

Important

Academic Rules

Scheme of

Studies & Syllabus



**B.Tech. Degree Programme
Civil Engineering**
(Effective from 2009-2010)



**LINGAYA'S
UNIVERSITY**
choose to know

(u/s 3 of UGC Act 1956)

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ABBREVIATIONS/DEFINITIONS

- "AC" means, Academic Council of the University.
- "BOM" means, the Board of Management of the University.
- "BOS" means, the Board of Studies of the Department.
- "CAU/AUC-option" CAU/AUC means change from Credit to Audit option / change from Audit to Credit option
- "Class/Course Committee" means, the Class/Course Committee of a class/course.
- "Course" means, a specific subject usually identified by its course-number and course-title, with a specified syllabus / course-description, a set of references, taught by some teacher(s) / course- instructor(s) to a specific class (group of students) during a specific academic-semester / term.
- "Course Instructor" means, the teacher or the Course Instructor of a Course.
- "Curriculum" means the set of Course-Structure and Course-Contents.
- "DAA" means, the Dean of Academic Affairs.
- "DAAB" means Departmental Academic Appeals Board.
- "DEC/PEC" means Dissertation Evaluation Committee / Project Evaluation committee.
- "Department" means a group in the University devoted to a specific discipline also called a School. Department and School are used interchangeably.
- "DSA" means, Dean Student Affairs.
- "ETE" means End Term Examination.
- "Faculty Advisor/Class Counsellor" means, the Faculty Advisor or the Panel of Faculty Advisors, in a Parent Department, for a group (admission-batch) of students. Also known as Class Counsellor.
- "Grade Card" means the detailed performance record in a term/ programme.
- "He" means both genders "he" and "she"; similarly "his" and/or "him" includes "her" as well, in all the cases.
- "HOD" means, the Head of the Department.
- "MET" means Make-up End Term.
- "MLC" means Mandatory Learning Course.
- "MTE" means Mid Term Examination.
- "Parent Department" or "Degree Awarding Department" means, the department that offers the degree programme that a student undergoes.
- "Project Guide" means, the faculty who guides the Major Project of the student.
- "Regulations" means, set of Academic Regulations.
- "University" or "LU" means, Lingaya's University, Faridabad
- "VC" means, the Vice Chancellor, Lingaya's University, Faridabad.

CODE OF CONDUCT AND ETHICS FOR STUDENTS

1. Wear decent dress respecting his/her modesty as well as that of others.
2. Expected to respect and show regard for teachers, staff and fellow students.
3. Inculcate civic sense and sensitivity for environment protection.
4. Not to resort to collection of funds for any use without written permission of VC.
5. To exhibit exemplary behaviour, discipline, diligences, and good conduct and are a role model to other students.
6. Not to indulge in offences of cognizable nature.
7. Not to practice casteism, communalism.
8. Not to indulge in any other conduct unbecoming of a professional student of the University.
9. Not to outrage the status, dignity and honour of any person.
10. Not to get involved in physical assault or threat, and use of physical force against any body.
11. Not to expose fellow students to ridicule and contempt that may affect their self esteem.
12. Not to form any kind of student's Union, etc.
13. Not to take active or passive part in any form of strikes/protests.
14. To observe all safety precautions while working.
15. Not to disfigure/damage the University property, building, furniture, machinery, library books, fixtures, fittings, etc. (Damage / loss caused shall have to be made good by the students).
16. Use of mobile/video camera phones is strictly prohibited inside the examination halls, class rooms, laboratories and other working places. LU has the right to confiscate the mobile phones in case of any violation.
17. Not to indulge in ragging/teasing, smoking, gambling, use of drugs or intoxicants, drinking alcohol, rude behavior, and use of abusive language.
18. Not to resort to violence, unruly travel in buses, bullying, threatening and coercing others for undesirable act, such as preventing from attending classes, writing exam. / tests, etc etc.
19. All the students of the LU shall be under the disciplinary control of the VC.
20. Students are deemed to be under the care and guidance of parents. It is obligatory for the former to appraise their progress (given by the CC) to the parents.
21. Fine, if ever imposed, is only to improve discipline and shall be paid promptly.
22. While on campus, students have to take care of their belongings and no responsibility for any loss or damage can be held by the University.
23. Every student shall produce the I-Card on demand, and if lost, get a duplicate issued.
24. The students must attend all lectures, tutorials and practical classes in a course punctually (The attendance will be counted course-wise).
25. To abide by the rules and regulations of the University stipulated from time to time.

IMPORTANT ACADEMIC RULES B.Tech. Degree Programme (Regular)

GENERAL

- The Regulations may evolve and get revised/refined or updated or amended or modified or changed through approvals from the Academic Council from time to time, and shall be binding on all parties concerned, including the Students, Faculty, Staff, Departments, University Authorities and officers. Further, any legal disputes shall be limited to the legal jurisdiction determined by the location of the University and not that of any other parties.
- If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation etc., the matter will be reported to the AC, recommending revoking the admission of the candidate.
- The University reserves the right to cancel the admission of any student at any stage of his study programme in the University on the grounds of unsatisfactory academic performance or indiscipline or any misconduct.
- Medium of Instruction shall be English.

PROGRAMME

- The normal duration of the programme leading to B.Tech degree will be four years comprising twelve trimesters (or terms).
- The B.Tech. Degree programme consists of two modes i.e. (a) Project Mode and (b) with Internship.
- The total course package for a Regular B.Tech Degree Programme with Project Mode will typically consist of the following components.
 - (i) General courses
 - (ii) Basic Science and Mathematics
 - (iii) Engineering Science and Technical Arts
 - (iv) Core Courses
 - (v) Elective Courses
An Elective Course can be any of the following:
 - a) Departmental Elective
 - b) Open Elective
 - (vi) Project/Internship (Supervised)
 - (vii) Major Project/Internship (Supervised)
 - (viii) Industrial Training
 - (ix) Mandatory Learning Courses
- The Regular B. Tech. Degree Programme with internship will typically consist of all the components of the Regular Project Mode as above, however with different weightage to industrial training and core courses.
- The student has to opt for the Internship Scheme in the ninth term which will not be revoked in any circumstances. In the absence of exercising the option, it will be presumed that option is for Project Mode.
- A student having registered for internship scheme of a programme cannot opt out of that scheme.
- The minimum credit requirement for the B.Tech.

Degree programme is 190. However, considering a case for award of honours the minimum credits will be 195.

- The project will be assigned in tenth term. It may be extended to Major Project. The Major Project shall comprise of Phase-I and Phase-II, spread over eleventh and twelfth terms. Appropriate double-letter grade is awarded as per the evaluation scheme which will be considered for TGPA and CGPA calculations. It is recommended that an external expert from industry/academia may be a member of the evaluation team of four persons (two professors, external expert and respective project guide).
- MLC must be completed by a student at appropriate time or at his convenience. The 'S' grade is awarded for satisfactory completion of the course and 'N' grade is awarded for non-satisfactory completion of the course. In case 'N' grade is awarded, the student has to re-register for the same course if no alternative options are available. However, one can opt for other courses if provided with multiple options. The 'S' and 'N' grades do not carry grade-points and, hence, are not included in the TGPA and CGPA computations.
Courses that come under this category are the following:
 - (a) Environment Science and Ecology
 - (b) Community Service Oriented Project
 - (c) Professional Development Courses
- Students admitted to the University will be required to take suitable additional Courses in Mathematics (5-0-0) and or Communication Skills (3-0-0), if found deficient.

ASSOCIATION

- Every under graduate student of the University shall be associated with Parent Department (degree awarding department) offering the degree programme that the student undergoes throughout his study period, right from the very first day of admission into the programme. However, in the first year class he may report to the Dept. of Applied Science and Humanities for administrative/academic purpose.
- A student will be placed in GROUP-A/B/C for all the three terms in an academic year.
- The schedule of academic activities for a term, including the dates of registration, mid-term examinations (MTE), end-term examination (ETE), inter-term vacation, etc. shall be referred to as the Academic Calendar of the term, and announced at least two weeks before the closing date of the previous term.

PRE-REGISTRATION

- In order to facilitate proper planning of the academic activities of a term, it is essential for the students to declare their intent to register for a course well in advance, before the actual start of the academic

session, through the process of Pre-Registration, which is mandatory for all those students of second or subsequent term who propose to deviate from recommended scheme of studies.

- Pre-registration is an expression of intention of a student to pursue particular course(s) in the next term. It is information for planning for next term. Every effort will be made to arrange for a course opted by the student. However, it is not obligatory on the part of the university to offer the course(s) and no course may be offered if the number of students opting for the course is less than 15 or 25 percent of the admission strength whichever is less.
- If a student fails to pre-register it will be presumed that he will follow suggested normal scheme of studies provided that he is progressing at a normal pace. For remaining students the HOD of the parent department will plan for courses as per the convenience of the department.

REGISTRATION TO COURSES

- Every Student after consulting his Faculty-Advisor is required to register for the approved courses with the HOD of parent department at the commencement of each term on the days fixed for such registration as notified in the academic calendar.
- A student shall register for courses from amongst the courses being offered in the term keeping in mind the minimum and maximum credits allowed for a degree and other requirements i.e. pre-requisite if any, TGPA and CGPA after consulting the Faculty Advisor. No registration will be valid without the consent of HOD of the parent department.
- A student will be permitted to register in the next term as per the suggested normal scheme only if he fulfills the following Conditions:
 - (a) Satisfied all the Academic Requirements to continue with the programme of studies without termination.
 - (b) Cleared all university, library and hostel dues and fines (if any) of the previous term.
 - (c) Paid all required advance payments of the university and hostel for the current term.
 - (d) Not been debarred from registering on any specific ground by the University.
- The students will be permitted to register for course(s) being offered in a term other than his normal suggested scheme provided that the time table permits.
- The registration in the critical cases will be done as per the priority given below:
 - (a) Fulfillment of minimum credit requirement for continuation,
 - (b) The completion of programme in minimum period needed for degree, (Those who need to improve TGPA/CGPA)
 - (c) The fulfillment of pre-requisite requirement of courses.
- Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.

- REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the DAA after the recommendation of HOD through the guardian of the student.
- Credits will be awarded in registered courses only.

CREDIT LIMITS

- A student of the B.Tech. degree programme must register for a minimum of 10 credits, and up to a maximum of 21 credits in a Term. However, the minimum / maximum credit limit can be relaxed by the DAA on the recommendation of the HOD, only under exceptional circumstances. The maximum credits that a student can register in a Summer Term are 8.
- Professional Development courses are one credit courses each, with multiple options, to be completed at student's convenience in each Term. Some of them may be mandatory and others two-letter grade category. However, registration has to be done for all courses.

CHANGE IN REGISTRATION

- A student has the option to ADD courses for registration till the date specified for late registration in the Academic Calendar.
- On recommendation of the Teaching Department as well as the Parent Department, a student has the option to DROP courses from registration until two weeks after the commencement of the classes in the term, as indicated in the Academic Calendar.
- A student can register for auditing a course, or a course can be converted from credit to audit or from audit to credit, with the consent of the Faculty Advisor and Course Instructor within two weeks after the commencement of the classes in the term as indicated in the Academic Calendar. However, CORE Courses shall not be available for audit.

ATTENDANCE REQUIREMENTS

- LU academic programmes are based primarily on the formal teaching-learning process. Attendance in classes, participating in classroom discussions and participating in the continuous evaluation process are the most essential requirements of any academic programme.
- Attendance will be counted for each course scheduled teaching days as per the academic calendar.
- The attendance requirement for appearing in end term examination shall be a minimum of 75% of the classes scheduled in each course.

LEAVE OF ABSENCE

- The leave of absence must be authorized as per regulations.
- A student short of attendance in a course (less than needed after leave of absence and condonation by VC) will be awarded 'FF' grade in the course.
- All students must attend all lecture, tutorial and practical classes in a course. The attendance will be counted course wise.
- To account for approved leave of absence e.g. representing the University in sports, games or athletics; professional society activities, placement

activities, NCC/NSS activities, etc. and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes scheduled in each course to appear in the examination.

- A student with less attendance in a course during a trimester, in lectures, tutorials and practicals taken together as applicable, shall be awarded 'FF' grade in that course, irrespective of his academic performance, and irrespective of the nature of absence.
- If the period of leave is more than three days and less than two weeks, prior application for leave shall have to be submitted to the HOD concerned, with the recommendation of the Faculty-Advisor, stating fully the reasons for the leave requested, along with supporting documents.
- If the period of leave is two weeks or more, prior application for leave shall have to be made to the DAA with the recommendations of the Faculty-Advisor, HOD concerned stating fully the reasons for the leave requested, along with the supporting documents. The DAA may, on receipt of such application, grant leave or decide whether the student be asked to withdraw from the course for that particular term because of long absence.
- If a student fails to apply and get sanction for absence as in (a) and (b) above, his parent/guardian may apply to the VC with reasons duly recommended by the faculty advisor, HOD and DAA and explain in person to the VC the reasons for not applying in time. The VC will consider on merit and decide to grant the leave or withdrawal from the course for that particular term subject to any condition that he may like to impose. The decision of the VC shall be final and binding.

ABSENCE DURING EXAMINATIONS

- A student who has been absent during MTE due to illness and/or any exigencies may give a request for make-up examination within one week after the MTE to the HOD with necessary supporting documents in person. The HOD may consider such requests depending on the merits of the case, and after consultation with the Course Instructor, may permit the Make-up examination for the student concerned. However, no makeup examination will be permitted if the attendance in the course is less than 60% till the date of examination.
- In case of absence from ETE of a course(s) on Medical ground and/or other special circumstances, the student can apply for award of 'I' grade in the course(s) with necessary supporting documents and certifications by an authorized person to the HOD within one week after the ETE. The HOD may consider the request, depending on the merit of the case, and after consultation with the Course(s) Instructor(s)/ Faculty Advisor permit the MET Examination for the student concerned. The student may subsequently complete all course requirements within the date stipulated by BOS (which may possibly be extended till first week of term under special circumstances) and 'I' grade will then

converted to an appropriate Double-letter grade, as per Clause No: G5.9. All the details of such a decision with date of finalizing the grade shall be communicated to DAA. If such an application for the 'I' grade is not made by the student then a double-letter grade will be awarded based on his term performance.

COURSE CREDIT ASSIGNMENT

- Every course comprises of specific Lecture-Tutorial-Practical (L-T-P) schedule. The credits for various courses are shown in the Scheme of Studies & Syllabus.
- The Academic Performance Evaluation of a student shall be according to a Letter Grading System, based on the Class Performance Distribution.
- The double-letter grade (AA, AB, BB, BC, CC, CD, DD, FF) indicates the level of academic achievement, assessed on a decimal (0-10) scale.

Letter-Grades and Grade-Points:

LETTER- GRADE	GRADE- POINTS	REMARKS
AA	10	
AB	9	
BB	8	
BC	7	
CC	6	
CD	5	
DD	4	
FF	0	Fail
I	-	Incomplete
U	-	Audited
W	-	Withdrawal
S	-	Satisfactory
N	-	Unsatisfactory

DESCRIPTION OF GRADES

- An 'AA' grade stands for outstanding performance, relative to the class which may include performance with previous batches. The Course Instructor is supposed to take utmost care in awarding of this highest double-letter grade.
- The 'DD' grade stands for marginal performance and is the minimum passing double-letter grade.
- The 'FF' grade denotes very poor performance, i.e. failure in a course, and the Course Instructor is supposed to take utmost care while awarding this lowest double-letter grade.
- A student, who obtains 'FF' grade in a core course, has to repeat (re-register) that core course, in subsequent terms/sessions whenever the course is offered, until a passing grade is obtained. However, for an elective course in which 'FF' grade has been obtained, the student may either repeat the same course, or register for any other elective course.
- An 'I' grade denotes incomplete performance in any course due to absence at the end term examination (see also Clause No: G7.4). When the 'I' grade is converted to a regular double

letter grade, a penalty of ONE Grade-Point is imposed, by awarding the double-letter grade that is immediately below the one that the student would have otherwise received except when the student has 95% attendance record in the subject concerned. For example, if on the basis of the performance including MET Examination, a student gets AB grade, he will be awarded BB grade if not under exception rule.

- 'U' grade is awarded in a course that the student opts to register for audit. It is not mandatory for the student to go through the entire regular process of evaluation in an audit course. However, the student has to go through some process of minimal level of evaluation and also the minimum attendance requirement, as stipulated by the Course Instructor and approved by the corresponding BOS, for getting the 'U' grade awarded in a course, failing which that course will not be listed in the Grade Card.
- A 'W' grade is awarded when the student withdraws from the course. Withdrawal from a course is permitted only under extremely exceptional circumstances (like medical emergencies, family tragedies and/or other unavoidable contingencies) and has to be recommended by the HOD and approved by the DAA. However, no withdrawal is permitted after the finalization of the grades in the term.
- 'S'/'N' grades are awarded for the Mandatory Learning Courses. The 'S' grade denotes satisfactory performance and completion of a course. The 'N' grade is awarded for non-completion of course requirements and the student will have to register for the course until he obtains the 'S' grade.

FEEDBACK TO STUDENTS

- A student requires feedback on the progress of his learning. For this purpose, the Instructor will conduct at least two quizzes for a theory course in a term-one before MTE and the other there after. The quizzes will form a component of class work, the other components being tutorials, home assignments or any other mode.
- For a laboratory course, the continuous assessment's feed back will be given through the laboratory records which are required to be submitted after performing the experiment in the next laboratory class.
- The continuous feedback on project/major project will be through project diary and interim report.
- For Internship stream, the continuous assessment and feedback is to be through seminars, professional diary and interim reports at the place of work.

EVALUATION

Theory Course:

- The double-letter grade awarded to a student in a course other than a practical course, i.e. it shall be denoted by L-T-0 course for which he has registered, shall be based on his performance in quizzes, tutorials, assignments etc., as applicable, in addition to one MTE and ETE. The weightage of these components of continuous evaluation may be as follows:

End-term Examination	:	50%
Mid-term Examinations	:	30%
Quizzes, Tutorials, Assignments, etc. (Several over the term)	:	20%
Total	:	100%

Laboratory Course:

- The double letter grade awarded to the student in a practical course i.e. 0-0-P course will be based on his performance in regular conduct of experiments, viva voce, laboratory report, quizzes etc., in addition, to term practical examination. The weightage of the components of continuous evaluation may be as follows:

Conduct of Experiments (as per syllabus)	:	40%
Lab Record	:	10%
Quizzes/Viva Voice	:	20%
End-term Examination	:	30%
Total	:	100%

Project (Including Seminar):

- The double letter grade awarded to the student in Project (Includes Seminar) i.e. 0-0-P course will be based on his performance in technical work pertaining to the solution of a small size problem, project report, and presentation of work and defending it in a viva-voce. The weightage of the components of continuous evaluation may be as follows:

Technical Work	:	50%
Report	:	25%
Seminar, Presentation & Viva-voce	:	25%
Total	:	100%

Major Project:

- The double letter grade awarded to the student in Major Project Phase-I and Phase-II i.e. 0-0-P course will be based on his performance in technical work pertaining to the solution of a problem, project report, presentation and defending in a viva-voce. The weightage of the components of continuous evaluation may be as follows:

Technical Work	:	50%
Report	:	25%
Presentation & Viva-voce	:	25%
Total	:	100%

Internship:

- The Internship-II will be treated as Major Project for evaluation purpose. The double letter grade awarded to the student in Internship-II i.e. 0-0-P course will be based on his performance in technical work pertaining to the solution of a real-life problem, project report, presentation and defending in a viva-voce. The weightage of the components of continuous evaluation may be as follows:

Technical Work	:	50%
Report	:	25%
Presentation & Viva-voce	:	25%
Total	:	100%

The continuous assessment and feedback is to be through seminars, professional diary and entering report at the place of work.

Seminar:

- The double letter grade awarded to the student in Seminar i.e. 0-0-P course will be based on his performance in oral presentation with emphasis on technical contents, presentation and ability to answer questions. The weightage of the components of continuous evaluation may be as follows:

Technical Contents	:	40%
Presentation	:	30%
Questions and answers	:	30%
Total	:	100%

Industrial/Field Training/Internship-I:

- The double letter grade awarded to the student in Industrial/Field Training/Internship-I i.e. 0-0-P course will be based on Practical Training/Internship-I in an industry, professional organization/ research laboratory. The components of continuous evaluation with weightage may be as follows:

Training report	:	40%
Presentation	:	30%
Questions and answers	:	30%
Total	:	100%

Professional Development:

- There are 14 credits divided into 14 courses of one credit each. The evaluation process of these courses will be as per the nature, contents and delivery of these courses. Some of the common components of evaluation could be quizzes, viva-voce, practical test, group discussion, etc. Participation by students is to be given more weightage in Co-curricular courses.

SCHEME OF EXAMINATION

- The duration of examinations for a theory course will be 3 hours for ETE and 1½ hours for MTE.
- The pattern of question paper/examination will be as under:

Theory Courses:

The University shall conduct the ETE for all theory courses being taught in the term.

