applications in mining.

UNIT-IV

Visual & Digital Image Processing: Remote Sensing Data Products, Elements of visual Image Interpretations, Generation of Thematic Maps, Digital Image Processing System, Image Enhancement, Image Transformation, Image Classification.

UNIT-V

Geographical Information System: Difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitisers, raster and vector data, storage. hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, Applications and Modern Trends of GIS in various natural resources and mining applications

TEXTBOOKS:

1. B. Bhatta - Remote Sensing and GIS
2. T.M. Lillensand and R.W. Keifer - Remote Sensing and Image Interpretation

REFERENCE BOOKS:

1. P.J. Curren - Principles of Remote Sensing
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing.

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

MINE ENVIRONMENTAL ENGINEERING
(Professional Elective-II)

Unit-I

Spontaneous Combustion: Various theories, factors, various indices for determination of susceptive of coal to spontaneous heating, control measures. Mine Fires: Survey of various causes of mine fires with statistical data of Indian mines, various methods adapted to combat fires and their advantages and disadvantages.

Advances in firefighting techniques and equipment, rescue operations in fire zones.

Unit-II

Reopening of sealed-off areas: Factors to be considered, methods, precautions. Mine Explosions: Causes of firedamp explosion with statistical data of Indian mines, preventive measures against firedamp explosion.

Production, assessment and control of mine dust and associated hazards. Causes of coal dust explosion with statistical data of Indian mines, preventive measures against coal dust explosion.

Unit-III

Mine Inundation: Causes of inundation with statistical data of Indian mines. Precaution to be taken while approaching old workings, preventive measures of inundation.

Noise and Vibrations: Causes and measurement of noise levels. Precautions, prevention and reduction of noise levels. Environmental aspects of blast induced vibration and noise.

Unit- IV

Mine illumination: Its effects on safety and efficiency, illumination standard, common types of flame safety lamps, their use and limitations, electric-hand and cap lamp, their maintenance and examination, lamp room design and organization. Illumination arrangement of opencast and underground working.

Unit-V

Mine Rescue & Recovery and its Scope. Rescue organization, Rescue stations, Rescue team selection, Initial & refresher trainings. Rescue apparatus self-contained portable breathing apparatus, Gasmasks, Smoke helmets, Self-Rescuers, Reviving apparatus with actual rescue operations. Fresh air base, Lifelines & communication, Actual operations survival techniques use of bore holes in rescue operations.

Text /Books:

1. Mine Fires, Explosions, Rescue, Recovery, and Inundation – M.A. Ramlu.
2. Fires in Coal Mines – L.C. Kaku

Reference Book:

3. Mine Environnent & Ventilation – G.B. Mishra.

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

PLANNING OF SURFACE MINING PROJECT
(Professional Elective-II)

Unit-I

Mining industry in comparison with other industries, Principles of Planning, Mater Plan, Feasibility Report. Estimation, optimal Production, Life, requirement of surface equipment, selection of mining equipment

Unit-II

Haul roads maintenance and dust control measures Surface facilities provision of dump yards, material handling plants

Unit-III

Surface Workshops, Mine lighting, occupational diseases remedial measures

Unit-IV

Surface environment management planning, EIA, load reclamation methods. Issues and challenges of Mine planning in future, mine closure planning.

Unit-V

Blast designing, applications of SME, Non-el limitation transport of Block explosive, electronic detonators.

Textbooks:

1. R.T. Deshmukh – Open cast Mining, Lovely Prakash, Dhanbad.
2. Das S.K. – Surface mining Technology

Reference Book:

1. G.B. Misra – Surface Mining
2. Hartman H.L. – Introduction to Mining Engineering.

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

GEOSTATISTICS
(Professional Elective-II)

Unit-I

Introduction to geostatistics, Univariate description: Frequency Tables and Histograms, Normal and lognormal Probability plots, Summary of statistics, Measure of Spread, Measure of Shape. Bivariate description: Comparing of two distribution, Scatter plots, Correlation, Linear regression, Conditional Expectation.

Unit-II

Spatial Description: Contour maps, Indicator maps, Moving window statistics, Proportional effect, Spatial continuity, h-scatter plots, correlation functions, covariance function and variograms, cross h-scatter plots; Random function, From statistics to Geostatistics, Modeling sample variograms, Regionalized variables.

Unit-III

Global estimation: Polygonal declustering, cell declustering, comparison of declustering methods; Point estimation: Polygon, triangulation, inverse distance methods, search neighborhoods; Kriging: Ordinary kriging, simple kriging; Block Kriging; Search strategy; cross validation.

Unit-IV

Variance volume relationships, change of support: Practical importance of support effects, effect of support on summery statistics, correcting for support effect, transforming from one distribution to another, affine correction, indirect lognormal correction, dispersion variance, estimating dispersion variance from a variogram model; assessing uncertainty;

Unit-V

Multivariate geostatistics, Geostatistics for quality control, grade tonnage curve, Basics of non-parametric geostatistics, Indicator Kriging, Brief idea about geostatistical simulation, Introduction to GEOEAS/ GSLIB/SURPAC software.

Textbooks:

1. E. H. Isaaks and R. M. Srivastava, An Introduction to Applied Geostatistics, Oxford University Press, USA, 1990
2. J. M. Rendu, An Introduction to Geostatistical Methods of Mineral Evaluation (Geostatistics), South African Institute of Mining and Metallurgy, 1978.

Reference Book:

1. A. J. Sinclair and G. H. Blackwell, Applied Mineral Inventory Estimation, Cambridge University publication, 2002.
2. B, D. Ripley, Spatial Statistics (Wiley Series in Probability and Statistics), Wiley-Interscience, New edition, 2004.
3. P. Goovaerts, Geostatistics for Natural Resources Evaluation, Oxford University Press, 1997.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINERAL PROCESSING LAB

1. Study of grab sampling and different sample division techniques like coning and quartering, riffle sampling techniques.
2. Determination of crushing characteristics of a given mineral sample using jaw crusher
3. Determination of crushing characteristics of a given mineral sample using secondary (roller) crusher
4. Determination of the grinding characteristics of a given mineral sample using ball mill
5. Sieve analysis of a given sample and to calculate (a) percentage sample retained on sieves (b) average size of sample material and (c) to plot sizing curves
6. Concentration of a given mineral sample using mineral jig.
7. Concentration of a given mineral using Wilfley table
8. Concentration of a given mineral using froth flotation cell
9. Concentration of a given mineral using magnetic separator
10. Study of washability characteristic of a coal sample using float and sink test.
11. Determination of Grindability index of coal sample

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

ROCK MECHANICS LAB

1. Determination of RQD of rocks.
2. Determination of Proto-dyakonov index of a given rock sample
3. Determination of point load index strength of a given rock sample
4. Determination of porosity of rocks.
5. Determination of hardness of rocks
6. Determination of uniaxial compressive strength of a given rock sample
7. Determination of tensile strength of a given rock sample using Brazilian method
8. Determination of triaxial strength of rock and drawing of Mohr's envelope
9. Determination of slake durability of rocks
10. Study of different types of supports used in mines
11. Determination of rock anchorage capacity of a rock bolt
12. Study of different types of roof convergence and other ground control instruments.

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

ARTIFICIAL INTELLIGENCE

(Common to ECE, CIVIL, ME & MIE)

Course objectives:

The Student will:

6. Know the AI based problems.
7. Illustrate AI techniques for representing the basic problem.
8. Illustrate Advanced AI techniques to solve the problem.
9. Define Learning and explain various learning techniques.
10. Understand the usage expert system.

UNIT-I:

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

UNIT-III:

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non- monotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

UNIT-IV:

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT-V:

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice- Hall, 2010

REFERENCES:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

Course outcomes:

The Student will be able to:

6. Identify the AI based problems.
7. Apply AI techniques for representing the basic problem.
8. Apply Advanced AI techniques to solve the problem.
9. Analyze Learning and explain various learning techniques.
10. Discuss and use of expert system.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINE HEALTH AND SAFETY ENGINEERING
(Professional Elective - III)

Unit-I

Introduction to accidents prevention and health and safety in industry : Terminology, reasons for accidents and need of prevention of accidents.

Safety scenario in Indian mines, Accidents in Indian mines, Measurement of safety performance, Statistical analysis of mine accidents.

Unit-II Causes of Accidents, accident report, accident analysis and control, cost of accidents, statistical and economic analysis of accident data.

System engineering approach to safety, Techniques used in safety analysis, Generic approach to loss control within mining operations.

Unit-III Safety management and organization, Risk management, Risk identification, Risk estimation and evaluation, Risk calculator, Risk minimization techniques in mines. Risk analysis; health risk assessment. Statutory provisions related to safety management system and risk management .