- There will be eight questions in all distributed over all the units in a course syllabus. The question paper will be in three parts with weightage 20 percent, 40 percent and 40 percent respectively.
- Part-A will be short answer type with multiple parts covering all the units in the syllabus, which will be compulsory.
- Part-B will have three questions from any three units, which will have long answers of derivation/descriptive type. Two questions are to be answered from this part.
- Part-C will consist of four questions from the remaining four units and they will be of problem solving type in order to measure ability on comprehension/ analysis/ synthesis/ application. The relevant data will be made available. The student is required to solve two questions. However, for Part-C,

the external examiner may select the questions from the question bank supplied by the University.

- Students are allowed in the examination the use of single memory, non-programmable calculator. However, sharing of calculator is not permitted.

Laboratory Courses:

- The ETE in laboratory course will be conducted jointly by an external examiner (other than the instructor) and an internal examiner (the coordinator / instructor) jointly.
- The student will be given randomly an experiment to perform from within the list of experiments in the course.
- No change in the experiment will be permitted after the draw, if the student had performed the same in the class.

Mid-Term Examination:

Question 1 is compulsory covering all topics taught till then. Question 2 and 3 will be essay type, out of which student will answer any one. Question 4 and 5 will be to measure to ability of analysis / comprehension / synthesis / application. The student will answer any one.

TRANSPARENCY

- The answer books of all MTE and ETE will be shown to the students within three days of the last paper. It is the responsibility of the student to check this evaluation and affix his signature in confirmation.
- If the student finds some discrepancy, he should bring it to the notice of the Course Coordinator. The Course Coordinator will look into the complaint and remove the doubts of the student and proceed with the work of grading.
- The entire process of evaluation shall be transparent, and the course instructor shall explain to a student the marks he is awarded in various components of evaluation.

RESULT

- The final marks shall be displayed on the notice board for ONE day, (the date of which will be indicated in the academic calendar). A student can approach the Course Instructor(s) concerned for any clarification within Two days of display. The process of evaluation shall be transparent and the students shall be made aware of all the factors included in the evaluation. In case of any correction, the Course Instructor shall have to incorporate the same before finalization of the grades.
- The Student's Grade Card shall contain the Letter-Grade for each registered course; along with the TGPA at the end of the term, and the CGPA at the completion of the programme.

APPEAL FOR REVIEW OF GRADE

- If a student is not satisfied with the award of the grade after the announcement of the grades, he may appeal on a Grievance Form duly filled in along with the fee receipt for this purpose to the

HOD of the parent department within one week of the following term. The HOD will forward the form along with his recommendation based on the records of the case to DAAB within the date specified in the Academic Calendar.

- The fee for such an appeal will be decided from time to time. If the appeal is upheld by DAAB, then the fee amount will be refunded to the student without interest.
- VC shall have power to quash the result of a candidate after it has been declared, if
 - He is disqualified for using malpractice in the examination;
 - A mistake is found in his result;
 - He is found ineligible to appear in the examination

AWARD OF DIVISIONS

- The overall performance of a student will be indicated by two indices:
 - TGPA** which is the Term Grade Point Average
 - CGPA** which is the Cumulative Grade Point Average

TGPA for a Term is computed as follows:

$$TGPA = \sum C_i G_i / \sum C_i$$

Where,

C_i denotes credits assigned to i^{th} course with double-letter grade, and G_i denotes the grade point equivalent to the letter grade obtained by the student in i^{th} course with double-letter grade, including all 'FF' grades in that term.

CGPA is computed as follows:

$$CGPA = \sum C_i G_i / \sum C_i$$

Where,

C_i denotes credits assigned to i^{th} course with double-letter grade, and G_i denotes the grade point equivalent to the letter grade obtained by the student in i^{th} course for all courses with double-letter grades, including all 'FF' grades in all terms at the end of the programme.

For CGPA calculation, the following grades are to be counted:

- Grades in all core courses,
 - The best grades in the remaining eligible courses to fulfill the minimum credits requirement for a programme.
- The degree will be awarded only upon compliance of all the laid down requirements for programme as under:
 - There shall be University requirement of earning a minimum credits for a degree, satisfactory completion of mandatory learning courses and other activities as per the course structure.
 - There shall be a minimum earned credit requirement on all Departmental Core Courses, Elective courses and Major Project as specified by BOS.
 - There shall be a maximum duration for complying to the degree requirement.
 - The candidate will be placed in First Division

with Honours/First Division with Distinction/First Division/Second Division which will be mentioned on the degree certificate as under:

DIVISION	CONDITIONS TO BE FULFILLED
First Division with Honours	CGPA ≥ 8.5 No 'FF', N or W grade in any course during the programme and total 195 credits
First Division with Distinction	CGPA ≥ 8.5
First Division	CGPA ≥ 6.75
Second Division	CGPA ≥ 5.0 but < 6.75

Note:

Although, there is no direct conversion from grades to marks, however, for comparison purposes percentage of marks may be assumed to be CGPA multiplied by nine.

B. TECH. DEGREE REQUIREMENTS

- The requirements of the award of B.Tech. Degree programme are as follows:
 - University Requirements:**
 - Minimum Earned Credit Requirement for Degree is 190 for regular programme. However, the credits required for consideration for honours degree will be 195.
 - Satisfactory completion of all Mandatory Learning Courses.
 - Programme Requirements:** Minimum Earned Credit Requirements on all Core Courses, Elective Courses and Major Project/Internship as specified by the BOS.
 - The CGPA at the end of programme is atleast 5.0.
 - The Maximum duration for a student for complying with the Degree Requirement is SEVEN years from date of first registration for first Term.

GRADE IMPROVEMENT

- A student may be allowed to improve the TGPA in an appropriate Term, if his TGPA falls below 5.0. Similarly, any student may be allowed to improve performance in any course provided the course is being floated and available.

TERMINATION FROM THE PROGRAMME

- A student shall be required to leave the University without the award of the Degree, under one or more of the following circumstances:
 - If a student fails to earn the minimum credits specified below:

CHECK POINT	CREDIT THRESHOLD**
End of FIRST year	20*
End of SECOND year	50*
End of THIRD year	85
End of FOURTH year	125

Note 1:

* A student may be given one more chance to cover the shortfall in the threshold during the following summer term as follows:

- (i) if a student earns 12 credits or more but less than 20 at the end of first year.
- (ii) if a student earns 42 or more credits but less than 50 at the end of second year.

In case he fails to clear the threshold even after the summer term he has to leave the course.

** If at any stage, a student fails to cross the threshold with a TGPA of minimum 5.0 in any term, he will be treated as critical case and will be advised to improve the grades.

Note 2:

The period of temporary withdrawal is not to be counted for the above credit threshold.

- (2) If a student is absent for more than 4 (four) weeks at a stretch in a term without sanctioned leave.
- (3) Based on disciplinary action by the AC, on the recommendation of the appropriate committee.

Note:

Under any circumstances of termination, the conditions specified in permanent withdrawal shall also apply.

WITHDRAWAL FROM PROGRAMME

Temporarily:

- A student who has been admitted to a degree programme of the University may be permitted to withdraw temporarily, for a period of one term or more, on the grounds of prolonged illness or grave calamity in the family, etc., provided:

- (i) He applies to the University stating fully the reasons for withdrawal together with supporting documents and endorsement from his parent/guardian
- (ii) There are no outstanding dues or demands, from the Departments/ University / Hostels/Library and any other centers;
- (iii) Scholarship holders are bound by the appropriate Rules applicable to them.
- (iv) The decision of the VC of the University regarding withdrawal of a student is final and binding.

- Normally, a student will be permitted only one such temporary withdrawal during his tenure as a student and this withdrawal will not be counted for computing the duration of study.

Permanently:

- Any student who withdraws permanently admission before the closing date of admission for the academic session is eligible for the refund of fee as per the University rules. Once the admission for the year is closed, the following conditions govern withdrawal of admission:
- A student who wants to leave the University for good, will be permitted to do so (and take Transfer Certificate from the University, if needed), only after clearing all the dues for the remaining duration of the course.
- A student who has received any scholarship, stipend or other form of assistance from the University shall repay all such amounts, in addition, to clearing all the dues for the remaining duration of the course.
- The decision of the VC regarding all aspects of withdrawal of a student shall be final and binding.

Department of Civil Engineering

DEGREE OBJECTIVE

All major physical structures for human habitat are the brain child of civil engineering, from a house to shopping mall, from a bridge to mass rapid transport systems, from a dam and auditorium to transportation, and so on.

Civil Engineers conceive, design, build and maintain structures for use of mankind. The objective therefore is based on the above four aspects. Broadly, the undergraduate programme has been classified into the following categories:

- Analytical and Application Oriented courses
- Survey engineering
- Building construction materials, Geology Engineering and Drawing
- Soil Mechanics and Foundation Engineering cum Geo technical Engineering
- Structural Engineering cum RCC & Steel Design
- Water Resources Engineering
- Environmental Engineering
- Transportation Engineering
- Project Management

Additionally, for being a good citizen, the student is trained through Professional Development courses where the student will understand the significance of Personal Ethics, Personal Character, Environmental awareness, Community obligations, etc. The obligation of the student to the community is further strengthened through an audit course Community Service Oriented Project (CSOP). The student will also be aware of the contributions in the area of Civil Engineering at national and global level through seminars and invited lectures. In the final year, the student is expected to take up elective courses as a part of limited specialization that would help him keep abreast of the latest developments globally.

CATEGORY-WISE LIST OF COURSES

General (Humanities, Soc Sc. Man) (GEN.)				
1	BA-225	Economics	5-0-0	3
2	BA-226	Principles of Management	5-1-0	4
3	CE-101	Environmental Science & Ecology	5-0-0	3
4	EN-101	Communication Skills	5-0-0	3
5	EN-151	Language Lab	0-0-2	1

Basic Science & Mathematics including Computer (BSM)				
1	CH-101	Applied Chemistry	5-0-0	3
2	CH-151	Applied Chemistry Lab	0-0-2	1
3	CS-101	Computer Programming	5-1-0	4
4	CS-151	Computer Programming Lab	0-0-2	1
5	MA-101	Applied Mathematics-I	5-1-0	4
6	MA-102	Applied Mathematics-II	5-1-0	4
7	MA-202	Applied Numerical Methods	5-1-0	4
8	MA-252	Applied Numerical Methods Lab	0-0-2	1
9	PH-101	Physics	5-1-0	4
10	PH-102	Applied Physics	5-1-0	4
11	PH-151	Physics Lab	0-0-2	1
12	PH-152	Applied Physics Lab	0-0-2	1
13	PH-152	Applied Physics Lab	0-0-2	1

Engineering Science & Technical Arts (ESTA)				
1	EC-201	Electronics Engineering	5-1-0	4
2	EC-251	Electronics Engineering Lab	0-0-2	1
3	EL-101	Electrical Engineering	5-1-0	4
4	EL-151	Electrical Engineering Lab.	0-0-2	1
5	ME-101	Engineering Mechanics	5-1-0	4
6	ME-151	Engineering Mechanics Lab	0-0-2	1
7	ME-152	Workshop Practice	0-0-4	2
8	ME-153	Engineering Graphics	0-0-6**	3

Department Core (DC)				
1	CE 255	Surveying-II Lab	0-0-2	1
2	CE-201	Surveying-I	5-0-0	3
3	CE-202	Building Construction Materials & Drawing	5-0-0	3
4	CE203	Structural Mechanics I	5-1-0	4
5	CE204	Engineering Geology	5-0-0	3
6	CE-205	Surveying-II	5-0-0	3
7	CE-206	Structural Mechanics-II	5-1-0	4
8	CE-207	Fluid Mechanics-I	5-1-0	4
9	CE-208	Fluid Mechanics-II	5-1-0	4
10	CE-209	Soil Mechanics	5-1-0	4
11	CE-210	Environmental Engineering (Water Supply)	5-0-0	3
12	CE251	Surveying-I Lab	0-0-2	1
13	CE-252	Building Construction Materials & Drawing Lab	0-0-2	1
14	CE253	Structural Mechanics-I Lab	0-0-2	1
15	CE254	Engg. Geology Lab	0-0-2	1
16	CE-256	Structural Mechanics-II Lab	0-0-2	1
17	CE-257	Fluid Mechanics-I Lab.	0-0-2	1
18	CE-258	Fluid Mechanics-II Lab	0-0-2	1

19	CE-259	Soil Mechanics Lab	0-0-2	1
20	CE-301	Transportation Engineering-I	5-0-0	3
21	CE-302	Elements of RCC	5-0-0	3
22	CE-303	Geotech Engineering	5-0-0	3
23	CE-304	Transportation Engineering-II	5-1-0	4
24	CE-305	Elements of Steel Engineering	5-0-0	3
25	CE-306	Hydraulics Structures & Irrigation Engg	5-0-0	3
26	CE-307	Advanced Construction Technology	5-0-0	3
27	CE-308	Environmental Engineering-II (Sanitation)	5-1-0	4
28	CE-309	Costing Estimate, Billing & Accounts	5-0-0	3
29	CE-310	Building Services	5-0-0	3
30	CE-351	Transportation Engineering-I Lab	0-0-2	1
31	CE-352	Elements of RCC Lab	0-0-2	1
32	CE-353	Geotech Engineering Lab	0-0-2	1
33	CE-354	Transportation Engineering – II Lab	0-0-2	1
34	CE-355	Elements of Steel Engineering Lab	0-0-2	1
35	CE-358	Environmental Engineering-II (Sanitation) Lab	0-0-2	1
36	CE-359	Costing Estimate, Billing & Accounts Lab	0-0-2	1
37	CE-391	Survey Camp	0-0-2	1
38	CE-401	Computer Programming & Graphics	5-0-0	3
39	CE-402	RCC & STEEL Designs	5-0-0	3
40	CE-404	Design of Environmental Engineering	5-0-0	3
41	CE-451	Computer Programming & Graphics Lab	0-0-4	2
42	CE-452	RCC & Steel Designs Lab	0-0-2	1
43	CE-453	Department Lab	0-0-2	1
44	CE-454	Design of Environmental Engineering Lab	0-0-2	1

Department Elective (DE)				
1	CE-421	Bridge Engineering		
2	CE-422	Hydrology		
3	CE-423	Environmental Pollution and Control		
4	CE-431	Computer Aided Design & Application in Civil Engineering		
5	CE-432	Ground Water & Sedimentation Transport		
6	CE-433	Environmental Impact Assessment & Management		
7	CE-441	Advanced Surveying & Remote Sensing in Civil Engineering		

8	CE-442	Professional Practices		
9	CE-443	Advanced Design of RCC and Steel Structure		
10	CE-461	Construction Operational Management		
11	CE-462	Design of Water Resource Systems		
12	CE-463	Repair & Maintenance of Buildings		

Open Elective (OE)				
1	AE-411	Transport Management	5-0-0	3
2	BA-271	Human Resource Management	5-0-0	3
3	BA-272	Entrepreneurship Development	5-0-0	3
4	CE-471	Advanced Traffic Engineering	5-0-0	3
5	CE-472	Elements of Town Planning and Architecture	5-0-0	3
6	CH-471	Advanced Applied Chemistry	5-0-0	3
7	CS-303	Computer Graphics	5-0-0	3
8	CS-422	Cryptography and Data Compression	5-0-0	3
9	EC-305	Embedded System Design	5-0-0	3
10	EC-401	Mobile Communication	5-0-0	3
11	EE-401	Programmable Logic Controllers & SCADA	5-0-0	3
12	EE-431	INDUSTRIAL ELECTRONICS	5-0-0	3
13	EL-421	Renewable Energy Source and Energy Conservation	5-0-0	3
14	EL-422	High Voltage Direct Current Transmission	5-0-0	3
15	EL-423	High Voltage Engineering	5-0-0	3
16	EN-471	Professional Communication	5-0-0	3
17	EN-472	Business Communication	5-0-0	3
18	IT-423	Introduction to E-commerce & ERP	5-0-0	3
19	IT-443	Information Storage & Management	5-0-0	3
20	MA-471	Discrete Mathematics	5-0-0	3
21	MA-472	Advanced Higher Engineering Mathematics	5-0-0	3
22	MA-473	Advanced Numerical Techniques	5-0-0	3
23	MA-474	Operation Research	5-0-0	3
24	ME-442	Ergonomics	5-0-0	3
25	ME-443	Finite Element Analysis	5-0-0	3
26	ME-461	Renewable Sources of Energy	5-0-0	3
27	PH-471	Non Destructive Testing Techniques	5-0-0	3
28	PH-472	Nano Technology	5-0-0	3
29	PH-473	Laser Technology	5-0-0	3

Project/Internship, Seminar Training, CSOP*				
2	CE-481	Major Project Phase-I	0-0-10	5
3	CE-482	Major Project Phase-II	0-0-6	3
4	CE-483	Internship – I	0-0-2	1
5	CE-484	Internship – II (in industry)	0-0-26	13
6	CE-485	Internship Documentation	0-0-6	3
1	CE-491	Community Service Oriented Project (CSOP)	0-0-2	1
7	CE-492	Project (including Seminar)	0-0-4	2
8	CE-493	Industrial Training/Field Training	0-0-2	1
9	CE-494	Seminar – I	0-0-2	1
10	CE-495	Seminar – II	0-0-2	1

Professional Development (PD) – Gen.				
1	PD-151	Basics of Computer Fundamentals	0-0-2	1
2	PD-191	Co-curricular Activities		1
3	PD-192	Personality Skills	0-0-2	1
4	PD-193	Entrepreneurial & Professional Skills	0-0-2	1
5	PD-251	MATLAB	0-0-2	1
6	PD-291	Co-curricular Activities		1
7	PD-292	Effective Communication	0-0-2	1
8	PD-293	Intra & Inter-personal Skills	0-0-2	1
9	PD-352	Civil Engineering Drawings	0-0-2	1
10	PD-391	Co-curricular Activities		1
11	PD-392	Problem Solving Skills	0-0-2	1
12	PD-393	Advanced Professional Development	0-0-2	1
13	PD-452	Construction Techniques and Equipment	0-0-2	1
14	PD-491	Co-curricular Activities		1

Mandatory Learning Course (MLC)				
1	CE-101	Environmental Science & Ecology	5-0-0	3
2	CE-491	Community Service Oriented Project (CSOP)	0-0-2	1
3	PD-292	Effective Communication	0-0-2	1
4	PD-393	Advanced Professional Development	0-0-2	1

Additional/Bridge Course				
1	EN-291	Essentials of Communication Objective (Bridge Course)	5-0-0	3
2	MA-191	Mathematics (Makeup Course)	5-0-0	3
3	MA-291	Mathematics (Bridge Course)	5-0-0	3

SUGGESTED PLAN OF STUDIES

Course→	1	2	3	4	5	6	7	8	9	10
Term-I	PH-101/ EL-101/ PH-102	MA-101/ ME-101/ MA-102	CH-101/ CS-101/ CE-101	EN-101/ ME-102/ ME-103	ME-151	PH-151/ PH-152/ EL-151	CH-151/ CS-151	EN-151/ ME-152/ ME-153	PD-192/ PD-193/ PD-151	PD-191
Term-II	PH-101/ EL-101/ PH-102	MA-101/ ME-101/ MA-102	CH-101/ CS-101/ CE-101	EN-101/ ME-102/ ME-103	ME-151	PH-151/ PH-152/ EL-151	CH-151/ CS-151	EN-151/ ME-152/ ME-153	PD-192/ PD-193/ PD-151	PD-191
Term-III	PH-101/ EL-101/ PH-102	MA-101/ ME-101/ MA-102	CH-101/ CS-101/ CE-101	EN-101/ ME-102/ ME-103	ME-151	PH-151/ PH-152/ EL-151	CH-151/ CS-151	EN-151/ ME-152/ ME-153	PD-192/ PD-193/ PD-151	PD-191
Term-IV	CE-201	CE-202	CE-203	CE-204	CE-251	CE-252	CE-253	CE-254	PD-292/ PD-293/ PD-251	PD-291
Term-V	CE-205	BA-225	CE-206	CE-207	CE-255	CE-256	CE-257	-	PD-292/ PD-293/ PD-251	PD-291
Term-VI	CE-208	CE-209	CE-210	BA-226	CE-258	CE-259	-	-	PD-292/ PD-293/ PD-251	PD-291
Term-VII	MA-202	CE-301	CE-302	EC-201	MA-252	CE-351	CE-352	EC-251	PD-392/ PD-393/ PD-352	PD-391
Term-VIII	CE-303	CE-304	CE-305	CE-306	CE-353	CE-354	CE-355	-	PD-392/ PD-393/ PD-352	PD-391
Term-IX	CE-307	CE-308	CE-309	CE-310	CE-358	CE-359	CE-391	-	PD-392/ PD-393/ PD-352	PD-391
Term-X (Project)	CE-401	CE-402	Dept. Elect.-I	CE-451	CE-452	CE-491	CE-492	CE-493	PD-452	PD-491
Term-X (Internship)	CE-401	CE-402	Dept. Elect.-I	CE-451	CE-452	CE-491	CE-492	CE-483	PD-452	PD-491
Term-XI (Project)	Dept. Elect.-II	CE-481	CE-453	CE-494	-	-	-	-	-	PD-491
Term-XI (Internship)	CE-484	CE-494	-	-	-	-	-	-	-	PD-491
Term-XII (Project)	CE-404	Dept. Elect.-III	Dept. Elect.-IV	CE-454	CE-482	CE-495	-	-	-	PD-491
Term-XII (Internship)	CE-404	Dept. Elect.-III	Dept. Elect.-IV	CE-454	CE-485	CE-495	-	-	-	PD-491

Scheme of Studies
B. Tech. Degree Programme (Regular)
(Common to all Branches)

1st Year

TERM – I

THEORY										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation with Weightage (%)					
					L-T-P	Class Work	MTE (1½ Hrs)	ETE (3 Hrs)		Total
1	A	MA-101	Applied Mathematics-I	5-1-0	20	30	50	100	4	
	B	MA-101	Applied Mathematics-I	5-1-0	20	30	50	100	4	
	C	ME-101	Engineering Mechanics	5-1-0	20	30	50	100	4	
2	A	PH-101	Physics	5-1-0	20	30	50	100	4	
	B	PH-101	Physics	5-1-0	20	30	50	100	4	
	C	EL-101	Electrical Engineering	5-1-0	20	30	50	100	4	
3	A	CH-101	Applied Chemistry	5-0-0	20	30	50	100	3	
	B	CS-101	Computer Programming	5-1-0	20	30	50	100	4	
	C	CE-101	Environmental Science & Ecology***	5-0-0	20	30	50	100	3	
4	A	EN-101	Communication Skills	5-0-0	20	30	50	100	3	
PRACTICAL/DRAWING/DESIGN										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme					Cr
					Components of Evaluation With Weightage (%)					
					L-T-P	EXPT.	Lab Record	MTE Quizzes/ Viva-voce	ETE (2 Hrs)	
1	C	ME-151	Engineering Mechanics Lab	0-0-2	40	10	20	30	100	1
2	A	PH-151	Physics Lab	0-0-2	40	10	20	30	100	1
	B	PH-151	Physics Lab	0-0-2	40	10	20	30	100	1
	C	EL-151	Electrical Engineering Lab	0-0-2	40	10	20	30	100	1
3	A	CH-151	Applied Chemistry Lab	0-0-2	40	10	20	30	100	1
	B	CS-151	Computer Programming Lab	0-0-2	40	10	20	30	100	1
4	A	EN-151	Language Lab	0-0-2	40	10	20	30	100	1
	B	ME-152	Workshop Practice	0-0-4	40	10	20	30	100	2
	C	ME-153	Engineering Graphics	0-0-6**	40	10	20	30	100	3
5	A	PD-192	Personality Skills	0-0-2	40	10	20	30	100	1
	B	PD-193	Entrepreneurial & Professional Skills	0-0-2	40	10	20	30	100	1
	C	PD-151	Basics of Computer Fundamentals	0-0-2	40	10	20	30	100	1
6	A/B/C	PD-191	Co-curricular Activities							1*

Note: A student will be placed in GROUP A/B/C for all the three terms in an academic year.