Training, Human Behavioral approach in Safety, safety policies, safety audit and safety management in mines. Emergency organization for disaster management.

Unit-IV

Accidents in opencast mines: possible accidents, common causes and measures for prevention

Accidents due to ground movement: Falls of roof and sides in underground coal mines

Accidents due to rope haulage: Common causes and measures for prevention.

Unit-V

Accidents due to blasting and explosives: Common causes and measures for prevention.

Accidents due to electricity: Common causes and measures for prevention.

Accidents due to Inundations: Dangers from surface and underground water.

Textbooks:

1. S.K. Das, Mine Safety and Legislation. Lovely Prakashan, Dhanbad, 2002
2. B.K. Kejriwal, Safety in Mines, Lovely Prakashan, Dhanbad, 2002

Reference Books:

1. Intent and content of Mine Legislation – Rakesh and Prasad.
2. N.J. Bahr, System Safety Engineering and Risk Assessment: A Practical Approach, Taylor and Francis, NY, 1997.

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UGC AUTONOMOUS

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

SOLID FUELS AND CLEAN COAL TECHNOLOGY
(Professional Elective - III)

UNIT-I

Introduction: Processes of formation of coal, Theories of origin of coal, Eras of coal formation, Indian Coalfields and its subsidiaries: Occurrence and distribution, coal bearing formations, coal type and rank variation, Characteristics of major coalfields, Coal production from different sectors.

UNIT-II

Coal petrography: Macro and micro lithotypes, Composition of macerals, application of coal petrography, Mineral matter in coal: Origin and chemical composition, Impact of mineral matter in coal process industry.

UNIT-III

Coal properties and their evaluation: proximate and ultimate analysis, calorific value, crossing and ignition point temperature, plastic properties(free swelling index, Caking index, Gray King Low Temperature Assay, Roga index, plastometry, dilatometry), physical properties like specific gravity, hard groove grindability index, heat of wetting, Crossing point temperature of coal, Behaviour of coal at elevated temperatures and products of thermal decomposition.

UNIT-IV

Classification of coal: International and Indian classification, grading of Indian coals; Coal Washing: Principles, objectives, coal preparation, washability characteristics; Selection, testing, storage and utilization of coking and non-coking coal, Use of coal by different industries.

UNIT-V

Clean Coal Technology: Introduction, Pre-combustion, Combustion and Post combustion clean coal technology, Conversion.

TEXTBOOKS:

1. S. Sarkar, Fuels and Combustion, Orient Longman Private Ltd., 2nd edition, 1990
2. O. P. Gupta, Elements of Fuels, Furnaces and Refractories, Khanna Publication, 3rd Edition, 1996

REFERENCE BOOKS:

1. M. A. Elliot (ed.), Chemistry of Coal Utilization, Wiley, 1981
2. N. Berkowitz, An Introduction to Coal Technology, Elsevier, 1993
3. D. Chandra, R. M. Singh and M. P. Singh, Textbook of Coal, Tara Book Agency, 2000
4. G. G. Sarkar, An Introduction to Coal Preparation Practice, Oxford and IBH, 1986
5. S. P. Mathur, Mine Planning for Coal, M. G. Consultants, Bilaspur, 1993

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
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B.Tech.: MIE	**L**	**T-P-D**	**C**
IV Year -I Semester	**3**	**0-0-0**	**3**

ADVANCED EXPLORATION TECHNIQUES
(Professional Elective - III)

Unit –I:

Introduction, definition, objectives, and criteria for mineral exploration

Guides for ore search: physiographic, stratigraphic, Lithological, structural, mineralogical, geo-chemical geo-botanical and hydro geological.

Reserve estimation: types of drilling, drill core sample logging, data compilation preparation of lithology of the bore hole-isochore and isopach maps, preparation of geological cross sections interpretation of the coal mining and exploration, deposit reserve estimation. Some case studies of coal mining and exploration.

Unit-II:

Geochemical exploration:

Introduction, geochemistry in mineral exploration, types of geochemical surveys Geochemical environments.

Primary environment: distribution of elements in igneous rocks and minerals, primary haloes, and primary dispersion**.**

Secondary environment: chemical weathering, mobility in secondary environment, displaced anomalies. Path finders and their application in geochemical exploration.

Unit-III:

Geophysical exploration: basic concepts of geophysical exploration. Methods of geophysical exploration, elementary principles of gravity survey, seismic survey and electrical resistivity survey methods of prospecting. Bore-hole logging -introduction.

Unit –IV

Remote sensing and photo-geology: introduction definition and scope, basic concepts of remote sensing and photo geology.

Photogrammetry application of remote sensing techniques to mineral exploration. Visual image interpretation land digital image analysis and interpretation of satellite data. Case studies of application of remote sensing for coal exploration.

Unit – V:

Geoengineering: Introduction. definition and application of Geo Engineering studies in and development of mines, geo-engineering studies for underground and opencast mines. Geotechnical log. Micrologging rock quality designation (RQD)-underground sealing mapping; Rock Mass rating (RMR)-Caving index, determination of stress field, case studies in coal mines.

Textbooks:

1. Introduction to Geophysical Exploration by Dobrin
2. Mineral Exploration by Kumara Swamy

REFERENCE BOOKS:

1. C. J. Moon, M. K. G. Whateley, A. M. Evans and W. L. Barrett, Introduction to Mineral exploration, Blackwell Publishing, 2006.
2. R. E. Sheriff and L. P. Geldart, Exploration Seismology, Cambridge University Press; 2nd edition, 1995.
3. H. L. Hartman, SME Mining Engineering Handbook, Society of Mining and Metallurgy and Exploration (US), 1992
4. R. Marjoribanks, Geological methods in Mineral exploration and Mining, Springer; 1st edition, 1997.

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

MINE SYSTEMS ENGINEERING
(Professional Elective - IV)

UNIT – I

Introduction: Development – Definition– Characteristics and Phases – Types of operation Research models – applications. **Allocation :** Linear Programming - Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques - Two–phase method, Big-M method – Duality Principle.

Transportation Problem: Formulation – Optimal solution - unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

UNIT – II

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 – III

CPM: Importance and application of CPM, Networks, early and latest start times of activities. Critical path and critical activities, Project duration, crashing of networks.

Waiting Lines: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

UNIT – IV

Inventory: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost- Single period model.

UNIT – V

Dynamic Programming: Introduction –Terminology- Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

Simulation: Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Brief Introduction of Simulation Languages.

TEXTBOOKS:

1. Operations Research /J.K. Sharma 4e. /McMilan
2. Operations Research / R. Pannerselvam 2e.,PHI Publications

REFERENCES :

1. Bernel & Krako, Introduction to System Analysis, A. A. Balkema, 2004.
2. 2. N. Deo, System Simulation by Digital Computers, Prentice Hall of India, 2005

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

TUNNELING ENGINEERING
(Professional Elective - IV)

Unit-I
Introduction to tunneling, geological concepts of tunneling. Influence of geological aspects on design and construction of tunnels.

Unit-II
Tunnelling method: Convectional and special drill and blast roadway driving machines, Tunnel Boring Machines (TBM).

Unit-III
Stresses and displacement associated with excavating tunnels, ground control or treatment in tunnelling and drivages.Design of supports of Tunnels; Steel supports, rock enforcements, New Australian Tunnelling Methods (NATM).

Unit-IV
Design of tunnels: Rock conditions, RMR, Q- System, RSR, rock mass behaviour, stress strain behaviour, and stress analysis of tunnels.

Unit-V
Maintenance: dewatering, ventilation, and illumination of drivages tunnels.
Numerical modelling techniques: Introductory use of FLAC, SPLAXIS etc.

Text Books:
1. Richards E Bullock- Tunnelling and underground construction techniques
2. Stack Barbara-Hand book of mining and Tunnelling machinery, John Wiley & Sons

Reference Books:
1. R.V. Proctor-Rock tunnelling with steel supports.
2. J.Johnson-Modern trends in Tunnelling and blast design.

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UGC AUTONOMOUS

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

LONGWALL MINING
(Professional Elective - IV)

Unit-I

History of longwall mining and its development, techno-economic consideration of the modified longwall retreat panels, longwall advance panels with caving method and stowing method, design of gate roadways and their size disposition, layout of panels, production and manpower planning, sublevel caving systems for thick seams, caving system in thin seams, multi-slice longwall mining, application of longwall mining for steep seams, longwall caving in metal mines.

Unit-II

Types of supports used in longwall mining in the past and present, design of powered supports for different situations, longwall face end problems, supports in longwall gate roadways during drivage and extraction, pressure distribution around a moving longwall face, caving of thick seams and thin seams. Main roof fall, local fall and induced roof wall, floor heaving, precautions during main fall and surface subsidence.