GROUP	TOTAL CONTACT HOURS	TOTAL CREDITS
A	20-2-8 (30)	18
B	15-3-10 (28)	17
C	15-2-12 (29)	17

FINAL EVALUATION IN GRADES

(L-T-P-Cr) – Lectures-Tutorials-Practicals-Credits

MTE – Mid-Term Exam

CW - Class Work

ETE – End-Term Exam

* One credit to be earned in Term-III through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of first year.

** One hour for explanation/demonstration.

*** CE-101 is a Mandatory Learning Course.

Scheme of Studies
B. Tech. Degree Programme (Regular)
(Common to all Branches)

1st Year										
TERM – II										
THEORY										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation with Weightage (%)					
				L-T-P	Class Work	MTE (1½ Hrs)	ETE (3 Hrs)	Total		
1	A	MA-102	Applied Mathematics-II	5-1-0	20	30	50	100	4	
	B	ME-101	Engineering Mechanics	5-1-0	20	30	50	100	4	
	C	MA-101	Mathematics-I	5-1-0	20	30	50	100	4	
2	A	PH-102	Applied Physics	5-1-0	20	30	50	100	4	
	B	EL-101	Electrical Engineering	5-1-0	20	30	50	100	4	
	C	PH-101	Physics	5-1-0	20	30	50	100	4	
3	A	CS-101	Computer Programming	5-1-0	20	30	50	100	4	
	B	CE-101	Environmental Science & Ecology***	5-0-0	20	30	50	100	3	
	C	CH-101	Applied Chemistry	5-0-0	20	30	50	100	3	
4	C	EN-101	Communication Skills	5-0-0	20	30	50	100	3	
PRACTICAL/DRAWING/DESIGN										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation With Weightage (%)					
				L-T-P	EXPT.	Lab Record	MTE Quizzes/ Viva-voce	ETE (2 Hrs)		Total
1	B	ME-151	Engineering Mechanics Lab	0-0-2	40	10	20	30	100	1
2	A	PH-152	Applied Physics Lab	0-0-2	40	10	20	30	100	1
	B	EL-151	Electrical Engineering Lab	0-0-2	40	10	20	30	100	1
	C	PH-151	Physics Lab	0-0-2	40	10	20	30	100	1
3	A	CS-151	Computer Programming Lab	0-0-2	40	10	20	30	100	1
	C	CH-151	Applied Chemistry Lab	0-0-2	40	10	20	30	100	1
4	A	ME-152	Workshop Practice	0-0-4	40	10	20	30	100	2
	B	ME-153	Engineering Graphics	0-0-6**	40	10	20	30	100	3
	C	EN-151	Language Lab	0-0-2	40	10	20	30	100	1
5	A	PD-193	Enterpreneural & Professional Skills	0-0-2	40	10	20	30	100	1
	B	PD-151	Basics of Computer Fundamentals	0-0-2	40	10	20	30	100	1
	C	PD-192	Personality Skills	0-0-2	40	10	20	30	100	1
6	A/B/C	PD-191	Co-curricular Activities							1*

Note: A student will be placed in GROUP -A/B/C for all the three terms in an academic year.

GROUP	TOTAL CONTACT HOURS	TOTAL CREDITS
A	15-3-10 (28)	17
B	15-2-12 (29)	17
C	20-2-8 (30)	18

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

MTE-Mid-Term Exam

CW - Class Work

ETE – End-Term Exam

* One credit to be earned in Term-III through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of first year.

** One hour for explanation/demonstration.

*** CE-101 is a Mandatory Learning Course.

Scheme of Studies
B. Tech. Degree Programme (Regular)
(Common to all Branches)

1st Year

TERM – III

THEORY										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation with Weightage (%)					
					L-T-P	Class Work	MTE (1½ Hrs)	ETE (3 Hrs)		Total
1	A	ME-101	Engineering Mechanics	5-1-0	20	30	50	100	4	
	B	MA-102	Applied Mathematics-II	5-1-0	20	30	50	100	4	
	C	MA-102	Applied Mathematics-II	5-1-0	20	30	50	100	4	
2	A	EL-101	Electrical Engineering	5-1-0	20	30	50	100	4	
	B	PH-102	Applied Physics	5-1-0	20	30	50	100	4	
	C	PH-102	Applied Physics	5-1-0	20	30	50	100	4	
3	A	CE-101	Environmental Science & Ecology***	5-0-0	20	30	50	100	3	
	B	CH-101	Applied Chemistry	5-0-0	20	30	50	100	3	
	C	CS-101	Computer Programming	5-1-0	20	30	50	100	4	
4	B	EN-101	Communication Skills	5-0-0	20	30	50	100	3	
PRACTICAL/DRAWING/DESIGN										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation With Weightage (%)					
					L-T-P	EXPT.	Lab Record	MTE Quizzes/ Viva-voce		ETE (2 Hrs)
1	A	ME-151	Engineering Mechanics Lab	0-0-2	40	10	20	30	100	1
2	A	EL-151	Electrical Engineering Lab	0-0-2	40	10	20	30	100	1
	B	PH-152	Applied Physics Lab	0-0-2	40	10	20	30	100	1
	C	PH-152	Applied Physics Lab	0-0-2	40	10	20	30	100	1
3	B	CH-101	Applied Chemistry	0-0-2	40	10	20	30	100	1
	C	CS-151	Computer Programming Lab	0-0-2	40	10	20	30	100	1
4	A	ME-153	Engineering Graphics	0-0-6**	40	10	20	30	100	3
	B	EN-101	Language Lab	0-0-2	40	10	20	30	100	1
	C	ME-152	Workshop Practice	0-0-4	40	10	20	30	100	2
5	A	PD-151	Basics of Computer Fundamentals	0-0-2	40	10	20	30	100	1
	B	PD-192	Personality Skills	0-0-2	40	10	20	30	100	1
	C	PD-193	Entrepreneurial & Professional Skills	0-0-2	40	10	20	30	100	1
6	A/B/C	PD-191	Co-curricular Activities							1*

Note: A student will be placed in GROUP A/B/C for all the three terms in an academic year.

GROUP	TOTAL CONTACT HOURS	TOTAL CREDITS
A	15-2-12 (29)	17+1*
B	20-2-8 (30)	18+1*
C	15-3-10 (28)	17+1*

FINAL EVALUATION IN GRADES

(L-T-P-Cr) – Lectures-Tutorials-Practicals-Credits

MTE – Mid-Term Exam

CW – Class Work

ETE – End-Term Exam

* One credit to be earned in Term-III through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of first year.

** One hour for explanation/demonstration.

*** CE-101 is a Mandatory Learning Course.

Department of Civil Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

2nd Year

TERM-IV				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-201	Surveying-I	5-0-0	3
2	CE-202	Building Construction Materials & Drawing	5-0-0	3
3	CE203	Structural Mechanics I	5-1-0	4
4	CE204	Engineering Geology	5-0-0	3
5	CE251	Surveying-I Lab	0-0-2	1
6	CE-252	Building Construction Materials & Drawing Lab	0-0-2	1
7	CE253	Structural Mechanics I Lab	0-0-2	1
8	CE254	Engg. Geology Lab	0-0-2	1
9	PD-292/ PD-293/ PD-251	Effective Communication**/ Intra & Inter-personal Skills/ MATLAB	0-0-2	1
10	PD-291	Co-curricular Activities		1*
20-1-10 (31)				18

TERM-V				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-205	Surveying-II	5-0-0	3
2	BA-225	Economics	5-0-0	3
3	CE-206	Structural Mechanics-II	5-1-0	4
4	CE-207	Fluid Mechanics-I	5-1-0	4
5	CE 255	Surveying-II Lab	0-0-2	1
6	CE-256	Structural Mechanics-II Lab	0-0-2	1
7	CE-257	Fluid Mechanics-I Lab.	0-0-2	1
8	PD-292/ PD-293/ PD-251	Effective Communication**/ Intra & Inter-personal Skills/ MATLAB	0-0-2	1
9	PD-291	Co-curricular Activities		1*
20-2-8 (30)				18

TERM-VI				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-208	Fluid Mechanics-II	5-1-0	4
2	CE-209	Soil Mechanics	5-1-0	4
3	CE-210	Environmental Engineering (Water Supply)	5-0-0	3
4	BA-226	Principles of Management	5-0-0	3
6	CE-258	Fluid Mechanics-II Lab	0-0-2	1
7	CE-259	Soil Mechanics Lab	0-0-2	1
8	PD-292/ PD-293/ PD-251	Effective Communication**/ Intra & Inter-personal Skills/ MATLAB	0-0-2	1
9	PD-291	Co-curricular Activities		1*
20-2-6 (28)				17+1

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

* One credit to be earned in Term-VI through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of second year.

** PD-292 is a Mandatory Learning Course.

Department of Mechanical Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

3rd Year

TERM-VII				
SN	Course No.	Course Name	L-T-P	Cr
1	MA-202	Applied Numerical Methods	5-1-0	4
2	CE-301	Transportation Engineering-I	5-0-0	3
3	CE-302	Elements of RCC	5-0-0	3
4	EC-201	Electronics Engineering	5-1-0	4
5	MA-252	Applied Numerical Methods Lab	0-0-2	1
6	CE-351	Transportation Engineering-I Lab	0-0-2	1
7	CE-352	Elements of RCC Lab	0-0-2	1
8	EC-251	Electronics Engineering Lab	0-0-2	1
9	PD-392/ PD-393/ PD-352	Problem Solving Skills/ Advanced Professional Development**/ Civil Engineering Drawings	0-0-2	1
10	PD-391	Co-curricular Activities		1*
20-2-10 (32)				19

TERM-VIII				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-303	Geotech Engineering	5-0-0	3
2	CE-304	Transportation Engineering-II	5-1-0	4
3	CE-305	Elements of Steel Engineering	5-0-0	3
4	CE-306	Hydraulics Structures & Irrigation Engg	5-0-0	3
5	CE-353	Geotech Engineering Lab	0-0-2	1
6	CE-354	Transportation Engineering – II Lab	0-0-2	1
7	CE-355	Elements of Steel Engineering Lab	0-0-2	1
8	PD-392/ PD-393/ PD-352	Problem Solving Skills/ Advanced Professional Development**/ Civil Engineering Drawings	0-0-2	1
9	PD-391	Co-curricular Activities		1*
20-1-8 (29)				17

TERM-IX				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-307	Advanced Construction Technology	5-0-0	3
2	CE-308	Environmental Engineering-II (Sanitation)	5-1-0	4
3	CE-309	Costing Estimate, Billing & Accounts	5-0-0	3
4	CE-310	Building Services	5-0-0	3
5	CE-358	Environmental Engineering-II (Sanitation) Lab	0-0-2	1
6	CE-359	Costing Estimate, Billing & Accounts Lab	0-0-2	1
7	CE-391	Survey Camp	0-0-2	1
8	PD-392/ PD-393/ PD-352	Problem Solving Skills/ Advanced Professional Development**/ Civil Engineering Drawings	0-0-2	1
9	PD-391	Co-curricular Activities		1*
20-1-8 (29)				17+1*

SUMMER TERM – INDUSTRY TRAINING/FIELD TRAINING/INTERNSHIP

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

* One credit to be earned in Term-IX through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of 3rd year.

** PD-393 is a Mandatory Learning Course.

Department of Mechanical Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

(PROJECT MODE)

4th Year

TERM-X				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-401	Computer Programming & Graphics	5-0-0	3
2	CE-402	RCC & STEEL Designs	5-0-0	3
3		Deptt Elective I	5-0-0	3
4	CE-451	Computer Programming & Graphics Lab	0-0-4	2
5	CE-452	RCC & Steel Designs Lab	0-0-2	1
	CE-491	Community Service Oriented Project (CSOP) [#]	0-0-2	1
6	CE-492	Project (Including Seminar)	0-0-4	2
7	CE-493	Industrial Training / Field Training**	0-0-2	1
8	PD-452	Construction Techniques and Equipment	0-0-2	1
9	PD-491	Co-curricular Activities		1*
15-0-16 (31)				17

TERM-XI				
SN	Course No.	Course Name	L-T-P	Cr
1		Deptt. Elective – II	5-0-0	3
2		Open Elective	5-0-0	3
3	CE-481	Major Project Phase – I***	0-0-10	5
4	CE-453	Department Lab	0-0-2	1
5	CE-494	Seminar-I****	0-0-2	1
6	PD-491	Co-curricular Activities		1*
10-0-14 (24)				13

TERM-XII				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-404	Design of Environmental Engineering	5-0-0	3
2		Deptt Elective-III	5-0-0	3
3		Deptt Elective-IV	5-0-0	3
4	CE-454	Design of Environmental Engineering Lab	0-0-2	1
5	CE-482	Major Project Phase-II	0-0-6	3
6	CE-495	Seminar-II*****	0-0-2	1
10	PD-491	Co-curricular Activities		1*
15-1-10 (26)				14+1*

FINAL EVALUATION IN GRADES

(L-T-P-Cr) – Lectures-Tutorials-Practicals-Credits

CSOP is a mandatory learning course.

* One credit to be earned in Term-XII through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of 4th year.

** To be evaluated based on the work done during Summer Term after Term-IX.

*** Marks of Major Project Phase-I to be added to marks of Major Project Phase-II for award of final grade.

**** To be based on Major Project Phase-I.

***** To be based on Major Project Phase-II.

Department of Mechanical Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

(INTERNSHIP MODE)

4th Year

TERM-X				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-401	Computer Programming & Graphics	5-0-0	3
2	CE-402	RCC & STEEL Designs	5-0-0	3
3		Deptt Elective-I	5-0-0	3
4	CE-451	Computer Programming & Graphics Lab	0-0-4	2
5	CE-452	RCC & Steel Designs Lab	0-0-2	1
	CE-491	Community Service Oriented Project (CSOP) [#]	0-0-2	1
6	CE-492	Project (Including Seminar)	0-0-4	2
7	CE-483	Internship-I**	0-0-2	1
8	PD-452	Construction Techniques and Equipment	0-0-2	1
9	PD-491	Co-curricular Activities		1*
15-0-14 (29)				16+1*

TERM-XI				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-484	Internship-II (in Industry)	0-0-24	12
2	CE-494	Seminar-I***	0-0-2	1
3	PD-491	Co-curricular Activities		1*
10-1-6 (17)				13

TERM-XII				
SN	Course No.	Course Name	L-T-P	Cr
1	CE-404	Design of Environmental Engineering	5-1-0	4
2		Deptt Elective-III	5-0-0	3
3		Deptt Elective-IV	5-0-0	3
4	CE 454	Design of Environmental Engineering Lab	0-0-2	1
5	CE-485	Internship Documentation	0-0-6	3
6	CE-495	Seminar-II****	0-0-2	1
10	PD-491	Co-curricular Activities		1*
15-1-10 (26)				15+1*

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

CSOP is a mandatory learning course.

* One credit to be earned in Term-XII through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of 4th year.

** To be evaluated based on the work done during Summer Term after Term-IX.

*** To be based on Internship-II and to be given in the beginning of Term-XII.

**** To be based on Internship Documentation.

LIST OF DEPT. ELECTIVES

Dept. Elective - I				
1	CE-421	Bridge Engineering	5 0 0	3
2	CE-422	Hydrology	5 0 0	3
3	CE-423	Environmental Pollution and Control	5 0 0	3

Dept. Elective - II				
1	CE-431	Computer Aided Design & Application in Civil Engineering	5 0 0	3
2	CE-432	Ground Water & Sedimentation Transport	5 0 0	3
3	CE-433	Environmental Impact Assessment & Management	5 0 0	3

Dept. Elective - III				
1	CE-441	Advanced Surveying & Remote Sensing in Civil Engineering	5 0 0	3
2	CE-442	Professional Practices	5 0 0	3
3	CE-443	Advanced Design of RCC and Steel Structure	5 0 0	3

Dept. Elective - IV				
1	CE-461	Construction Operational Management	5 0 0	3
2	CE-462	Design of Water Resource Systems	5 0 0	3
3	CE-463	Repair & Maintenance of Buildings	5 0 0	3

IMPORTANT NOTES

1. Laboratory Courses are being offered as distinct courses (0-0-2) without being mixed with lecture components.
2. Conduct of Lab Courses:
 - a. At least ten experiments/programs/exercises are to be performed in a term.
 - b. It is expected that more experiments/programs/exercises are designed and set as per the scope of the syllabus, which may be added to the above list.
 - c. One or more than one experiments/programs/exercises may be performed in one lab period in order to utilize the time properly.
 - d. The scheme of operation is to be approved by HOD.
3. Students admitted through Lateral Entry Scheme will be required to take a Bridge Course on Mathematics (5-0-0) as an Audit Course.
4. Assessment of Industrial/Field Training and Internship-I will be based upon certificate of Industry/Field training obtained by the student, report, seminar and viva-voce examination. A student who is awarded 'FF' Grade is required to repeat Industry/Field training.
5. The choice of the students for any elective shall not be a binding for the department to offer, if the department does not have expertise.
6. For open elective, all students will be permitted to opt for any one elective run by another department. However, the departments will offer only those elective for which they have expertise. Further, the students will not be allowed to opt for any course under this category, which has already been done. An open elective opted during the end of tenth term, allotted list of which will be displayed on notice board and taught in the eleventh term.
7. The choice of students for the Internship stream shall not be a binding for the department to offer.
8. Elective-II is not required to be done by the students pursuing the degree through Internship Mode.
9. Students are allowed in the examination the use of single memory, non-programmable calculator. However, sharing of calculator is not permitted.
10. The B. Tech. degree programmes in Mechanical Engineering, Automobile Engineering, Civil Engineering & Bachelor of Architecture constitute one group for the purpose of deciding core courses.
11. For the students admitted in 2009-10 the sequence of PD Courses is given in the table below:

Professional Development (PD) – Gen.				
1st Year	PD-251	MATLAB	0-0-2	1
	PD-191	Co-curricular Activities		1
	PD-292	Effective Communication	0-0-2	1
	PD-393	Advanced Professional Development	0-0-2	1
2nd Year	PD-151N*	Basics of Computer Fundamentals	0-0-2	1
	PD-291	Co-curricular Activities		1
	PD-192	Personality Skills	0-0-2	1
	PD-193	Entrepreneurial & Professional Skills	0-0-2	1
3rd Year	PD-352	Civil Engineering Drawings	0-0-2	1
	PD-391	Co-curricular Activities		1
	PD-392	Problem Solving Skills	0-0-2	1
	PD-293	Intra & Inter-personal Skills	0-0-2	1
4th Year	PD-452	Construction Techniques and Equipment	0-0-2	1
	PD-491	Co-curricular Activities		1

* The contents for PD-151N are the same as for PD-151.