Unit-III

Methods of mining coal on longwall faces, machines – shearers, ploughs etc., methods of cutting and face advancement, stables and Sumping, gate road pillar extension.
Mode of transporting coal or ore in longwall face and machinery used. Shortwall Mining – a modified longwall mining. Remotely operated longwall faces. Shifting of longwall equipment.

Unit-IV

Methods of driving gate roadways, choice of selection of machinery, road headers and dinters, special problems associated with working of longwall faces - faults, roof caving, face spalling, overburden movement, subsidence control, hydraulic stowing, dealing with spontaneous heating while working thick seams in coal.

Unit-V

Methods of ventilating longwall faces and gate roadways. Methane control, dust control and noise control, monitoring at longwall faces. Assessment of cost of ventilation. Electric and hydraulic circuits. Surface and ground water effects. Strata monitoring with instruments

Textbooks:

1. Peng , S.S., Longwall Mining, 2nd Edition, John Willey and Sons, New York, 2006
2. Singh, R.D., Principles and Practices of Modern Coal Mining, New Age International, 1997.

Reference Books:

1. Mathur, S.P., Mining Planning for Coal, M.G. Consultants, Bilaspur, 1999
2. Singh T.N., Dhar, B.B. Thick Seam Mining, problems and Issues, Oxford & IBH Publishers, 1992.
3. Das S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994. 4 Longwall Mining in Company Seminar – Proceedings – The Singareni Collieries Co. Ltd., 1990.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

(F4101) LIFE SKILLS AND PROFESSIONAL SKILLS LAB

EXPERIMENT 1: Communication skills-debates, practical sessions & public speaking skillsLS-23
EXPERIMENT 2: Dealing with Criticism & Conflict Resolution & Management-LS-26
EXPERIMENT 3: Thinking Out-of-the Box – Case-study & Activity Based-LS-28
EXPERIMENT 4: Developing a Vision & Action-plan. -LS-30 EXPERIMENT 5: SWOT Analysis – Individual-LS-31
EXPERIMENT 6: 1Yoga & Meditation – Demonstration, Practice & Techniques YS-8
EXPERIMENT 7: Corporate Etiquettes-LS-35
EXPERIMENT 8: JAM Sessions& Mock Interviews-ES 4.
EXPERIMENT 9: Interview Questions & Skills-ES 5
EXPERIMENT 10: Group Discussion-ES 3
EXPERIMENT 11: Aptitude- Verbal Ability Revision-ES-32
EXPERIMENT 12: Aptitude- Arithmetic Revision-ES-33
EXPERIMENT 13: Aptitude- Reasoning Revision-ES-34

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINE PLANNING AND DESIGN
(Professional Elective - V)

Unit I:

Mine Planning requirements, principles of mine planning, conceptual mine plan, long range plan, intermediate range plan, daily planning, strategic mine planning

Unit II:

Factors to be considered while opening surface or underground mines – production potential, mining costs, risk of accident, losses and dilution, psychological factors, techno-economic decision, final project appraisal

Determination of technical factors in mine planning, classification of planning information, geological and mineralogical information, structural information, economic information, determination of production parameters.

Unit III:

Considerations of risk of mine planning, mineral risk, project completion risk, capital cost and delay risk, operation risk, market conditions, supply and demand, Economic analysis, market analysis, legal analysis, environmental factors

Unit IV:

Planning of Surface Layouts – Factors affecting the design of layouts, winding, pit top layouts, layout of coal handling plant

Planning of Pit bottom layouts for skip winding and man, material winding.

Examples of layouts of underground workings

Unit V:

Stages of planning of new mines, feasibility report, selection of mine site and environment management plan, planning for ventilation system and transport system.

TEXTBOOKS:

1. S. P. Mathur, Mine Planning for Coal, M. G. Consultants, Bilaspur, 1993
2. J. Bhattacharya, Principles of Mine Planning, Allied Publishers Pvt Limited, New Delhi, 2003

Reference Books:

1. W. Hustrulid and M. Kuchta, Open Pit Mine Planning and Design, A. A. Balkema Rotterdam, 1995
2. B. M. Vorobjev and R. T. Deshmukh, Advanced Coal Mining Vol-II, Asia Publishing house, Bombay, revised edition, 1966
3. PWJ Van Rensbarg, Planning Open-pit mines, AA Balkema Cape Town, 1970
4. A. A. Myasnikov, Principle of Coal Mine Ventilation Planning, N. T. I. S., 1981.
5. R D Singh, Principles and Practices of Modern Coal Mining, New age International Pvt limited Publishers, New Delhi, 1997.
6. H. L. Hartmanetal, SME Mining Engineering Handbook, Vol. I & II, SME, USA, 1992.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

ADVANCED MINING
(Professional Elective - V)

Unit-I : Underground Coal Gasification (UCG)

Underground Coal Gasification (UCG) Concept; conditions suitable for UCG, Principles of UCG, Technology of UCG, Mining methods of UCG - Chamber method, Stream method, Borehole method, Blind bore hole method; Linkage Techniques- Percolation linkage, Electro linkage, Boring linkage, compressed-air-linkage, Hydraulic fracture linkage and CRIP. Merits and Demerits of UCG.

Unit-II : Coal Bed Methane (CBM)

Concept of CBM, Difference between CBM and UCG, Principles of CBM, Extraction, Properties and Suitability for application, well construction, advantages and disadvantages, Environmental impact

Unit-III : Highwall Mining (HWM)

Concept of Highwall Mining, Technology and machinery used in HWM, Safety features of the equipment, Factors considered for web pillars design, Key influences on operations, Advantages and disadvantages, statutory provisions for HWM.

Unit-IV : Conversion of Underground mine into Opencast & OC to UG

Factors affecting conversion process need of conversion of UG into OC, Procedure of converting an underground mine into OC, problems associated with conversion process and their mitigating measures. Statutory provisions for conversion of UG to OC.

Unit-V : Communication system in mines

Importance of communication system in mines, Existing communication systems in mines like telephone, wireless network, radio frequency based, trapped miner communication etc and the drawbacks in the existing communication systems, recent trends in communication systems like Zigbee, radio frequency identified tags (RFID), Through the Earth system (TTE) etc.

Textbooks:

1. Introductory Mining Engineering – H.L. Hartman
2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

NUMERICAL MODELLING IN MINING
(Professional Elective - V)

UNIT I Introduction to elastic and plastic models
Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elastoplastic models. Need for numerical modelling in design of excavations in mines; Domain and boundary conditions; Discretisation of domain and boundary; Methods of numerical simulation for excavations in mining.

UNIT II Finite difference methods
Concept, formation of mesh element, finite difference patterns, solutions, application to mining. Commercial Softwares for application in mining.
Explicit finite difference method; Finite difference equation; Mechanical damping, mechanical time-step determination, solution stability, advantages and their limitations. Non-linear solution methods Introduction to Numerical Modelling Packages: Strand – 7 and FLAC.

UNIT III Finite element methods
Concept, discretisation, element configuration, element stiffness, Assembling elements to form a structural stiffness matrix; Imposing boundary conditions and solving structural equations Elements on assumed displacements, constant strain triangle, isoparametric formulation, advantages and their limitations., two and three dimensional solutions, linear and non-linear analysis, applications in geomechanics; simulation of joints in strata. Commercial Softwares for application in mining.

UNIT IV Boundary element method
Concept, discretisation, formulation, merits, demerits and limitations, different methods of solution for isotropic and infinite media. Commercial Softwares for application in mining. Boundary Element Method: Introduction, formulation, advantages and their limitations.

UNIT V Practical applications in mining and rock mechanics
Practical Applications in stress analysis, slope and dump stability, subsidence prediction, pillar design, rock burst, different types of mine supports, etc.
Constitutive modeling and their uses: Mohr's Coulomb Plasticity model for simulation of rock failure, Interfaces to simulate the bedding planes, Simulation of support in rock: bolts, props and lining.

Textbooks.

1. Desai, C.S. and Abel, J.F., Introduction to the finite Element Method, Van Nostrand Riehokl Co., New York, 1983.
2. Zienkiewicz, O.C., The Finite Element Method in Engineering Science, Tata McGraw Hill 1972.
3. Segerlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, New York, 1987.

References

1. Mukhopadyay, M., Matrix Finite Element – Computer and Structural Analysis, Oxford and IBH Publishing co., 1984
2. Brown, E.T., (Ed) Analytical and Computational Methods in Engineering and Rock Mechanics, Allen and Unwin, London, 1987.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

MINE GROUND CONTROL
(Professional Elective - VI)

Unit-I

Definition and concept of ground control in Mines. Ground control practice in Mines. Constraints on ground control design; characteristics of coal measure strata.