DETAILED SYLLABUS

GEN., BSM, ESTA, DEPT. CORE & ELECTIVE

BA-225	ECONOMICS	L T P	Cr
		5 0 0	3

OBJECTIVE

The purpose of this course is to

- Acquaint the students in the basic economic concepts and their operational significance and
- Stimulate him to think systematically and objectively about contemporary economic problems.

1. **INTRODUCTION:** Definition of economics; difference between micro and macro economics; central problems of economy including PP curve; factors of production
2. **UTILITY:** concept and measurement of utility; Law of Diminishing Marginal Utility (DMU); derivation of Law of Demand from Law of DMU; Law of Equimarginal Utility (EMU) – its practical applications
3. **DEMAND:** What is demand and supply; shift in demand and extension of demand; law of demand and law of supply; demand function; demand schedule; elasticity of demand; measurement of elasticity of demand; factors affecting elasticity of demand; role of demand and supply in price determination and effect of changes in demand and supply on prices
4. **PRODUCTION FUNCTIONS:** Meaning of production and production functions; Law of Variable Proportion; returns to scale, internal and external economies and diseconomies of scale.
5. **COSTS:** Various concepts of costs: fixed cost, variable cost, average cost, marginal cost, opportunity cost; shape of average cost, marginal cost, total cost etc. in short run and long run.
6. **MARKET STRUCTURES:** What is market; main features of perfect competition; monopoly; oligopoly; monopolistic competition.
7. **MACRO ECONOMICS:** Macro economics: brief concepts of GDP, GNP, NI, per capita income; inflation; privatization; globalization (merits & demerits); elementary concepts of VAT, WTO, GATT and TRIPS

TEXT BOOK

Hirschey M., "Managerial Economics", Thomson Learning, 2007

REFERENCE BOOKS

1. Monroe Kent B., "Pricing Making Profitable Decisions", McGraw Hill, New York, 2006
2. Keat Paul B., and Young Philip K. Y., "Managerial Economics - Economic Tools for Today's Decision Makers", Pearson Education, 2003

BA-226	PRINCIPLES OF MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with various concepts of management which will be very basic to appreciate the subject.

1. **INTRODUCTION:** Meaning of management, definitions of management, characteristics of management, management vs. administration; management: art, science and profession; importance of management; Fayol's principles of management; the management functions; interrelationship of managerial functions.
2. **FORMS:** Forms of organizational structure (line, line & staff, functional); delegation of authority; centralization & decentralization.
3. **GROUPS:** Formal & informal groups; stages in team development, empowerment concept, significance; changing nature of managerial work; outsourcing.
4. **CORPORATE SOCIAL RESPONSIBILITY:** Corporate social responsibility – meaning; responsibility towards different stakeholders; ethics in management – meaning; factors effecting ethical choices.
5. **STAFFING:** Nature and significance of staffing; human resource management - functions of human resource management; human resource planning; process of human resource planning; recruitment, selection; promotion-seniority vs. merit.
6. **MARKETING MANAGEMENT:** Marketing management – definition of marketing, marketing concept, objectives and functions of marketing; marketing mix (basics of 4Ps of marketing); difference between goods and services; steps of personal selling.
7. **FINANCIAL MANAGEMENT:** Introduction of financial management; objectives of financial management; functions and importance of financial management; brief introduction to the concept of capital structure and various sources of finance.

TEXT BOOK

Chhabra T. N., "Principles and Practice of Management", Dhanpat Rai Publishers, 2008

REFERENCE BOOKS

1. Aggarwal R. D., "Organization and Management", Tata McGraw Hill, 1995
2. Prasad L. M., "Principles and Practice of Management", Sultan Chand & Sons, 2005
3. Harold, Koontz and O'Doneell Cyril, "Management", McGraw Hill, 1968

4. Sherlekar S. A., "Marketing Management", Himalaya Publishing House, 2009
5. Pandey I. M., "Financial Management", Vikas Publishing House, New Delhi, 2005
6. Stoner James A. F. and Freemann R. Edward, "Management", 6th Edition, Prentice Hall of India, 2000
7. Prasad L. M., "Organizational Behavior", Sultan Chand & Sons, 2008
8. Singh & Chhabra, "Business Organization & Management", Dhanpat Rai Publishers

CE-101	ENVIRONMENTAL SCIENCE AND ECOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

Environmental Studies is a multidisciplinary area, the issues of which every one should know. The aim of the course is to make everyone aware of environmental issues like continuing problems of pollution, loss of forest, solid waste disposal, and degradation of environment. Issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity are other serious concerns before the mankind.

1. **THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** Basic definitions related to environment; Scope, vis-à-vis environmental science and environmental engineering; Causes of environmental degradation, atmospheric composition and associated spheres, habitat and climate; objective, goals and principles involved in environmental education, environmental awareness, environmental ethics, environmental organization and their involvement.
2. **NATURAL RESOURCES:** Renewable and non-renewable resources; forest resources, over-exploitation, and deforestation / afforestation; water resources, impact of over-utilization of surface and ground water, floods, drought, conflicts over water, dams; mineral resources: dereliction of mines, environmental effects of extracting and using mineral resources; Food resources, modern agriculture and its impact, problem associated with fertilizer and pesticide, water logging, salinity ; energy resources, renewable, non-renewable energy sources, solar energy, wind energy, hydro energy, biomass energy, geothermal energy, nuclear energy and its associated hazards; land as a resource, land degradation, man induced landslides, soil erosion and desertification.
3. **ECOSYSTEMS:** Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids; characteristic features, structure and function of the following ecosystem -forest ecosystem, grassland ecosystem desert ecosystem and aquatic ecosystems.
4. **BIODIVERSITY AND ITS CONSERVATION:** Bio-geographical classification of India; biodiversity at global, national and local levels, India as a mega-diversity nation, hot-spots of biodiversity; value of biodiversity-consumptive use, productive use, social, ethical aesthetic and option values; threats

- to biodiversity; conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.
5. **ENVIRONMENTAL POLLUTION:** Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, solid waste management, e-waste management; disaster management – floods, earthquake, cyclone and landslides.
 6. **SOCIAL ISSUES AND THE ENVIRONMENT:** Water conservation, rain water harvesting, watershed management; climate change, global warming, acid rain, ozone layer depletion; Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.
 7. **HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, population explosion – family welfare programmes; role of information technology in environment and human health; case studies, Chipko movement, Saradar Sarovar dam, mining and quarrying in Udaipur, salinity and water logging in Punjab, Haryana and Rajasthan, Bhopal gas tragedy, Chernobyl nuclear disaster, arsenic pollution in ground water.

TEXT BOOK

Kaushik, Anubha, and Kaushik, C.P., "Perspectives in Environmental Studies", New Age International Publishers, 2004

REFERENCE BOOKS

1. Agarwal, K. C., "Environmental Biology", Nidhi Publ. Ltd., Bikaner, 2001
2. Bharucha Erach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., 2006
3. Brunner R. C., "Hazardous Waste Incineration", McGraw Hill Inc., 1989.
4. Clark R.S., "Marine Pollution", Clanderson Press Oxford, 1989
5. Cunningham, W.P., Cooper, T.H. Gorhani, E. & Hepworth, M.T., "Environmental Encyclopedia", Jaico Publ. House, 2001.
6. De A. K., "Environmental Chemistry", 2nd Edition, Wiley Eastern, 1989
7. Jadhav, H. and Bhosale, V.M., "Environmental Protection and Laws", Himalaya Pub. House, Delhi, 1995.
8. Mckinney, M.L. and Schocl. R.M., "Environmental Science Systems & Solutions", Web enhanced edition, 1996.
9. Rao M.N. and Datta, A.K., "Waste Water Treatment", Oxford & IBH Publ. Co., 1987.
10. Sharma B.K., "Environmental Chemistry", Goel Publ. House, Meerut, 2001
11. Trivedi R.K. and Goel, P.K., "Introduction to Air Pollution", Techno-Science Publications, 1996

CE-201	SURVEYING-I	L T P	Cr
		5 0 0	3

OBJECTIVE

Surveying or land surveying is the technique and science of accurately determining the terrestrial or three-dimensional position of points and the distances and angles between them. These points

are usually on the surface of the Earth and they are often used to establish land maps and boundaries for ownership or governmental purposes. To accomplish their objective, surveyors use elements of geometry, engineering, trigonometry, mathematics, physics and law.

1. **FUNDAMENTAL:** Principles of Surveying; Definition, objects, classification, fundamental; principles, methods of fixing stations.
2. **MEASUREMENT OF DISTANCES:** measurement; Direct measurement, instruments for measuring distance, instruments for making stations, chaining of line. Errors; in chaining, tape corrections examples.
3. **COMPASS AND CHAIN TRAVERSING:** Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines, local attraction, examples.
4. **LEVELLING:** levelling; Definition of terms used in levelling, Type; types of levels and staff. Temporary adjustment of levels. Principles of levelling; reduction of levels, booking of staff readings, examples, contouring, characteristics of contours lines; locating contours, interpolation of contours.
5. **THEODOLITE AND THEODOLITE:** Traversing; Theodolites; temporary adjustment of theodolite, measurement of angles, repetition and reiteration method. Traverse surveying with theodolite; checks in traversing, adjustment of closed traverse, examples.
6. **PLANE TABLE SURVEYING:** Plane table; methods of plane table surveying, radiation, intersection, traversing and resection. Problems; two point and three point problems.
7. **TACHEOMETRY:** Uses of tacheometry, principle of tacheometric surveying, instruments used in tacheometry, systems of tacheometric surveying-stadia system fixed hair method, determination of tacheometric constants, tangential systems, examples.

TEXT BOOK

Punmia, B.C., Jain Ashok Kumar, Jain. Arun Kumar., "SURVEY –I", Laxmi Publication Pvt Limited, New Delhi, 2005

REFERENCE BOOKS

1. Kanitkar T.P., "SURVEY –I", Standard Publication, New Delhi, 2008
2. Duggal, S.K., "Surveying Volume –I" Tata McGraw Hill, July 2004
3. Bannister., "Surveying", 7th Edition, Pearson Education, 2009
4. William, Irvine., Finlay, Macleannan., "Survey for Construction", McGraw-Hill, 5th Edition, 2006

WEB REFERENCES

1. reality.gn.apc.org/econ/gik1.htm - United Kingdom
2. www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc
3. www.msbt.com/.../First%20to%20Fourth%20Semester%20Curriculum.pdf

CE-202	BUILDING CONSTRUCTION MATERIALS & DRAWING	L T P	Cr
		5 0 0	3

OBJECTIVE

The understanding and, consequently, the status of the terms architect, drawing and building, alter through context and time. Less recognized are the interdependencies that lie beneath their constituent parts; the drawing and the building, the designer and maker, the material and the immaterial.

1. **MASONRY CONSTRUCTION:** Masonry; Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry; bonds in brick work, laying brick work. Structural brick work; cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.
2. **CAVITY AND PARTITION WALLS:** Cavity; Advantages, position of cavity. Partition Walls; types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.
3. **FOUNDATION & PILES DESIGN:** Foundation; Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas. Piles; design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.
4. **DAMP:** Proofing and Water; Proofing Defects .Dampness; causes of dampness, prevention of dampness, materials used. Treatment of building; damp proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.
5. **ROOFS AND FLOORS:** Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings.
6. **DOORS AND WINDOWS:** Locations, sizes, types of doors and windows, fixtures and fasteners for doors and windows.
7. **ACOUSTICS:** Sound Insulations and Fire Protection; Classification, measurement and transmission of sound. Sound absorber; classification of absorbers, sound insulation of buildings. Wall construction and acoustical design of auditorium. Fire-resisting properties of materials; fire resistant construction and fire protection requirements for buildings.

PART B: MATERIALS

1. **STONES:** Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.
2. **BRICK AND TILES:** Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.
TILES; Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.
3. **LIMES:** cement and mortars: Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements

composition, types of cement, manufacturing of ordinary portland cement, testing of cement, special types of cement, storage of cement.

MORTARS: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

4. **TIMBER AND PLY WOOD:** Timbers; Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber. Plywood; fiber boards, masonite and its manufacturing, important Indian timbers.
5. **FERROUS AND NON-FERROUS METALS:** Definitions, manufacturing of cast iron, manufacturing of steel from pig iron, types of steel, marketable form of steel, manufacturing of aluminium and zinc.
6. **PAINTS AND VARNISHES:** Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes.
7. **PLASTIC:** Plastic; Definition, classification of plastics, composition and raw materials, manufacturing, characteristics and uses, polymerisation, classification, special varieties.

TEXT BOOK

Punmia, B. C., Jain, Ashok Kumar., Jain, Arun Kumar., "Building Construction", Laxmi Publication Pvt Ltd., New Delhi, 2005

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1. Kumar, Sushil., "Building Construction" Standard Pub., N. Delhi, 2008
2. Rangwala, S. C., 'Building Construction I', Rangawala Charotar Publishing House Pvt. Ltd.
3. Sane Y.S. Construction Engineering, CBS Publishers & Distributors, New Delhi., year 2006
4. Gurcharan Singh, Building Construction, Standard Pub., N. Delhi., 1999

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3. academics.triton.edu/faculty/.../Arc120%20instructors%20manual.pdf
4. www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc
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CE-203	STRUCTURAL MECHANICS-I	L T P	Cr
		5 1 0	4

OBJECTIVE

Structural Mechanics is a collection of Mathematical packages that address computational problems in analyzing elastic structural elements. The functions contained in Structural Mechanics are designed for professional engineers, educators, and students of engineering mechanics in mechanical, civil, and aerospace engineering. In practice, the engineer can adopt Structural Mechanics to perform analyses of elastic structural elements along with other professional engineering analysis tools.

1. **COMPOSITION AND RESOLUTION OF FORCES:** Types of Forces, systems of Forces, methods of resolution of forces. Moments and their Application; laws of moments, types of moments, couples, equilibrium of forces, free body diagram, numerical.
2. **ANALYSIS OF STRESSES AND STRAINS:** Analysis of simple states of stresses and strains; elastic constraints, bending stresses, theory of simple bending, flexure formula. combined stresses in beams, shear stresses. Mohr's circle; Principle stresses and strains. Torsion; in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.
3. **THEORY OF COLUMNS:** Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.
4. **BENDING MOMENT AND SHEAR FORCE:** Determinate beams and frames, definitions and sign conventions, axial force, shear force and bending moment diagrams.
5. **THREE HINGED ARCH;** horizontal thrust, shear force and bending moment diagrams.
6. **DEFLECTION AND GRAPHICAL SOLUTIONS:** Deflections in beams; Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method. Principle of virtual work; Maxwell's Law of Reciprocal Deflections. Williot Mohr diagram.
7. **ANALYSIS OF STATICALLY DETERMINATE TRUSSES:** Determinate truss; Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections. Space Frame ; analysis of space trusses using tension coefficient method

TEXT BOOK

S. Ramamurthan., "Strength of Materials", Dhanpat Rai & sons, 2nd Edition, New Delhi, 2007.

REFERENCE BOOKS

1. Bhavikatti, S. S., "Strength of Materials", Vikas Publishing House Pvt. Ltd, New Delhi, 2008
2. Timoshenko, S., "Strength of Materials Part-I", New Delhi, 2008
1. Popov, Nagarjan., & Lu., "Mechanics of Materials", Prentice Hall of India.
3. Jain, A.K., "Elementary Structural Analysis", Nem Chand & Bros, Roorkee, 2003
4. Wibur & Nooris., "Elementary Structural Analysis", McGraw Hill Book Co., New York.

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CE-204	ENGINEERING GEOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

Engineering Geology is the application of the geologic sciences engineering practice for the purpose of assuring that the geologic factors affecting the location, design, construction, operation and maintenance of engineering works are recognized and adequately provided for. Engineering geologists investigate and provide geologic and geotechnical recommendations, analysis, and design associated with human development.

1. **INTRODUCTION:** Definition, object, scope and sub division of geology, geology around us. The interior of the earth. Importance of geology in Civil Engineering projects.
2. **PHYSICAL GEOLOGY:** The external and internal geological forces causing changes, weathering and erosion of the surface of the earth. Geological work of ice, water and winds. Soil profile and its importance. Earthquakes and volcanoes.
3. **MINERALOGY AND PETROLOGY:** Definition and mineral and rocks. Classification of important rock forming minerals, simple description based on physical properties of minerals. Rocks of earth surface; classification of rocks. Mineral composition, Textures, structure and origin of Igneous, Sedimentary and Metamorphic rocks.
4. **STRUCTURAL GEOLOGY:** Forms and structures of rocks. Bedding plane and outcrops, Dip and Strike. Elementary ideas about fold, fault, joint and unconformity and recognition on outcrops. Importance of geological structures in Civil Engineering projects.
5. **APPLIED GEOLOGY:** Hydrogeology, water table, springs and Artesian well, aquifers, ground water in engineering projects. Artificial recharge of ground water, Elementary ideas of geological investigations. Remote sensing techniques for geological and hydrological survey and investigation.
6. **SUITABILITY AND STABILITY OF FOUNDATION SITES AND ABUTMENTS:** Geological conditions and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges etc.
7. **LANDSLIDES AND HILLSLOPE STABILITY:** Improvement of foundation rocks, precaution and treatment against faults, joints and ground water, retaining walls and other precautions. Geology and environment of earth.

TEXT BOOK

Mukherjee, P. K., "A Text Book of Geology", World Press Pvt. Ltd. Kolkatta, 2001

REFERENCE BOOKS

1. S.K. Garg., "Physical and General Geology", Khanna Publishers, New Delhi, 2007

2. Parbin, Singh., "Geology for Engineers", IBH publications, Delhi, 1991
3. Arthur, Holemess., "Principles of physical geology", Thomas Nelson and Sons, USA, 1964.
4. Ford, W.E., "Dana's textbook of mineralogy", (4th edition), Wiley Eastern Ltd., N. Delhi, 1989.
5. Winter J.D., "An introduction to igneous and metamorphic petrology", Prentice Hall of India, 2001.
6. Billings, M.P., "Structural Geology", Prentice Hall Inc., New Jersey, USA, 1972.
7. Krishnan, M.S., "Geology of India and Burma", 3rd Edition, IBH Publishers, Delhi, 1984.
8. Blyth, F.G.H., and de Freitas, M.H., "A geology for Engineers", 7th edition, Elsevier Publications, 2006.

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3. www.physicalgeography.net/physgeoglos/e.html
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CE-205	SURVEYING-II	L T P	Cr
		5 0 0	3

OBJECTIVE

In the past four decades, huge amount of geologic data has been accumulated. Now it is time to integrate these geologic data with other sources of data, such as the digital elevation model (DEM) and remote sensing data, to do various analyses, 3D modelling, and real-time interactive visualization to extract more meaningful results.

1. **TRIGONOMETRICAL LEVELLING:** Introduction-Height and Distance (Base of an object accessible and inaccessible)-Difference in elevations between two points-Geodetical observations and correction for temperature, refraction, curvature and signal.
2. **TRIANGULATION:** Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations.
3. **SURVEY ADJUSTMENT:** Definite weight of an observation, most probable values Types of error, principle of least squares and adjustment of triangulation figure.
4. Introduction to Modern survey Equipments and their principle of working with special emphasis on Total station, EDM(Electra Optical, Inferared, Microwave) and electronic precision, optic theodolite, automatic lazer level etc.
5. **FIELD ASTRONOMY:** Definitions of Astronomical terms, Star at prime vertical, star at horizon, star at culmination, introduction of celestial sphere, celestial co-ordinate systems, Napier's rule of circular parts. A brief introduction of different types of time. Determination of Azimuth, altitude by astronomical observations.
6. **ELEMENTS OF PHOTOGRAMMETRY:** Introduction, types of photographs, Arial photography and its interpretation, Flight planning

for arial survey, Sterioscope and stereoscopic vision.

7. Introduction of remote sensing, special emphasis on applications of remote sensing in civil and environmental engineering. Concept of G.I.S and G.P.S-Basic components.

TEXT BOOK

Punmia, B. C., Jain, Ashok Kumar., "Surveying Volume –II & III", Laxmi Publication Pvt limited, New Delhi,

REFERENCE BOOKS

1. Clark, D., "Plane and Geodetic Surveying", Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
2. Bannister, A. and Raymond, S., "Surveying", ELBS, 6th Edition, 1992.
3. James, M. Anderson and Edward, M. Mikhail., "Introduction to Surveying", McGraw-Hill Book Company, 1985
4. Wolf, P.R., "Elements of Photogrammetry", McGraw-Hill Book Company, Second Edition, 1986.
5. Robinson, A.H., Sale, R.D. Morrison, J.L. and Muehrche, P.C., "Elements of Cartography", John Wiley and Sons, New York, Fifth Edition, 1984.
6. Heribert, Kahmen and Wolfgang, Faig., "Surveying", Walter de Gruyter, 1995.
7. Kanetkar, T. P., "Surveying and Leveling", Vols. I and II, United Book Corporation, Pune, 1994.
8. Arora, K. R., "Surveying" Vol. 2 & 3 , Standard Book House Pub., New Delhi.
9. Satheesh, Gopi, R. Sathikumar, and N. Madhu., "Advanced surveying", Pearson.

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2. <https://www1.nga.mil/ProductsServices/.../Geo4lay.pdf>
3. www.1911encyclopedia.org/Surveying
4. www.fig.net/commission4/iho/M-13_Chapter_2.pdf
5. www.novaregion.org/DocumentView.asp?DiD=756

CE-206	STRUCTURAL MECHANICS–II	L	T	P	Cr
		5	1	0	4

OBJECTIVE

Any structural design can be considered satisfactory if it meets the three principal goals of structural performance: safety, economy and simplicity of construction. The first two require a sufficient margin of safety against collapse. Also, the construction should be serviceable under working load conditions through its life time.

1. **STATICALLY INDETERMINATE STRUCTURES:** Introduction, Static and Kinematic Indeterminacies; Castigliano's theorems, Strain energy method. Analysis of frames with one or two redundant members using Castigliano's 2nd theorem.
2. **SLOPE DEFLECTION:** Slope deflection Methods; Analysis of continuous beams & portal frames. Portal frames with inclined members.
3. **MOMENT DISTRIBUTION METHODS:** Moment Distribution Methods; Analysis of continuous

beams & portal frames. Portal frames with inclined members.

4. **COLUMN ANALOGY METHOD:** Column Analogy Method; Elastic centre, Properties of analogous column. Applications to beam & frames.
5. **ANALYSIS OF THREE HINGED ARCHES:** Analysis of Three hinged Arches; Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.
6. **UNSYMMETRICAL BENDING:** Unsymmetrical Bending ;Introduction, Centroidal principal axes of sections, Bending stresses in beams subjected to unsymmetrical bending, shear centre, shear centre for channel, Angles and Z sections.
7. **CABLE AND SUSPENSION BRIDGES:** Introduction, uniformly loaded cables, Temperature stresses, Three hinged stiffening Girder and two hinged stiffening Girder.

TEXT BOOK

Punmia, B.C., Jain, Ashok Kumar., Jain, Arun Kumar., "Theory of structure", Laxmi publication Pvt. Ltd, New Delhi, 2009

REFERENCE BOOKS

1. Wang, C.K., "Statically Indeterminate Structures", McGraw Hill Book Co., New York.
2. Jain A. K., "Advanced Structural Analysis", Nem Chand & Bros., Roorkee.
3. A. Kassimali., "Structural Analysis", PWS-Kent, Cincinnati, OH, 1999. (K in course syllabus)
4. Kenneth, M. Leet and Chia-Ming Uang., "Fundamentals of Structural Analysis", McGraw-Hill, New York, NY, 2002. (L & U in course syllabus)
5. James, K. Nelson and Jack, C. McCormac., "Structural Analysis: Using Classical and Matrix Methods", John Wiley & Sons, Hoboken, NJ, 2003 (N & M in course syllabus)
6. William, Weaver, Jr. and James, M. Gere., "Matrix Analysis of Framed Structures", Second Edition, D. Van Nostrand, New York, NY, 1980.
7. M. Hoit., "Computer-Assisted Structural Analysis and Modeling", Prentice-Hall, Englewood, Cliffs, NJ, 1995.
8. T. R. Tauchert., "Energy Principles in Structural Mechanics", McGraw-Hill, New York, 1974.
9. Ramamurthan, S., "Theory of structure", Dhanapat Rai and sons, New Delhi, 2009

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2. www.alhandasa.net
3. www.arab-eng.org/vb/t120271.html
4. www.cphbooks.com/html/03ms2.htm
5. www.civil.iitb.ac.in/800-dir/Kalani_Book.pdf

CE-207	FLUID MECHANICS-I	L	T	P	Cr
		5	1	0	4

OBJECTIVE

Fluid mechanics can be mathematically complex. Sometimes it can best be solved by numerical method,

typically using computers. A modern discipline, called computational fluid dynamics (CFD), is devoted to this approach to solving fluid mechanics problems. Also taking advantage of the highly visual nature of fluid flow is particle velocimetry, an experimental method for visualizing and analyzing fluid flow.

- 1. INTRODUCTION:** Fluid properties; mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility, viscosity. Newtonian and Non-Newtonian fluids. Real and ideal fluids.
- 2. KINEMATICS OF FLUID FLOW:** Kinematics; Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional flows. stream lines; streak lines and path lines. continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential function rotational and irrotational flows, graphical and experimental methods of drawing flow nets.
- 3. FLUID STATICS:** Pressure; density, height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, centre of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.
- 4. DYNAMIC OF FLUID FLOW:** Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation. Pitot tubes, venturimeter, Orificemeter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.
- 5. BOUNDARY LAYER ANALYSIS:** Boundary layer thicknesses, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.
- 6. FUNDAMENTALS OF FLOW THROUGH OPEN CHANNELS:** flow through open Channels ;Types of flow, phases formula, Menniges formula, rectangular and trapezoidal channels. velocity distributions in open channels, measurement of velocity and discharge in irregular channels.
- 7. DIMENSIONAL ANALYSIS:** Principles of Dimensional homogeneity, Rayleigh's method, Buckingham's theorem, dimensional analysis problems, use and limitation of dimensional analysis.

TEXT BOOK

P.N. Modi & S.M. Seth., "Hydraulic and Fluid Mechanic" Standard Book House, 2009

REFERENCE BOOKS

1. Streeter & wyle., "Fluid mechanics", McGraw-Hill Companies, 9th Sub edition (December 1, 1997)
2. V.T. Chow., "Open channel Hydraulics", McGraw-Hill Companies (June 1, 1959)
3. R. J. Garde, & A. G. Mirajgaoker., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995

4. Arora, "Fluid mechanics hydraulics and hydraulics machines", Standard Publications.
5. Jagdish, Lal., "Hydraulics Machines", Metropolitan Book Co, N Delhi, 2003
6. A. K. Jain., "Fluid Mechanics", Khanna Publishers (rs) (2008)
7. Subramanyam., "Fluid mechanics", Tata McGraw-Hill
8. Rajput, R.K., "Fluid Mechanics and Hydraulic Machines", Standard Publishing House, New Delhi, 2002

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3. www.niceindia.com/qbank/Fluid_Machines_and_Machinery.Doc
4. www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc
5. www.hctmkaithal-edu.org/syllabus/civil/III%20semester.pdf
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CE-208	FLUID MECHANICS-II	L T P	Cr
		5 1 0	4

OBJECTIVE

Fluid flow is particle velocimetry, an approach for study of visualizing and analyzing of dynamic fluid flow is the main object. The phenomena of statics were studied by using the dynamic approach so that two trends ; statics and dynamics fluid flow ; turned out to be inter related within single science, i.e. Fluid mechanics.

- 1. TURBULENT FLOW:** Introduction to turbulent flow, Prandtl mixing length theory, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes.
- 2. FLOW THROUGH PIPES:** Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length of pipe, Hydraulic Gradient Line (H.G.L), Total Energy Line (T.E.L), pipes in series, pipes in parallel, branching of pipes, pipe network siphon, water Hammer (only quick closure case). Transmission of power through pipelines.
- 3. FLOW IN OPEN CHANNEL:** Uniform flow, basic concept, Resistance equation chezy's and manning formula, uniform flow construction of efficient channel section, specific energy concept critical flow, and channel transition.
- 4. Flow in Open Channel:** Non-uniform flow, gradually varied flow basic assumption and dynamic equation of gradually flow, type of slopes and their characteristics, analysis and computation of flow profile, brink depth analysis, surge in open section.
- 5. TURBINES:** Classification definitions, similarly laws, specific speed and unit quantities, Pelton turbines-their construction and settings, speed regulation dimensions of various element. Action of jet, torque,

power and efficiency for ideal case, characteristic curves. Reaction turbines construction & setting draft tube theory, runaway speed, working proportion of hydraulic turbines and characteristic curves, cavitation. Forces on immersed bodies: types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift.

6. **PUMPS:** Centrifugal pumps: Various types and their important components, manometric and total head, net positive suction head, specific speed, shut off head, cavitation. Principle of working and characteristic curves. Priming and maintenance. Submersible pumps.
7. **RECIPROCATING PUMPS:** principle of working, coefficient of discharge, slip, single acting and double acting pump. Manometric head, Acceleration head, working of air vessels, construction and discharge of Air lift pump.

TEXT BOOK

Modi & Sethi., "Fluid Mechanics & Hydraulics", Standard Book House, New Delhi

REFERENCE BOOKS

1. A. K. Jain., "Fluid Mechanics", Khanna Publishers, New Delhi, (2008)
2. Subramanyam., "Fluid mechanics", Tata McGraw-Hill, New Delhi
3. Rajput, R.K., "Fluid Mechanics and Hydraulic Machines", Standard Publishing House, New Delhi, 2002
4. F.M. White., "Fluid Mechanics", Tata McGraw-Hill, New Delhi, 2008
5. Jagdish, Lal., "Hydraulics Machines", Metropolitan Book Co, New Delhi, 2003
6. Kumar, K.L., "Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995

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8. www.manit.ac.in/downloads/syllabus/.../5th%20semester%20civil.pdf
9. www.scribd.com/.../Civil-engg-syllabus-RGTU-3rd-to-6th-sem

CE-209	SOIL MECHANICS	LTP	Cr
		5 1 0	4

OBJECTIVE

Working on soil mechanics and numerical methods, attempt to describe numerically the behaviour of engineering works or structure elements which are standard in soil mechanics. With this object, analyse accurately all the factors which produce distortions

between the numerical models and reality, then they propose a precise description for the mechanical properties of the soil and for the friction conditions between soil and structure.

1. **SOIL FORMATION AND COMPOSITION:** Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, inter-particle forces, soil structure, principal clay minerals.
2. **BASIC SOIL PROPERTIES & CLASSIFICATION OF SOIL:** Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.
3. **CLASSIFICATION:** Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System and Soil Exploration. Permeability of Soils: Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.
4. **COMPACTION:** Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.
5. **BEARING CAPACITY** of Soil & Terzaghi analysis, depth factor, Mayor Hoff's method etc.
6. **COMPRESSIBILITY AND CONSOLIDATION:** Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.
7. **SHEAR STRENGTH:** Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, tri-axial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

TEXT BOOK

Punmia, B. C., Jain, Ashok Kumar., and Jain, Arun Kumar., "Soil Mechanics and Foundations", Laxmi Publication Pvt. Ltd., New Delhi, 2009

REFERENCE BOOKS

1. Gopal, Ranjan, A.S.R. Rao., "Basic and Applied Soil Mechanics", New Age International (P) Ltd. Pub. N. Delhi.
2. Alam, Singh., "Soil Engg. in Theory and Practice", Vol. I, Fundamentals and General Principles", CBS Pub., N. Delhi.
3. Gulati, S. K., "Engg. Properties of Soils", Tata-McGraw Hill, N. Delhi.
4. P. Purshotam, Raj., "Geotechnical Engg.", Tata McGraw Hill.
5. Das, B.M. "Principles of Geotechnical Engineering", PWS KENT, Boston.

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5. theconstructor.org/.../compressibility-and-consolidation-of-soils/ - United States
6. www.softtech-engr.com/sepl/download/Soil%20Mechanics.pdf

CE-210		L T P	Cr
		5 0 0	3

OBJECTIVE

General Importance of environmental engineering, Need for protected Water supply-water borne diseases, Need for disposal of waste. Water requirement for Domestic, Public & Industrial needs, Fire demands, Losses and wastage, Rate of demand, Factors affecting rate of demand, Minimum requirement as IS 1172, Variation in rate of demand. Objects of sedimentation, Plain sedimentation, Sedimentation with Coagulation, Principles of coagulation, Types of coagulants, Choice of coagulants, Process of coagulation. Sedimentation tanks, Types, Construction, Working and Design aspects. Study of clarifloculator. Schematic arrangement of water supply scheme, Jack well, Pump house, Pumps,

1. **SOURCES OF SUPPLY:** Surface sources and types of intake, storage reservoirs, ground water, types of aquifers and wells, well hydraulics, yield of wells, radial collector wells.
1. **WATER QUANTITY:** Importance and necessity of water supply scheme. Water demands and its variations. Estimation of total quantity of water requirement. Population forecasting. Quality and quantity of surface and ground water sources. Selection of a source of water supply, types of intakes.
2. **WATER QUALITY:** Impurities in water and their sanitary significance. Physical, chemical and bacteriological analysis of water, water borne diseases, water quality standards.
3. **WATER TREATMENT:** Objectives, treatment processes and their sequence in conventional treatment plant, sedimentation; plain and aided with coagulation. Types, features and design aspects.

Mixing basins and Flocculation units. Filtration; mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects), Disinfection principles and aeration.

4. **OTHER WATER TREATMENT PROCESSES:** Purification processes in natural systems, water softening, removal of taste and odour, advanced methods of water treatment, deflouridation, dissolved solids removal.
5. **WATER CONVEYANCE SYSTEM:** Conveyance of water, Intake structures, Rising and Gravity system, Dual systems, Pumping Systems and pumping stations, valves and appurtenances, pipe materials and pipe fitting.
6. **WATER DISTRIBUTION SYSTEM:** Layout of Distribution system ; Dead End system, Grid Iron system, Ring system, Radial system, their merits and demerits, Distribution Reservoir- functions and determination of storage capacity, Water Distribution Network, analysis of distribution network, leak detection, Maintenance, Water supply in buildings and plumbing.
7. **MISCELLANEOUS TREATMENT METHOD:** Removal of iron, manganese, color, odour and taste activated carbon treatment, Use of copper sulphate, fluoridation, defluoridation, Desalination.

TEXT BOOK

B.C. Punmia., Ashok, Jain & Arun, Jain., "Water Supply Engineering", Laxmi Publication , New Delhi ,1995

REFERENCE BOOKS

1. E.W. Steel., "Water Supply and Sewerage", McGraw Hill, New Delhi.
2. S.R. Krishirsagar., "Water Supply Engineering"
3. S.K. Garg.,Water Supply Engineering, Khanna Publisher, Delhi
4. Manual on Water Supply and Treatment: Ministry of Urban Dev., New Delhi.
5. K.N. Duggal, M., "Elements of Public Health Engineering", S Chand & Co Ltd.
6. G.S. Birdie and J.S. Birdie., "Water Supply and Sanitary Engineering", Dhanpath Rai & sons , New Delhi.
7. Howard S. Peavy., Donald, R. Rowe and George., "Tchobanoglous Environmental Engineering" McGraw-Hill, Delhi

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4. www.urbanindia.nic.in/publicinfo/o_m/Chapter%205.pdf
5. www.hctmkaithal-edu.org/syllabus/civil/VIth%20Semester.pdf

CE-251	SURVEYING-I LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Chain surveying : chaining and chain traversing
2. compass Traversing

3. Plane tabling : methods of plane table surveying ,Two point Problem
4. Plane tabling :Three point problem
5. Leveling : profile leveling and plotting of longitudinal section and cross sections , Fly leveling
6. Use of tangent clinometer.
7. contours ; Block and radial contours
8. Use of total station ,measurement; lenear measurement, angle ; vertical and horizontal
9. Traversing : different poles and alignme
10. study of Theodolite

CE-252	BUILDING CONSTRUCTION MATERIALS & DRAWING LAB	L T P	Cr
		0 0 2	1

DRAWINGS

1. Masonary; Drawing of different type of bonds showing L-Junction, T-Junction, Cross junction
2. Sketch of different type of bond; English, Flemish, double flemish and diagonal bond T & L Junctions
3. Sketches of different type of stone masanory
4. Foundation drawing of Raft, Grillage.
5. Foundation drawing of Inverted arch, Machine foundation.
6. Sketches of DPC at basement ,plinth level and roof level
7. Arch, doors and window ; sketches of different type of arch illustrating the key points
8. sketches of fully paneled ,glazed door and window, solid flush door
9. Sketches of collapsible and rollings shutters
10. Roofs sloping (king post queen post), jack

ARCH ROOFING

1. Details Drawing of single stotey houses 3BHK
2. Sketches of different type of stair case with landing and hand rail provision
3. sketches for shear wall provision and sketches of modern lintel and chajja

CE-253	STRUCTURAL MECHANICS-I LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss- horizontal deflections & vertical deflections of various joints of a pin- jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behaviour of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Uniaxial tension test for steel (plain & deformed bars)
9. Uniaxial compression test on concrete & bricks specimens.
10. study of space frame and its analytical verification

CE-254	ENGINEERING GEOLOGY LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

PART -I

1. Identification of Materials by Visual Inspection
2. To Study The Procedure for Testing of Portland Cement (IS: 269-1967)
3. To Study The Utilization of Fly Ash
4. To Study The Procedure for Testing of Stone
5. To Study The Fiber Reinforced Concrete
6. To Study The Properties and Use Of Different Glasses
7. To Study The Different Aluminum and Steel Sections
8. To Study The Manufacture and Use of Concrete Hollow Blocks
9. To Determine Compressive And Tensile Strength of Timber Parallel and Perpendicular To Grain
10. To Study The Properties and Uses of Kota Stone
11. To Find out The Water Absorption and Tolerance Limit of Bricks

PART II

- (1) Physical Properties of Minerals
- (2) Physical Properties of Rocks
- (3) Identification of Minerals in Hand Specimen
- (4) Identification of Rocks in Hand Specimen
- (5) Identification of Geological features through wooden Models
 - a. Structural Geological Diagrams
 - b. Petrological Diagrams
 - c. Engineering Geological Diagrams
- (6) Interpretation of Geological Map (10 Nos.)
- (7) Dip & Strike Problems (8 Nos.)

CE-255	SURVEYING-II LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Theodolite; Measurement of horizontal angle
2. Theodolite; Measurement of vertical angles, permanent adjustment
3. Tacheometry; Tacheometric constants, calculating horizontal distance and elevation with the help of tacheometer
4. Setting of simple circular curves by off set method, Off set from chord produced,
5. Setting of simple circular curves by off set method, Off set from long chord
6. Setting of simple circular curves by deflection angle method
7. An exercise of triangulation including base line measurement
8. Setrup of alignments by total stations with different poles.
9. Setup of vertical angles by total stations.
10. Setup of horizontal angles by total stations.

CE-256	STRUCTURAL MECHANICS-II LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Experiment on a two- hinged arch for horizontal thrust & influence line for Horizontal thrust
2. Experimental and analytical study of a 3 bar pin jointed Truss.

3. Experimental and analytical study of deflections for unsymmetrical bending of a Cantilever beam.
4. Begg's deformeter verification of Muller Breslau principle.
5. Experimental and analytical study of an elastically coupled beam.
6. Sway in portal frames - demonstration.
7. To study the cable geometry and static's for different loading conditions.
8. To plot stress-strain curve for concrete.
9. To study suspension Bridge; Two hinge and three hinge
10. To Study redundant truss and Frame

CE-257	FLUID MECHANICS – I LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. To Determine the coefficient of impact for the vanes
2. To Determine the coefficient of discharge of an orifice meter
3. To Determine coefficient of Discharge of Notch (V-Notch and Rectangular Notch)
4. To Determine the friction factor for the pipes
5. To Determine the coefficient of Discharge of Venturimeter
6. To Determine the coefficient of Discharge of an orifice.
7. To Verify the Bernoulli's Theorem
8. To find critical Reynolds's number for a pipe flow
9. To Determine the metacentric height of a floating body.
10. To Determine the minor losses due to sudden enlargement, sudden contraction and bends for pipe flow.

CE-258	FLUID MECHANICS- II LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS:

1. To study the constructional details of a pelton turbine.
2. To draw the constant head, constant speed and constant efficiency performance characteristics curves of pelton turbines.
3. To study the constructional details of Francis Turbine.
4. To draw the constant head, constant speed and constant efficiency performance Characteristics curves of Francis Turbine.
5. To Study the constructional details of Kaplan Turbine.
6. To Study the constructional details of a centrifugal pump and draw its characteristics curve.
7. To Study the constructional details of a Reciprocating pump and draw its characteristics curve.
8. To study the model of a Hydroelectric power plant and draw it's layout
9. To Determine the friction factors
10. To determine the coefficient of impact vaes

CE-259	SOIL MECHANICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by: Sand replacement method
6. Field density by Core cutter method
7. Proctor's compaction test.
8. Coefficient of permeability of soils.
9. Unconfined compressive strength test.
10. Direct shear test on granular soil sample.

REFERENCE BOOKS

1. S. Prakash, S., Jain, P. K., "Soil Testing for Engineers", Nem Chand & Bros., Roorkee.
2. Lambi, Wiley., "Engineering Soil Testing" Eastern.
3. Bowles J. P., "Engineering Properties of Soils and their Measurement", McGraw Hill.
4. Alam, Singh., "Soil Engineering in Theory and Practice", Vol. II, Geotechnical Testing and Instrumentation,

CE-301	TRANSPORTATION ENGINEERING -I	L T P	Cr
		5 1 0	4

OBJECTIVE

The object of Transportation engineering has to plan, construct, maintain, and improve roads and bridges, and also provide planning and financial support for other modes of transportation, such as mass transit, airports, railways, and ports.