Unit-II

Modern concept of strata pressure redistribution. Manifestation of strata pressure, convergence, loads on prop, creep, heave, roof fall and facture systems due to mining. Insitu stress measurement, instrumentation.

Unit-III

Roof support: Timber and steel supports, friction and hydraulic prop Arches, shotcrete, roof truss, roof bolts. Powered supports stowing caving strip packing pump packing rock reinforcement.

Unit-IV

Design of structures in rock; design of underground openings. Design of pillars, design of open pit slopes, waste dumps and embankments. Design of stopes.

Unit-V

Subsidence: Theories of subsidence, factors affecting subsidence, prediction and measurement of subsidence. Damage and prevention of damage due to subsidence.
Bumps and rock bursts-causes, occurrence and control.

Textbooks:

1. Obert & Duvall “Rock Mechanics and Design of structures in rock”
2. Jaeger and cook “Fundamental of Rock Mechanics”

Reference Books:

1. V. Singh & B.P. Khare “Rock Mechanics and Ground Control”
2. Richard “Rock Mechanics”
3. Peng “Coal Mining Ground Control

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

ROCK SLOPE ENGINEERING
(Professional Elective - VI)

Unit-I

Introduction: economic implications, geological investigation, data interpretation for slope stability analysis. Basic Mechanism of Slope Failure: Planer, wedge, rotational shear, toppling, buckling and rock fall.

Unit-II

Mechanism of failure of jointed rock mass. Determination of shear strength of discontinuities.

Unit-III

Influence of ground water on slopes and techniques of depressurization, remedial and corrective measures. Remedial measures for slope stabilization.

Unit-IV

Monitoring and instrumentation techniques of rock slopes. Investigations of failed slopes.

Unit-V

Numerical analysis of slopes. Use of FLAC Software.

Textbooks:

1. Rock Mechanics by Alfreds R. Jumikis.
2. Fundamentals of Rock Mechanics by Jager & Cook.

Reference Books:

1. Cumming A.B. & Given I &V. & SME Vol. I & II, Society of Mining Engineers , USA.
2. Hartman H.L. – Introduction to Mining Engineering, John Willey & Sons.
3. Walker B.F. Fell . R. – Soil Slope Instability and Stabilization

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

ECO-FRIENDLY MINING
(Professional Elective - VI)

Unit-I : Overview

Basic concept of eco-friendly mining. Selection of eco-friendly equipment and exploitation operations.

Unit-II : Water quality

Physical, chemical, biological, criteria and standards. Classification and chemistry of major air pollutants.

Unit-III : Soil chemistry

Nature and importance of soil, soil properties, soil amendments.

Unit-IV : Waste Management

Wastewater management – sources characteristics, techniques of treatment. Acid mine drainage – occurrence, effects, and treatment techniques. Solid waste management for mine spoils.

Unit-V : Mine Reclamation & Mine Closure

Mine Reclamation strategies, Principles, planning, financial provisions, implementation, standards for closure criteria, systems approach for mine closure and development of closure plan, Socio-economic Aspects of Mining.

Textbooks:

1. H. S. Peavy, D. R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw-Hill Publishing Co.; 7th Rev Ed edition, 2000.
2. C. J. Barrow, Environmental Management: Principles and Practice (Routledge Environmental Management Series) Routledge, 1st edition, 1999.

Reference Books:

1. P. G. Hutchison, and R. D. Ellison, Mine Waste Management, CRC Press, 1st edition, 1992
2. G. Burke, B. R. Singh and L. Theodore, Handbook of Environmental Management and Technology, Wiley-Interscience, 2nd edition, 2000.
3. N. C Saxena, Mining Environment Management Manual, Scientific Publishers (India), 2004
4. M. J. Hammer, Water and Wastewater Technology, Prentice Hall, 6th edition, 2007.

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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UGC AUTONOMOUS

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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
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.

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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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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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UGC AUTONOMOUS

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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UGC AUTONOMOUS

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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UGC AUTONOMOUS

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.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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.

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS

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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UGC AUTONOMOUS

	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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UGC AUTONOMOUS

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

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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

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
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.

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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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UGC AUTONOMOUS

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

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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.

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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.

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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.

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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

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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.

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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.

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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