1. **INTRODUCTION, HIGHWAY PLANS, HIGHWAY ALIGNMENT AND SURVEYS:** Transportation and its importance. Different modes of transportation. Brief review of history of road development in India, Road patterns. Classification of roads, Objectives of highway planning, Planning surveys. Saturation system of planning. Main features of 20 years road development plans in India. Requirements of an ideal highway alignment. Factors affecting alignment. Surveys for highway alignment.
2. **CROSS SECTION ELEMENTS AND SIGHT DISTANCE CONSIDERATIONS:** Cross section elements: friction, carriageway, formation width, land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance.
3. **DESIGN OF HORIZONTAL AND VERTICAL ALIGNMENT:** Effects of centrifugal force. Design of superelevation. Providing superelevation in the field. Radius of circular curves. Extra-widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

4. **TRAFFIC CHARACTERISTICS AND TRAFFIC SURVEYS:** Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.
5. **TRAFFIC CONTROL DEVICES:** Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method. Intersections at grade and grade separated intersections. Design of a rotary. Types of grade separated intersections.
6. **HIGHWAY MATERIALS: SOIL AND AGGREGATES:** Subgrade soil evaluation: CBR test, plate bearing test. Desirable properties of aggregates. Various tests, testing procedures and IRC/IS specification for suitability of aggregates. Proportioning of aggregates for road construction by trial & error method and Routhfuch method.
7. **BITUMINOUS MATERIALS AND BITUMINOUS MIXES:** Types of bituminous materials; bitumen, tar, cutback and emulsions. Various tests, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

TEXT BOOK

S.K. Khanna & C.E.G. Justo., "Highway Engg.", Nem Chand & Brothers, 2009.

REFERENCE BOOKS

- 1 Rao, G. V., "Principles of Transportation and Highway Engg.", Tata McGraw Hill Pub., N. Delhi.
- 2 Kadiyali, L. R., "Traffic Engg. And Transport Planning", Khanna Pub. Delhi, 2008.
- 3 Smith, T. M. W.S. and Hurd,, "Traffic Engg." McGraw Hill Book Co., New York.

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CE-302	ELEMENTS OF RCC	L	T	P	Cr
		5	0	0	3

OBJECTIVE

Reinforced concrete is concrete which reinforcement bars ("rebars"), reinforcement grids, plate or fobres or have been incorporated to strengthen the concrete in tension. In addition the failure strain of concrete in

tension is so low that the reinforcement has to hold the cracked sections together.

1. **DESIGN PHILOSOPHIES IN REINFORCED CONCRETE:** Working stress and limit state methods, Limit state v/s working stress method, Normal distribution curve, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress ;strain ;relationship for concrete and steel.
2. **LIMIT STATE METHOD:** Limit State; Basic assumptions, permissible stresses in concrete and steel. Design of singly and doubly reinforced rectangular and flanged beams in flexure. steel beam theory. Inverted flanged beams. Design examples.
3. **BOND AND FLEXURAL ANALYSIS:** Analysis and Design of Sections in shear, bond and torsion; Diagonal tension, shear reinforcement, development length, Anchorage and flexural bond, Torsional, stiffness, equivalent shear, Torsional reinforcement, Design examples.
4. **ONE WAY AND TWO WAYS SLABS:** General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Non-rectangular slabs, openings in slabs, Design examples.
5. **COLUMNS AND FOOTINGS:** Effective length, Minimum eccentricity, short columns under axial compression, Uniaxial and biaxial bending, slender columns, Isolated and wall footings, Design examples.
6. **RETAINING WALLS:** Classification, Forces on retaining walls, design criteria, stability requirements, Proportioning of cantilever retaining walls.
7. **DESIGN OF COUNTERFORT:** Counterfort retaining walls, criteria for design of counter forts, design examples.

TEXT BOOK

I.C. Syal & A.K. Goel., "Reinforced Concrete", A.H. Wheeler & Co. Delhi.

REFERENCE BOOKS

1. P. Dayaratnam., "Design of Reinforced Concrete Structures", Oxford & IBH Pub. N. Delhi
2. Jain, A.K., "Reinforced Concrete-Limit State Design", Nem Chand & Bros., Roorkee.
3. Sinha, S. N., "Reinforced Concrete Design", Tata McGraw Hill.
4. SP-16(S&T)-1980, "Design Aids for Reinforced Concrete", to IS: 456, BIS, N. Delhi.
5. SP-34(S&T)-1987 Handbook on Concrete Reinforcement and Detailing, BIS, N. Delhi.

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2. www.onlinefreebooks.net/.../design-of-construction-structure-pdf.html
3. www.technopress3000.com/PrestressedFrame.htm
4. www.cphbooks.com/html/06rcc1.htm
5. forum.vtu.ac.in/~edusat/Prog6/ddrc/mcn/MCN_02_4_RW_ppt.ppt

CE-303	GEOTECH ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

The object of Geotechnology is to study for Geoinformation & design of Dam, stability of slopes, earth and earth retaining structure (e.g. GIS-, CAD-, and other data sets). The limited exchange and re-use of information increases the project costs and more importantly, may lead to less optimisation in project

- EARTH DAMS:** Introduction, types of sections, earth dam foundations, causes of failure and criteria for safe design, control of seepage through the embankment, control of seepage through the foundation, drainage of foundations, criterion for filter design. Introduction to rock fill dams.
- STABILITY OF SLOPES:** Causes of failure, factors of safety, stability analysis of slopes-total stress analysis, effective stress analysis, stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, effect of pore pressure, Fellenius method to locate centre of most critical slip circle, friction circle method, Taylor's stability number, slope stability of earth dam during steady seepage, during sudden draw down and during and at the end of construction.
- BRACED CUTS:** Depth of unsupported vertical cut, sheeting and bracing for deep excavation, movements associated with sheeting and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.
- COFFERDAMS:** Introduction, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock, inter-lock stresses.
- CANTILEVER SHEET PILES:** Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method, simplified procedure, cantilever sheet pile, penetrating clay, limiting height of wall.
- SOIL STABILIZATION:** Soil improvement, shallow compaction, mechanical treatment, use of admixtures, lime stabilization, cement stabilization, lime fly ash stabilization, dynamic compaction and consolidation, Bituminous stabilization, chemical stabilization, pre-compression, lime pile and column, stone column, grouting, reinforced earth.
- BASICS OF MACHINE FOUNDATIONS:** Terminology, characteristics elements of a vibratory systems, analysis of vibratory motions of a single degree freedom system; undamped free vibrations, undamped forced vibrations, criteria for satisfactory action of a machine foundation, degrees of a freedom of a block foundation, Barken's soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

TEXT BOOKS

Gopal, Ranjan and A.S.R. Rao., "Basic and Applied Soil Mechanics", Newage International Publication.

REFERENCE BOOKS

- S. Prakash., Gopal Ranjan, & S. Saran., "Analysis and Design of Foundation and Retaining Structures", Sarita Prakashan.
- Swami Saran, "Analysis and Design of Sub Structures", Taylor & Francis, 2006.
- Shamsher Prakash, "Soil Dynamic", McGraw Hill
- Teng., "Foundation Design", Prentice Hall of India
- Bharat Singh, Shamsher Prakash., "Soil Mechanics & Foundation Engineering", Nem Chand & Bros, Roorkee.

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- www.scribd.com/.../Geotechnical-Engineering-Procedures-for-Foundation-Design-of-Buildings-and-structures
- www.scribd.com/doc/.../EM-111022504-Design-of-Sheet-Pile-Walls-1
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CE-304	TRANSPORTATION ENGINEERING-II	L T P	Cr
		5 1 0	4

OBJECTIVE

Transportation organizations are challenged to reduce fatalities and maintain critical infrastructure for citizens, businesses, and government. Department executives, managers, and engineers must invest in systems that improve public safety, accessibility, and customer service while simultaneously reducing construction, contractor, and technology costs.

- DESIGN OF FLEXIBLE PAVEMENTS:** Types of pavements; Flexible and rigid pavements. Components of a pavement and their functions. Factors affecting design of pavements. Design of thickness of a flexible pavement by Group Index method, CBR method (including latest IRC guidelines), Triaxial method and Burmister's method.
- DESIGN OF RIGID PAVEMENTS:** Westergaard's theory, critical locations of loading, load and temperature stresses. Critical combination of stresses. IRC guidelines for determination of thickness of a rigid pavement. Joints; requirements, types, patterns. Spacing of expansion and contraction joints. Functions of dowel and tie bars.
- HIGHWAY CONSTRUCTION:** Non-Bituminous Pavements, Brief introduction to earthwork machinery; shovel, hoe, clamshell, dragline, bulldozers. Principles of field compaction of subgrade. Compacting equipments. Granular roads. Construction steps of WBM. WMM. Construction of cement concrete pavements, Slip-form pavers, Basic concepts of the following; soil stabilized roads, use of geo-

synthetics, reinforced cement concrete pavements, prestress concrete pavements, roller compacted concrete pavements and fibre reinforced concrete pavements.

4. **CONSTRUCTION OF BITUMINOUS PAVEMENTS:** Various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of BUSG, Premix carpet, BM, DBM and AC. Brief coverage of machinery for construction of bituminous roads; bitumen boiler, sprayer, pressure distributor, hot ; mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various IRC and MOST specifications.
5. **HIGHWAY MAINTENANCE, DRAINAGE AND HILL ROADS::** Pavement failures. Maintenance operations. Maintenance of WBM, bituminous surfaces and cement concrete pavements. Pavement evaluation. Benkelman beam. Introduction to various types of overlays. Surface drainage; types, brief design. Types of sub-surface drainage. Special characteristics of hill roads: geometrics, hair pin bends, construction of hill roads, drainage of hill roads, maintenance problems of hill roads
6. **HIGHWAY ECONOMICS AND FINANCE:** Need of economic evaluation. Highway user benefits and costs. Methods of economic evaluation: benefit cost ratio method, net present value method, internal rate of return method, comparison. Highway finance.
7. **TUNNELS:** Sections of tunnels; advantages, limitations and suitability of each section. Shaft. Pilot tunnel. Driving tunnel in rocks: sequence of construction operations, full-face method, heading and bench method, drift method. Driving tunnels in soft ground; sequence of construction operations, needle beam method, shield tunneling, compressed air tunneling.

TEXT BOOK

S.K.Khanna & C.E.G. Justo, Highway Engg, Nem Chand Bros., Roorkee

REFERENCE BOOKS

1. Kadiyali, L. R., "Principles and Practice of Highway Engg.", Khanna Publishers, Delhi.
2. Yoder, E.J. & Witczak, M.W., "Principles of Pavement Design", John Wiley and Sons, USA.
3. Saxena, S. C., "Tunnel Engineering", Dhanpat Rai Publications, N. Delhi.
4. A. S. P. Bindra., "Text book of Tunnel, Bridges and Railway Engg.", Dhanpat Rai Delhi.

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4. home.iitk.ac.in/~adas/article13.pdf
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CE-305	ELEMENTS OF STEEL ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

An object-oriented model-based approach is presented for the integrated design of steel structures consisting of several members. The problem of integrated design of steel structures by a hierarchy of cooperating knowledge bases.

1. **INTRODUCTION:** Properties of structural steel. I.S. Rolled sections and I.S.2007 specifications for plastic design. Connections; Importance, various types of connections, simple and moment resistant, riveted, bolted and welded connections.
2. **DESIGN OF TENSION MEMBERS:** Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices design problems.
3. **DESIGN OF COMPRESSION MEMBERS:** Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members design problems.
4. **COLUMN BASES AND FOOTINGS:** Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentric loading, design of grillage foundations design problems.
5. **DESIGN OF BEAMS:** Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling design problems.
6. **GANTRY GIRDERS:** Introduction, various loads, specifications, design of gantry girder.
7. **PLATE GIRDER:** Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

DRAWINGS

(1) Drawing of Rivets and types of welds.
Structural drawings of various types of welded connections (simple and eccentric)
Beam to column connections (framed & seat connections)
Column bases; slab base, gusseted base and grillage foundation.
Plate girder.
Roof truss.
Drawing of gouting girder.
Pressed Steel tank.

TEXT BOOK

Arya, A.S. & Ajmani, J. L., "Design of steel structures" Nem chand & Bros., Roorkee.

REFERENCE BOOKS

1. Raghupati M, Design of steel structures, Tata McGraw Hill, Pub., New Delhi.
2. A.Kazmi SM & Jindal SK., "Design of steel structures", Prentice Hall, New Delhi.
3. Duggal SK , "Design of steel structures", Tata McGraw Hill, Pub., New Delhi.

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CE-306	HYDRAULIC STRUCTURES & IRRIGATION ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

The object of Hydraulic Structures and Irrigation engineering to analyze and Design the Hydraulic structure (i.e. Dam, Aqueduct, Siphon Aqueduct, Cannel , Cross Drainage etc) and analysis of precipitation and methodology of irrigation system .

1. **INTRODUCTION:** definition, necessity, benefits of irrigation, ill effects of irrigation, types of irrigation, and history of irrigation development in India.
2. **METHODS OF IRRIGATION:** free flooding, contour laterals, model strip method, check flooding, basin flooding, zig zag and furrow method, sub surface irrigation, sprinkler irrigation, drip irrigation
3. **REGULATION WORKS:** Canal falls-necessity and location, development of falls, design of cistern element, roughening devices, design of Sarda type fall, design of straight Glacis fall. Off-take alignment, cross;regulator and distributory head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes.
4. **CROSS DRAINAGE WORKS:** Classification and their selection, hydraulic design aspects of aqueducts, syphon aqueducts, super passage, canal syphon and level crossing, design of transitions.
5. **DIVERSION CANAL HEADWORKS:** Various components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.
6. **STORAGE HEADWORKS:** Types of dams, selection of a site, gravity dam; two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams-constant angle and constant radius arch dam, simple design and sketches, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters.

7. SPILLWAYS AND ENERGY DISSIPATORS:

Essential requirements of spillway and spillway's capacity, types of spillways and their suitability, Ogee spillways, chute, side channel, shaft and syphon spillways, energy dissipation below spillways, stilling basins, USBR and I.S. Stilling Basins.

TEXT BOOK

Modi, P.N., "Irrigation Water Resources and Water Power Engineering", Standard Book. House, 2008.

REFERENCE BOOKS

1. Singh Bharat, "Fundamentals on Irrigation Engineering.", Nemchand Bros., Roorkee
2. Garg, S. K., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi, 2009
3. Varshney, R.S. Gupta, Gupta, R. L., "Theory and Design of Irrigation Structures" Vol. I & II. Nem Chand Publication, 2007.

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CE-307	ADVANCED CONSTRUCTION TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

The Advanced Construction Technology System (ACTS) is to identify the use of emerging technologies to improve construction efficiency and effectiveness.

1. **EARTH WORK:** Excavation in ordinary and hard soils, excavation in soft and hard rock blasting techniques, Excavation in weak soils Slide slopes of excavation: minimum working space at bottom, shoring, strutting Dewatering techniques; pumping and well points. Disposal of spoil and balancing Embankments Compaction of earth fills protection and drainage of embankment
2. **CONSTRUCTION WORKS FOR HIGH RISE BUILDINGS:** breakup/specifics; Safety aspects and prevention of accidents for high rise buildings
3. **CONSTRUCTION TECHNIQUES:** Construction techniques; chimneys and cooling towers Precast and Pre stressed Concrete construction Introduction prestressed concrete. General theory linear post tensioning and its advantages, high strength post tensioned stands, parallel lay wire, high strength alloy Steel bars Techniques of post tensioning :general, special requirements for forming and false work, ducts and closure, placing of ducts or tendons, concreting, stressing procedure, grouting, protecting anchorage from corrosion.
4. **CONSTRUCTION CONTRACTS & SPECIFICATIONS:** Introduction, types of contracts, contract document, specifications, important conditions of contract, arbitration.

5. **CONSTRUCTION PLANNING:** Introduction, work breakdown structure, stages in planning-pre-tender stages, contract stage, scheduling, scheduling by bar charts, preparation of material, equipment, labour and finance schedule, limitation of bar charts, milestone charts.
6. **CONSTRUCTION ORGANIZATION:** Principles of Organization, communication, leadership and human relations, types of Organizations, Organization for construction firm, site organization, temporary services, job layout.
7. **NETWORK TECHNIQUES IN CONSTRUCTION MANAGEMENT-I:** CPM Introduction, network techniques, work break down, classification of activities, rules for developing networks, network development; logic of network, allocation of time to various activities, Fulkerson's rule for numbering events, network analysis, determination of project schedules, critical path, ladder construction, float in activities, shared float, updating, resources allocation, resources smoothing and resources leveling, Network Techniques in Construction Management-II- PERT Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem

TEXT BOOK

Sengupta & H. Guha., "Construction Management & Planning", Tata McGraw Hill, 1995.

REFERENCE BOOKS

1. Sharma, S.C., "Construction Equipment and Management", Khanna Publishers, 2008.
2. Purify., "Advance Construction Equipment",
3. Chandola & Vazrani., "Heavy construction", khanna Publishers.
4. Satyanaryana & Saxena., 'Construction planning & Equipment', Standard Publishers Distributors, 2009
5. P. S. Gehlot., & B.M. Dhir., "Construction Planning & Management", New Age International Publishers Ltd., 1992.
6. Srinath L. S., "ERT & CPM -Principles & Applications:", Affiliated East-west Press(P)Ltd.
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7. www.hctmkaital-edu.org/syllabus/civil/Vth%20%20Semester.pdf –
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CE-308	ENVIRONMENTAL ENGG - II (SANITATION)	L T P	Cr
		5 1 0	4

OBJECTIVE

The following are the aims and objects of Environmental Engineering (sanitation); Proper disposal of human excreta to a safe place, before its starts decomposition and may cause insanitary conditions in the locality, to take out all kinds of wastewater from the locality immediately after its use, so that mosquitoes, flies, bacteria etc may not breed in it and cause nuisance, final disposal of sewage on land or in near by watercourses after some treatment so that receiving land or water may not get polluted and unsafe for its further use. The sewage is disposed of on land, it should have such s degree of treatment that it may not affect the sub-soil in anyway

1. **COLLECTION OF SEWAGE:** Importance of sanitation, Systems of sewerage;separate, combined and partially separate. Shapes of sewer; circular and egg shaped. Construction and testing of sewer lines.
2. **SEWAGE CHARACTERIZATION:** Quality parameters;BOD, COD, Solids, D.O., Oil & Grease. Indian Standards for disposal of effluents into inland surface sources and on land.
3. **DESIGN OF SEWERS:** Sewers appurtenances and sewage pumping, construction and maintenance of sewage.
4. **SEWAGE TREATMENT:** Objectives, sequence and efficiencies of conventional treatment units. Preliminary treatment, screening and grit removal units. Theory and design aspects of primary treatment, secondary treatment; activated sludge process & its modifications, Tricking filter, sludge digestion and drying beds. Stabilization pond, aerated lagoon, UASB process.
5. **DISPOSAL OF SEWAGE:** Disposal of sewage by dilution; self; purification of streams. Sewage disposal by irrigation (sewage treatment).
6. **TANK:** Septic ; Septic tanks ' imhoff tanks, and onsite sanitation
7. **SEWERAGE SYSTEM:** Sewerage project and building drainage works

TEXT BOOK:

Garg, S.K., "Sewage and Sewage Treatment", Khanna Publishers, New Delhi, 1994.

REFERENCE BOOKS

1. Metcalf and Eddy., "Waste Water Engineering", McGraw-Hill Companies
2. S.R. Krishna, Sagar., "Sewage and Sewage Treatment",
3. Punmia, B. C., "Waste Water Engineering", Laxmi Publications, 1998.
4. Manual on Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.

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3. www.amiantit.com/...circular...Systems/.../GRP_no_n_circular_Pipe_Systems.pdf

4. www.indiaenvironmentportal.org.in/.../Journ%20of%20Ind%20Poll%20Contorl.pdf

CE-309	COSTING ESTIMATE, BILLING & ACCOUNTS	L T P	Cr
		5 0 0	3

OBJECTIVE

The object of Estimation, Costing, Billing & Accounts is for estimation of Building, Road, study of Technical specification for construction of Road and Building, rate analysis, Tenders and valuation of buildings.

- ESTIMATE:** Principle of estimation, units of work & different kinds of estimates, different methods of estimation, estimation of materials in single room building, two room building with different sections of walls, foundation, floors and roofs, R.B and R.V.C.C works, Plastering, white washing, Distempering and painting, doors and windows, lumpsum items, Estimates of canals, roads etc.
- SPECIFICATION OF WORKS:** Necessity of specification types of specification, general specification, specification of bricks, cement, sand, water, lime, reinforcement: detailed specification for earthwork, cement, concrete, brickwork, flooring, D.P.C, R.C.C, cement plastering, white and colour washing, distempering, painting
- RATE ANALYSIS:** Purpose, importance and requirements of rate analysis, units of measurement preparation of rate analysis, procedure of rate analysis for items: Earth work, brick masonry work, concrete works, R.C.C works, reinforce brick work, plastering, painting, finishing (white washing, distempering), Estimation of earth work, road hills road and canals
- PUBLIC WORKS ACCOUNT:** Tender and acceptance of tender, Ernst money, security money, retention money, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction.
- BILLING:** Maintenance of muster ROLL precaution filling preparation of pay bill, measurement of book for payment of contractors, different types of payment ;first & final, running advance and final payment
- VALUATION:** Purpose of valuation, principles of valuation depreciation, sinking fund, salvage & scrapvalue, valuation of a building–cost method, rental ; return method.
- PREPARATION:** Typical estimates related to civil engg. Works.

TEXT BOOK

Chakraborty, M., "Estimate costing & specification in civil Engg.", Chakraborty Publication, 2006.

REFERENCE BOOKS

- Dutta, B. N., "Estimating & cost",
- Kohli & kohli., "A text book on estimating & costing (Civil) with drawings", S. Chand & Company Ltd. 2004.
- Rangwala, S.C., "Estimating & Costing", Charotar Publishing House, 2007
- Pasrija & Arora., "Estimating Costing Valuation", New Asian Publishers

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- www.itesmumbai.org/civilsyllabus.pd

CE-310	BUILDING SERVICES	L T P	Cr
		5 0 0	3

OBJECTIVE

Services in construction of buildings is for construction and repair of building, capital construction, Waterproofing and protection against weather conditions of buildings ,modernization ,major overhaul of building ,special construction works ,externals network gas and water pipes.

- INTRODUCTION:** General principles governing the design of sanitary plumbing system, system of plumbing and choice of a particular system, sewerage and water supply plans of building Principal Service installations
- DOMESTIC WATER SUPPLY:** Water supply requirements & quality, house connection, water supply networks, cold and hot water services, water services to multistoried buildings. pipe materials, jointing, valves & taps
- BUILDING DRAINAGE:** Discharge & Ventilation Pipes, building drainage systems, Drainage pipe materials, jointing & testing, types of fixtures & fittings Estimate of water supply & sanitary work of a residential building construction.
- REFUSE HANDLING:** Collection of refuse from buildings, refuse bins & sacks
- ACOUSTICS:** Basic problems& technology, transmission of sound in rooms, coefficient of sound absorption, noise reduction, classification & selection of acoustical materials, acoustics of auditorium, schools etc.
- AIR CONDITIONING, HEATING & VENTILATION:** Different types of heating materials, Solar water heaters, requirement of comfort conditions, temperature & humidity control, Mechanical Ventilation, Air conditioning units & their working principles
- LIFTS:** Classification & types of lifts lift codes & rules, Traffic analysis & selection of lifts, car speed, Fire safety, and arrangement of lifts.

TEXT BOOK

Jain, V. K., "Design & installation of services in building complexes & High rise buildings",

REFERENCE BOOKS

- Merrit, F. S., "Mechanical and Electric design of buildings",
- Sinha, A., "Building Environment",
- Bhatia, H.S., "Environmental Services (Plumbing)", Galgotia Publication pvt. Ltd., 2002.

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- www.scribd.com/.../Abu-Dhabi-Guid-to-Water-Supply-Regulations

- www.freefuelforever.com/downloads/split_system_installation_manual.pdf
- www.wbdg.org/resources/acoustic.php -

CE-351	TRANSPORTATION ENGG-I LAB	L T P	CR
		0 0 2	1

LIST OF EXPERIMENTS

- Aggregates impact test
- loss –angles abrasion test on aggregates
- dorry's abrasion test on aggregates
- Deval attrition test on aggregates
- crushing strength test on aggregates
- Penetration test on bitumen.
- Ductility test on bitumen
- Viscosity test on Bituminous materials
- softening point test on Bitumen
- Flash and Fire point Test on Bitumen

CE-352	ELEMENTS OF RCC LAB	L T P	CR
		0 0 2	1

LIST OF EXPERIMENTS

- Design and Drawing of Retaining walls
- Design and Drawing of Counter forts walls
- Design and Drawing of under ground water tank.
- Design and Drawing of elevated water tank.
- Design and Drawing of R.C.C flat slab for two Way. (Span Ratio < 2.)
- Design and Drawing of R.C.C flat slab for two Way. (Span Ratio > 2.)
- Design and Drawing of portal with hinged section.
- Design and drawing of portal with fixed section.

CE-353	GEOTECH ENGINEERING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Grain Size analysis –Hydrometer method
- Shrinkage limit determination
- Relative Density of granular soils
- consolidated Drained (CD) Traixial Test
- Consolidated Undrained (CU) Triaxial Test with pore pressure
- consolidated Test
- Unbisturved sampling
- Standard penetration test
- Dynamic cone penetration test
- Model; plate test

CE-354	TRANSPORTATION ENGG-II LAB	L T P	Cr
		0 0 2	1

Highway Materials Testing:

- Tests on Bitumen
- Tests on Emulsion

Design of Asphalt Concrete Mixes:

- Marshall Stability Test

Pavement Evaluation Tests:

- Benkelman Beam test
- Roughness Test

- Abrasions and Index Test
- Ductility Test
- To study model of soil stabilized roads.
- To study model of geo-synthetics roads
- To study for different geo-textiles used in highway embankments.

CE-355	ELEMENT OF STEEL ENGG. LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Structural drawing of various type of Welded connection for simple connections.
- Structural drawing of various type of Welded connection for eccentric connections.
- Structural drawing of various type of riveted connection for simple connections.
- Structural drawing of various type of riveted connection for eccentric connections.
- Beam to column connections for framed and seat connections
- Column bases: Column bases; slabs, Gusseted base.
- Column bases: Column bases; Grillage Foundation.
- Plate Girder.
- Roof truss
- To study model of grillage foundations steel structures.

CE-358	ENVIRONMENTAL ENGINEERING-II (SANITATION) LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Study of instruments and equipments.
- Bacteriological culture media-Liquid and Solid media.
- Preparation, distribution and sterilization,
- Isolation of microbes from Soil, Water and Air samples.
- Culture of organisms and staining.
- MPN Test for coli-forms in water.
- MPN Test for coli-forms in sewage.
- To study model of septic and imhoff tanks.
- To study model of sewer in urban area.
- To study model of sewerage systems.
- Analysis of waste disposals in urban areas.

CE-359	COSTING ESTIMATE, BILLING & ACCOUNTS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Estimation of earth work and foundation, basement floors
- Estimation of 1st Floors, 2nd and 3rd floor of housing complex.
- Estimation of 4th Floors , 5th and 6th floor of housing complex
- Costing of earth work and foundation ,basement floors
- Costing of 1st Floors, 2nd and 3rd floor of housing complex.

6. Costing of 4th Floors, 5th and 6th floor of housing complex.
7. Valuation of buildings.
8. Tendering for housing project and road project.
9. Flow chart and networking for housing project by critical path method.
10. Flow chart and networking for programme evaluations and review techniques with an example.

CE- 391	SURVEY CAMP	L T P	Cr
		0 0 2	1

Every student will carry out Survey Camp under the supervision of guide/instructors. The Survey Camp shall be approved by a committee constituted by the HOD. The method of evaluation including intermediate assessment shall be as evaluated by the pertinent BOS.

Survey Camp is spread one term. The distribution of amount of work in term is equivalent to 1credit. The evaluation of work is continuous but award of grade is for 1 credit in the last of term on the basis of total work.

CE-401	COMPUTER PROGRAMMING AND GRAPHICS	L T P	Cr
		5 0 0	3

OBJECTIVE

Object-oriented programming is proving to be a valuable technology for building large, complex software products, especially those involving heavy user interaction; just the sort of problems found in computer graphics. The chapters describe subjects ranging over the full spectrum of computer graphics problems.

1. **ALGORITHM AND FLOW CHART:** An overview identifying computer components and their function. Problem solving, Algorithm, Techniques in problem solving Flow charting.
2. **INTRODUCTION TO C, C++ PROGRAMMING:** Structured programming with reference to C, C++.
3. **STATEMENT AND FUNCTIONS FOR PROGRAMMING:** Data types and operation, I/O Statements, Functions, Scope, Introduction to object oriented programming.
4. **INTRODUCTION TO INTERACTIVE GRAPHICS:** Graph plotting windows and clipping, segmentation, viewpoint, interactive programming, Planning and zooming.
5. **INTRODUCTION TO CAD:** Introduction to interactive computing and use of graphics requirement of interactive computing dedicated v/s time sharing models, Interactive interface
6. **COMPUTER AIDED DRAFTING:** Introduction to AutoCAD, Basic drawing and editing, commands for 2d drawings, simple drawing exercises for application of auto cad commands.
7. **ADVANCED 2D DRAFTING:** using auto cad, use of layers and blocks exercises on simple drawings Introduction to 3d drafting simple exercises on 3d drafting walk through exercises.

TEXT BOOK

Rajaraman, V., "Fundamental of computers", Prentice-hall Of India Pvt. Ltd., 2007

REFERENCE BOOKS

1. Basanda, S. K., "Computer today",
2. Saxena, Sanjay., "MS –office 2000 for everyone", Vikas Publication House Pvt. Ltd., 2003.
3. Alexiis, leon and Mathews., "Internet for every one", Vikas Publication House Pvt. Ltd., 2009
4. Sinha, P.K., "Computer Fundamental", 4th Edition, BPB, 2003.

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2. www.datamat.com/training/autocad.htm
3. en.wikipedia.org/wiki/Computer-aided_design
4. [en.wikipedia.org/wiki/C_\(programming_language\)](http://en.wikipedia.org/wiki/C_(programming_language)) -

CE-402	RCC & STEEL DESIGNS	L T P	Cr
		5 0 0	3

OBJECTIVE

The main object of Reinforced cement concrete is to analyze the design of building structure for the formulation of bending moment and shear forces, establish the reinforcement and concrete grade by different method. In addition the failure strain of concrete in tension is so low that the reinforcement has to hold the cracked sections together.

1. **INTRODUCTION:** properties of concrete and reinforcing steel, design philosophies, limit state, ultimate load method, working stress.
2. **WORKING STRESS METHOD:** Design of beams; singly reinforced, doubly reinforced, T and L, rectangular beams and lintels Design of slabs; one way, two ways, baffle slabs Design of columns: Subjected to eccentric and axial loading. Design of staircases; type's terms used, design of stair spanning, horizontally, doglegged stair with quarter space landing, stair with central stringer beam.
3. **LIMIT STATE METHOD:** Design of beams; singly, doubly, rectangular, Tand L Beams Design of slabs: One way, two ways, baffle slabs Design of column: Subjected to eccentric and axial loading using S.P.-16.
4. **DESIGN OF FOOTING:** square, rectangular, circular, trapezoidal, combined and steeped footing and raft foundation.
5. **DESIGN OF RETAINING WALLS:** Various types of retaining walls, design of cantilever and counter fort retaining.
6. **DESIGN OF WATER TANKS:** analysis of beam curved in plan, design of RCC rectangular and circular water tanks resting on ground, design of underground tanks, design of staging only for overhead tanks.
7. **DESIGN OF CONNECTION IN STEEL STRUCTURES:** Riveted and bolted and welded connections, assumption, different types of joints, design of various types of riveted and welded connections subjected to direct loads and moments

TEXT BOOK

Punima, B.C., "Reinforced concrete structures vol. I", Laxmi Publication, 1992.

REFERENCE BOOKS

- 1 Jain, Ashok K., "Reinforced Concrete (limit state Design)" USP, 2007.
- 2 Jain, Ashok K., "Reinforced concrete", Nem Chand & Brothers, 2009.
- 3 Krish, Raju N., "Prestressed Concrete Structure", CBS, 2009.
- 4 Arya, A.S. & J.L. Ajmani., "Design off steel Structures"

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2. www.nitham.ac.in/ced/syllabus08/3rd%20year%20Civil.pdf
3. www.nitham.ac.in/ced/syllabus08/3rd%20year%20Civil.pdf
4. www.ubter.in/Curriculum/Civil/Document/sem5.pdf

CE-404	DESIGN OF ENVIRONMENTAL ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

The object of Environmental engineering for obtaining the portable water from intake structure as well as Design of Sewer hydraulics structure and treatment plants of sewer water.

1. **INTAKE STRUCTURES:** Design of intake structures.
2. **INFILTRATION WELLS AND GALLERIES:** Design of small plants such as infiltration wells and galleries etc.
3. **DESIGN AND ARRANGEMENTS OF WATER PURIFICATION:** plants; screens, aerator: plain sedimentation, mixing, coagulation and flocculation tanks: rapid and slow sand filters with all major components, softening unit: Arrangement of various units-conventional others.
4. **DESIGN OF STORM AND SANITARY SEWERS:** hydraulic elements, computation of flow rates in pipe: calculation of sizes and grades, cross sections of sewers
5. **SEWAGE TREATMENT:** Design and arrangement of sewage treatment; plants ;Detritus tank, grit chamber, skimming tanks, primary units, trickling filters, activated sludge units, sludge digestion tank, sludge drying bed, layouts of various units, package treatment plants
6. **SEPTIC TANKS:** Design of septic tanks and Inhofe tanks
7. **RESERVOIR DESIGN AND OPTIMIZATION:** Design of small plants such as oxidation ponds, oxidation ditches etc, Design of house plumbing systems, Design of distribution system for water, distribution Reservoir, Optimization of pipe design

TEXT BOOK

Gulhati., "Design and implementation of large scale environmental engineering",

WEB REFERENCES

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2. www.wbdg.org/ccb/DOD/UFC/ufc_3_230_08a.pdf
3. www.niir.org/.../%5BNiir%5D%20Water%20and%20Air%20Effluents%20Treatme
4. www.answers.com/topic/sewage-treatment

CE-421	BRIDGE ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

The object of Bridge Engineering has to Design of super structure and other structural Components and also provide planning and financial support.

1. **INTRODUCTION:** Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.
2. **STANDARD SPECIFICATIONS FOR ROADS AND RAILWAYS BRIDGES:** General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.
3. **DESIGN CONSIDERATION FOR R.C.C. BRIDGES:** Various types of R.C.C. bridges (brief description of each type), design of R.C.C. culvert and T-beam bridges.
4. **DESIGN CONSIDERATION FOR STEEL BRIDGES:** Various types of steel bridges (brief description of each), design of truss and plate girder bridges.
5. **HYDRAULIC & STRUCTURAL DESIGN:** Piers, abutments, wing wall and approaches.
6. **JOINTS AND BEARING:** Brief descriptions of bearings, joints, articulation and other details.
7. **BRIDGE:** Foundation-Variou types, necessary investigations and design criteria of well foundation.

TEXT BOOK

Victor, D. J., "Essentials of Bridge Engineering", Oxford & IBH Publication, 2008.

REFERENCE BOOKS

1. Raju, N. Krishna., "Design of Bridges", Oxford & IBH, 2008.
2. Raju, N. Krishna., "Design of Bridges",, John Wiley & Sons.
3. Jagadish, T. R. & Jairam. M. A., "Design of Bridge Structures", Prentice Hall of India, 2009.

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3. mppsc.nic.in/main_exam/CIVIL%20ENGINEERIN G.pdf -
4. www.nitham.ac.in/ced/syllabus08/3rd%20year%20Civil.pdf

CE-422	HYDROLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

It is practically a science of planning and designing of the Hydrology system for the agricultural land to protect the crops from bad effects of drought or low rainfall. It includes the construction of weirs or dams, barrages or canal system for the regular supply of water to the cultivable lands

- 1. INTRODUCTION:** Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry, hypsometric curves.
- 2. PRECIPITATION:** Forms and types of precipitation, characteristics of precipitation in India, measurement of precipitation, recording and non recording raingages, raingage station, raingage network, estimation of missing data, presentation of rainfall data, mean precipitation, depth -area -duration relationship, frequency of point rainfall, intensity -duration- frequency curves, probable max. Precipitation.
- 3. EVAPORATION & TRANSPIRATION:** Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control, transpiration, evapo-transpiration and its measurement, Penman's equation and potential evapo-transpiration.
- 4. INFILTRATION:** Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.
- 5. RUNOFF:** Factor affecting run-off, estimation of runoff, rainfall; run off relationships, measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph, measurement of velocity-current meters, floats, area velocity method, moving boat and slope area method, electromagnetic, ultra-sonic and dilution methods of stream flow measurement, stage discharge relationship.
- 6. HYDROGRAPH:** Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH, floods, rational methods, empirical formulae, UH method, flood frequency methods, Gumbel's method, graphical method, design flood.
- 7. GROUND WATER:** Occurrence, types of aquifers, compressibility of aquifers, water table and its effects on fluctuations, wells and springs, movement of ground water, Darcy's law, permeability and its determination, porosity, specific yield and specific retention, storage coefficient, transmissibility, Well Hydraulics: Steady state flow to wells in unconfined and confined aquifers.

TEXT BOOK

K. Subramanya., "Engineering Hydrology", 2nd Edition, Tata McGraw Hill Publishing Company Limited, 1984.

REFERENCE BOOKS

- H. M. Raghunath., "Hydrology", New Age International (p) Limited, 2006

- Linsely, Kohler, Paulhus., "Hydrology", McGraw Hill, 1988.
- Singh, V. P., "Engineers Elementary Hydrology", Prentice Hall.

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- www.hctmkaithal-edu.org/syllabus/civil/Vth%20%20Semester.pdf

CE-423	ENVIRONMENTAL POLLUTION AND CONTROL	L T P	Cr
		5 0 0	3

OBJECTIVE

The programme is designed to meet the growing need, internationally, for Engineers who are able to understand and solve environmental problems. Since most environmental problems are interdisciplinary in nature, the Pollution and Environmental Control is founded upon a variety of environmental science, engineering and social science disciplines.

- 1 THE ENVIRONMENT ITS POLLUTION AND PRESENT STATUS:** biosphere and environment, physical and biological environment' ecosystem and ecological balance of nature. Impact of man on biosphere; pollution and conservation of environment: status of administrative, control on environment in India. Status of water pollution; monitoring and control in India. Status of air pollution; monitoring and control in India.
- 2 PRINCIPLES INVOLVED IN THE PROTECTION OF PUBLIC HEALTH:** sanitation of dwelling houses. Principles of villages and town planning; land pollution and its control.
- 3 AIR BORNE:** diseases and their control, sources of pollution, occupational health hazards.
- 4 POLLUTIONS CONTROL:** Water borne diseases; river pollution and control of water pollution
- 5 ENVIRONMENTALS VENTILATION:** Environmental Consideration of ventilation, air conditioning and illumination in modern buildings.
- 6 SAMPLE COLLECTION AND SAMPLING DEVICES:** Sample collection and sampling devices; mathematical modeling. Application of above in the design of hospital s and other public buildings.
- 7 ECOLOGICAL AND ENVIRONMENTAL:** Aspects impact assessment of power plants on environment and ecosystem, environmental degradation and control strategies, population and their control.

TEXT BOOK

Bhatia, H.S., "Environmental pollution & Control", Galgotia Publications Pvt. Ltd., 2003.

REFERENCE BOOKS

- Martin, B. B. Hocking., "Handbook of Chemical Technology and Pollution Control", Academic Press, 2006.

- Louis, Theodore., "The book Air Pollution Control" John Wiley & Sons, 2008.
- Ross, E. McKinney, Marcel, Dekker., "Environmental Pollution Control", Inderscience 2004

REFERENCE WEBSITE:

- en.wikipedia.org/wiki/Sustainability
- en.wikipedia.org/wiki/Computer_simulation
- www.wbdg.org/resources/naturalventilation.php
- en.wikipedia.org/wiki/Urban_planning

CE-431	COMPUTER AIDED DESIGN & APPLICATION IN CIVIL ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

Civil engineering challenges computer scientists in the following areas; computational geometry, large spatial databases, floating-point arithmetic, software reliability, management of complexity, and real-time control. Most of these challenges may be surmounted by the use of state-of-the-art algorithms, object databases, software development tools, and code-generation techniques.

- COMPUTER FUNDAMENTALS AND HARDWARE:** Introduction, Computer generation, Elements of modern computer, definitions of terms, Input devices, Output devices, Storage devices and display devices.
- FUNDAMENTALS OF CAD:** Overview of CAD/CAM. Characteristics of CAD/CAM. Design process, role of computers in design and production.
- 2D TRANSFORMATIONS:** World coordinates, Normalized co ordinates. World to normalized Device co-ordinates.
- WINDOW TO VIEW PORT TRANSFORMATIONS:** aspect ratio, Transformation of points, straight line, parallel lines, scaling, shearing, rotation, reflection, combined transformations, solid body Transformation.
- TRANSLATION AND HOMOGENEOUS:** Co-ordinates, rotation about aqn arbitrary point, reflection through an arbitrary line, projection, overall scaling, points at infinity, Transformation convention, Practical examples .
- 3D TRANSFORMATIONS:** Introduction, Three dimensional scaling, Sheatring rotation, reflectio0nand translation, Multiple transformations, Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane.
- ORTHOGRAPHIC PROJECTIONS:** Axonometric projections, oblique projections, perspective transformations, Techniques for generating perspective views, vanishing points. Photography and the perspective transformation, Stereographic projection, Reconstruction of three dimensional images, Introduction to Civil Engineering software

TEXT BOOK

David, F. Rogers, and J. Alan, Adams., "Mathematical Elements for computer Graphics", Tata McGraw Hill, 2008.

REFERENCE BOOKS

- C.S. Krishnamurthy., "Computer Aided Designs", Narosa Book Distributors Private Ltd. 2005.
- Grabowski., CAD users, 15th Edition; includes introduction to 3D modeling.) For AutoCAD 2006, eZine Publishing, Ltd

WEB REFERENCES

- en.wikipedia.org/wiki/Computer
- www.cncinformation.com/computer...design-cad-cad-design/the-origins-of-cad-cam-2
- www.unchainedgeometry.com/jbloom/pdf/homog-coords.pdf.

CE-432	GROUND WATER ENGINEERING & SEDIMENTATION TRANSPORT	L T P	Cr
		5 0 0	3

OBJECTIVE

Objective for ground water engineering and sedimentation transport of B. Tech. students are for awareness in the field of properties of aquifers, effect of boundaries, tube wells, artificial recharge, introduction to sediment & fluvial hydraulics, bed load transport, total load transport etc.

- PROPERTIES OF AQUIFERS:** Properties of Aquifers; Formation constants, compressibility of aquifers, Equation of motion for steady and unsteady ground water flow in isotropic homogeneous aquifers. Unconfined flow with a recharge, tile drain problem. Ground water exploration and methods of investigations.
- EFFECT OF BOUNDARIES:** Effect of boundaries; interference of water, leaky aquifers, Thiem's equilibrium formula for unconfined and confined aquifers and determination of hydraulic properties of aquifers. Partial penetration of an aquifer by a well, spherical flow in a well. Non equilibrium formula for aquifer (unsteady radial flows).
- TUBE WELLS:** Tube wells; optimum capacity: silting of tube well, design of tube wells in different aquifers, tube well types, parts, bore hole, strains, its types, well pipe, casing pipe, blind pipe. Construction and working of tube wells, site selection, drilling operation, cable tool method, hydraulic method, rivers Rotary Method and drilling fluids, well screen assembly installation, verticality and alignment of tube wells, gravel packing, development of tube wells, sickness, in construction and corrosion and failure of tube wells, Pumping equipment and hydraulic testing of pumps.
- ARTIFICIAL RECHARGE:** Artificial recharge of ground water, considerations and methods, recharge techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts and recharge wells.
- INTRODUCTION TO SEDIMENT & FLUVIAL HYDRAULICS:** Properties of Sediments: origin & formation of sediments, fundamental properties of individual sediment particles, bulk properties of sediments. Incipient motion of sediment particles,

- competent velocity, life concept, critical tractive force, critical tractive stress.
- BED LOAD TRANSPORT:** Bed load equations empirical, semi theoretical and based on dimensional considerations saltation. Suspended Load Transport: Mechanism of suspension, general equations of diffusion, sediment distribution equations, effect of temperature or suspended load transport, wash load.
 - TOTAL LOAD TRANSPORT:** Approaches to the problem, microscopic and macroscopic methods, some approximate methods, effect of hydraulic conditions on sediment transport.

TEXT BOOK

D.K. Todd., "Groundwater Hydrology", Wiley India Pvt Ltd., 2006.

REFERENCE BOOKS

- H.M. Raghunath., "Groundwater", Wiley Eastern Ltd., N. Delhi
- G.W. Govier, & K. Aziz., "The Flow of Complex Mixtures in Pipes", Society of Petroleum, 2008.
- I. Zandi., "Hydraulics Transport of Bulky Materials", Pergamon Press.
- W.H. Graf., "Hydraulics of Sediment Transport" McGraw Hill Series in Water Resources.
- R.J. Garde & KG. Ranga, Mechanics of Sediment Transportation and alluvial Stream Problems, Raju Willey Eastern Ltd.

WEB REFERENCES

- www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc
- www.nitkkr.ac.in/WebCivil/Civil_syllab
- cgwb.gov.in/documents/Guide_on_ArtificialRecharge.pdf-us.do
- www.springerlink.com/index/MJ2G965607H28L80.pdf

CE-433	ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

The object of Environmental impact assessment and management system for ecological balance of environmental system as well as sustainable development in respect of Population for want of foods, Resources, Capital, Energy, Land Services etc and sustainable development in the various sectors of economy such as Industry, Agriculture and Infrastructure.

- ENVIRONMENTAL PROBLEMS AND ISSUES:** Explosion of Environmental issues and scientific, technological and regulatory responses. Effects on ecology, environment, society, health and economy. Review of national and international developments related to environmental issues.
- REVIEW OF REMEDIAL ACTIONS:** Rural and urban approaches, energy approach, transportation approach, industrial approach, agricultural approach, Technological solutions and Role of technology. Religio- philosophical

approaches and concept of Deep ecology. Market based instruments including taxation for pollution control; Role of environmental ethics.

- ENVIRONMENTAL MANAGEMENT, PLANNING AND ECONOMICS:** Multidisciplinary environmental strategies, planning and decision making, human dimensions. Setting of industries and concept of Zoning Atlas, Economic valuation of environmental assets and preliminary concept of Natural Resource Accounting.
- SUSTAINABLE DEVELOPMENT:** Concept of limits to growth in terms of population, Food, Resources, Capital, Energy, Land Services etc. Their inter linkages and use of Systems approach including feed back loops. Carrying capacity of systems, prerequisites for sustainable development, concepts of sustainable development in the various sectors of economy such as Industry, Agriculture and Infrastructure.
- IMPACT ASSESSMENT:** Collection of baseline data, concept and methodologies for initial environmental examination (IEE), Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS), Environmental Audit (EA), Risk Assessment (RA) etc. Case studies for the above.
- REMOTE SENSING IN CIVIL ENGINEERING PROJECTS:** Introduction, Role of remote sensing in terrain investigation, photogrammetry, photo-interpretation, Selection of appropriate date, Digital processing of satellite data, Necessity of field work to collect ground truth.
- ENVIRONMENTAL IMPACT AND ASSESSMENT:** Typical case study related to environmental impact assessment and auditing

TEXT BOOK

R.K. Sapru., "Environment Management in India", APH Publishing Corporations, 1990.

REFERENCE BOOKS

- Sharma, P. D., "Ecology and Environment", Rastogi Publication, 2009.
- Bindu, N. Lohani., "Environmental Quality Management", Publisher South Asian, 1984.
- R.B. Singh., "Studies in Environment and Development" Commonwealth Publishers, 1988.
- Larry W. Canter., Environmental Impact Assessment by Larry W. Canter.
- Saxena, K.D., "Environmental Planning Policies and Programmes in India," Shipra Publication, 1993.
- Shukla, S. K., & P.R. Shrivastava., "Concepts in Environmental Impact Analysis", Commonwealth Publishers 1992

WEB REFERENCES

- ecologyandsociety.org/vol4/iss1/art13
- www.manit.ac.in/downloads/syllabus/civil/.../7th%20semester%20civil.pdf
- www.fao.org/docrep/u7260e/u7260e08.htm
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CE-441	ADVANCED SURVEYING & REMOTE SENSING IN CIVIL ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

Many challenges are associated with the integration of geographic information systems (GISs) with models in specific applications. One of them is adapting models to the environment of GISs. Unique aspects of survey and remote sensing problems require a special approach to development of GIS data structures. Expanded development of GIS applications for handling advanced surveying can be assisted by use of an object oriented approach.

- 1. INTRODUCTION:** Physical basis of Remote Sensing, Sensor systems ground based, air borne and satellite, passive scanning system multi; spectral scanners(MSS), Thermal Infrared Scanning system, Radio-meters, Active Scanning system: Radar, Lidar, Satellite data-types, description and utility for various Civil Engineering projects.
- 2. REMOTE SENSING IN CIVIL ENGINEERING PROJECTS:** Introduction, Role of remote sensing in terrain investigation, photogrammetry, photo-interpretation, Selection of appropriate date, Digital processing of satellite data, Necessity of field work to collect ground truth.
- 3. TOPOGRAPHIC MAPPING USING REMOTE SENSING:** Introduction, Aerial photographs, Scale, geometric characteristics, parallax bar, generation of Digital Elevation Model, Stereoplotters, Requirements for cartographic presentation of satellite data. Mapping using satellite image interpretation, Mapping of inaccessible areas using side Looking Airborne Radar data.
- 4. RESOURCES MAPPING FOR CIVIL ENGINEERING PROJECTS:** Identification of Geomorphic and Hydrogeomorphic features and mapping. Locating construction materials; water resources, sand, soil, kankar, rocks.
- 5. SOIL CHARACTERISTICS USING REMOTE SENSING:** Application of visible, infra-red and microwave remote sensing for identification of soil types, grain size and soil moisture studies, Monitoring areas prone to Landslides using remote sensing, digital model and GIS.
- 6. APPLICATION IN WATER RESOURCES ENGINEERING:** Mapping surface water bodies using satellite data, studies related to floods, snow melts, wetland, coastal environment, sediment transport, ground water targeting, bathymetry. Regional and urban planning using remote sensing: Land use. Land covers classification, urban land use planning, urban sprawl monitoring, waste disposal sites.
- 7. MAPPING AND COMPILING THROUGH GIS APPLICATION:** Unit VII Preparation of Atlas related to a particular area through overlapping technology for locating industrial and non industrial units

TEXT BOOK

Mehrotra, A., & Suri, R. K., "Remote Sensing for Environment and Forest Management" Indus Publishing Company, 1994.

REFERENCE BOOKS

1. Jeusen J.R., "Introductory Digital Image Processing",
2. T.M. Lilles nd Kiefer R.W., Remote Sensing and Image Interpretation.
3. Manual of Remote Sensing - Vol-I.
4. Principles of Remote sensing - P.T.
5. Rampal, K.K., "Mapping & Compiling",
6. Manual of Photographic Interpretation.
7. S.J. Ventura., Niemann., B.J. and D.D. Mayer., "A Multipurpose Level Information System for Rural resources planntey (soil & water conservation)".

WEB REFERENCES

1. en.wikipedia.org/wiki/Remote_sensing
2. www.icivilengineer.com/Surveying/Remote_Sensi.
3. www.waterresources-ju.org/
4. www.gisdevelopment.net › Geospatial Application Papers

CE-442	PROFESSIONAL PRACTICES	L T P	Cr
		5 0 0	3

OBJECTIVE

Objective for professional practices of B. Tech. students are for awareness in the field of leadership, motivation, human relations, communication, conflicts, labour industrial & tax law, accident safety etc.

- 1. LEADER SHIP:** concepts of leadership, role of training role of leader, leadership in industry Professional ethics: concepts of ethics character, duty & responsibility, disciplines, Integrity, courage etc conducts, codes
- 2. MOTIVATION:** Dynamics of human behaviour, classification of motives, pay, promotion, competition, and participation rewards etc job satisfaction
- 3. HUMAN RELATIONS:** Behaviour modification technique s, industrial relations, characteristics of group behaviour, Mob psychology, lookouts, handling of grievances, labour welfare
- 4. COMMUNICATION:** Process, bareness & effective communication
- 5. CONFLICTS:** Genesis, Inter group, resolving conflicts team building
- 6. LABOUR INDUSTRIAL & TAX LAW:** factory act, workmen compensation act, minimum wage act etc
- 7. ACCIDENT SAFETY:** classification & action

TEXT BOOKS

Namavat, Roshan, "Professional Practice", Anupbhai Publications

REFERENCE BOOKS

1. "Codes of Practice and Standard Specifications" of AP PWD, CP WD, MES etc.,
2. Vasavada, B.J., "Engineering Contracts and Arbitration", March 1996
3. Gajaria, G.T., "Laws Relating to Building and Engineer's Contracts", M.M. Tripathi Pvt. Ltd., Mumbai, 1985. Horgon, M.O'c and Roulstion, F.R., "Project Control of Engineering Contracts", E and FN, SPON, Ny, 1988.

- Collex, K., "Managing Construction Contracts", Reston Publishing Company, Virginia, 1982.
- Park, W.B. and Wiley, John, "Construction Bidding for Projects", Ny, 1978.

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- unpan1.un.org/intradoc/groups/public/documents/unpan038789.pdf
- www.vakilno1.com/bareacts.htm
- www.indianembassy.org/newsite/doing_business..labor_laws.asp

CE-443	ADVANCED DESIGN OF RCC AND STEEL STRUCTURE	L T P	Cr
		5 0 0	3

OBJECTIVE

Advance design of rcc and steel structure is specifically designed for engineers and structural draftsmen looking for complete and easy to use software completely integrated into auto cad. Advance design of rcc and steel structure automates the creation of formwork plans, reinforcement drawings, bill of materials and nc files.

- LIMIT STATES:** Design of beams for shear, torsion and bond: Shear strength of beams ;Interaction diagrams for combined bending and torsion, Design of members subjected to combined bending, shear and torsion ;Skew bending theory ;Bond anchorage and splicing of reinforcement.
- LIMIT STATE:** Design of columns and analysis of slabs: behavior, strength and design of axially loaded and eccentric loaded short and long columns ;Design of column carrying axial load and biaxial moments, behavior of R.C slabs under gradually increasing loads, assumption made in yield line theory of slabs, analysis of isotropically and orthographically reinforced slabs of various shapes under different edge conditions by virtual work method and equilibrium method, Application to practically design problem ;effect of corner levers, Hillerborg's simple strip method of analysis.
- LIMIT ANALYSIS AND DESIGN OF STATICALLY INDETERMINATE STRUCTURES:** Fundamentals principles; Moment redistribution; Limit analysis and design of continuous beams and simple portal frames; check to rotation capacity.
- STRUCTURAL CONNECTION:** Design of high Strength function grip bolts; Design of riveted and bolted connections at the junctions of beams and columns in frames ;Design of un stiffened and stiffened seat connections; Welded connections ;Eccentric connections, Beam and connections-Direct web fillet welded connection s-Direct web Butt welded connection; Double plate web connection; Double angle web connection un stiffened and stiffened; Moment resistant connection, Behaviour of welded connections; Problem.
- BEAMS AND BEAM COLUMN:** Design of beams to resist biaxial bending moments; Design of section to resist unsymmetrical bending; Beam splices; Lattice beams; elastic lateral torsional

buckling. Differential Equation, Moment magnification, Factor for end moment ;Side way; Nominal Strength ;Interaction Equations; Biaxial; Bending.

- INDUSTRIAL BUILDING:** Industrial; Building frames, General; Framing, Bracing; Crane girders and columns; Analysis of trussed bents-Design examples, Design of rigid joints knee for gable frames.
- PLASTIC ANALYSIS AND DESIGN:** Plastic design of tension and compression members; Theory of plastic bending; Plastic hinge; redistribution of moments; failure mechanisms; plastic analysis and design of fixed beams, continuous beam, portal frames by mechanism method.

TEXT BOOKS

Chandera Rama., "Design of Steel structure", Standard Book Publishers, New Delhi

REFERENCE BOOKS

- Dayaratnam P ,Design of steel structure", A.H Wheeler & Co. LTD. Allahabad
- Arya and Ajmani ,Design of steel structure", Nemchand Brothers,Roorkee,1989
- Jain Ashok K, Reinforced Concrete & Limit State Design" , Nemchand and Bros,Roorkee, 1983.
- Purushotaman P, Reinforced Concrete Structural Elements", Tata Mc Graw Hill, Publishing Co. Pvt. Ltd.

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- www.scribd.com/doc/26701447/Mix-Design-Presentation
- www.ce.berkeley.edu/~filippou/Research/.../Reports/sem9014.pdf
- www.vsl.net/Portals/0/vsl_techreports/PT_Masonry_Structures.pdf

CE-451	COMPUTER PROGRAMMING & GRAPHICS LAB	L T P	Cr
		0 0 4	2

LIST OF EXPERIMENTS:

- Introduction to CAD: introduction to interactive computing and use of graphics.
- Model: Requirement of interactive computing dedicated v/s time sharing models. Interactive interface
- Computer aided drafting: Introduction to AutoCAD, Basic drawing and editing.
- Commands for 2D: commands for 2D; Simple drawing exercises for application of auto cad commands.
- Advanced 2D drafting: Advanced 2D Drafting; using auto cad, use of layers and blocks exercises on simple drawings.
- Introduction to 3D: Introduction to 3D; Drafting & simple exercises on 3d rafting walk through exercises.
- 3D Model: Requirement of interactive computing dedicated v/s time sharing 3D models. Interactive interface for 3D.

8. Computer programming for simple beam, column and roof of single story buildings.
9. Computer programming for isolated foundations of single story building.
10. Computer programming for combined footings of building.
11. Computer programming for raft foundation.

CE-452	RCC & STEEL DESIGNS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Drawing for simply supported beam by plastic analysis.
2. Drawing for compression members.
3. Drawing for Tension members.
4. Drawing for Riveted connections.
5. Drawing for welded connection
6. Design and drawing for plate Girder Bridge.
7. RCC Design of Raft foundation
8. Design and drawing for RCC elevated water tank.
9. Design of Grillage foundation and combined footing.
10. RCC design and drawing for isolated footing.

CE-453	DEPARTMENT LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENT

1. Simulation of vibration in a cable hoist
2. Programming management problems such as price forecasting
3. Project management problems
4. Experiment and analytical study in demineralization or removal of total solids
5. To study the analysis of hexavalent premium and dissolve asphalt of water quality.
6. To study the analysis of radio active materials and vanadium test
7. Experiment of nitrogen test.
8. Principle of physical and Biological methods of sewage treatment and management of sludge
9. Relevant layout ,line diagram etc
10. Typical sketches ,plan and sections of important units

CE-454	DESIGN OF ENVIRONMENTAL ENGINEERING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENT

1. To study the model of sanitary sewers.
2. To study model and design of septic tanks.
3. To study model and design of imhoff tanks.
4. To study model of water distribution system in urban area.
5. Sampling and analysis of waste water like D.O., BOD
6. Sampling and analysis of waste water like
7. COD suspended solid.
8. Total suspended particulate matter
9. Sulphate rate
10. flouride measurement
11. High volume and handy samples

CE-481	MAJOR PROJECT PHASE-I	L-T-P	Cr
		0-0-10	5

OBJECTIVE

The project involves in-depth study on the topic, design, development, analysis fabrication and/or experimental work – Hardware and/or Software. It is intended to give an opportunity to a student to apply his knowledge to solve real-life problem. The student has to select a project work based on a topic of interest.

OPERATION

Major Project shall comprise of Phase-I and Phase-II, spread over Term-XI and Terms-XII respectively. The students may work jointly (small group) or individually.

CE-482	MAJOR PROJECT PHASE-II	L T P	Cr
		0 0 6	3

Refer to CE-481 for details.

CE-483	INTERNSHIP - I	L T P	Cr
		0 0 2	1

OBJECTIVE

The Internship course is a formal method of linking university with the world of work and essentially takes the class room for 20-22 weeks to a professional location where the student and faculty solve real-life problems, of course, with the help of professional experts. Resident University faculty will supervise the education of the students.

OPERATION

The Internship course has two components, namely Internship-I of 6-8 weeks duration (Summer-term following 9th Term) and Internship-II of 13-14 weeks duration (11th Term). After the Internship-II, in 12th term the student will document internship work in detail and deliver colloquium. However, the student may contact industry during this period.

(a) Internship-I: Internship-I is conducted at large industrial complexes during Summer Term after Term-IX and exposes the students to real-life situations.

(b) Internship-II: This component is conducted at various production and manufacturing units, Design, Development and Consulting Agencies, National Laboratories, R&D Centers, etc. The students solve real-life problems of interest to the host organizations. The professional expert acts as a consultant while resident University faculty supervises the work.

CE-484	INTERNSHIP - II	L T P	Cr
		0 0 24	12

Refer to CE-483 for details

CE-485	INTERNSHIP DOCUMENTATION	L T P	Cr
		0 0 6	3

OBJECTIVE

The students are required to prepare comprehensive report on the problem(s) solved in industry and suitably extend the work wherever required so as to help the industry implement the solution. For this purpose the student can interact with the industry.

CE-491	COMMUNITY SERVICE ORIENTED PROJECT	L T P	Cr
		0 0 2	1

The student(s), either individually or in groups, are expected to take up a project that uses engineering and/or technological principles related to the field of study and that should be useful for solving real life problems in their neighbourhood.

The student has to go through some process of minimal level of evaluation and also the minimum attendance requirement, as stipulated by the Course Coordinator/Instructor and approved by the corresponding BOS, for getting the 'U' grade awarded in a course, failing which that course will not be listed in the Grade Card.

CE-492	PROJECT (INCLUDING SEMINAR)	L T P	Cr
		0 0 4	2

A student may perform experimental/design task of relatively minor intensity and scope as compare to the major project. The project may be extended to Major Project.

CE-493	INDUSTRIAL TRAINING/FIELD TRAINING	L T P	Cr
		0 0 2	1

OBJECTIVE

To carryout training for a period of two months i.e. Summer Term after Term-IX in industry (private or public)/ research laboratory/organization of repute, on platforms learnt till the completion of 3 years of bachelor degree.

METHODOLOGY

The students shall demonstrate their ability to understand a given problem and to innovatively bring out solution.

Students shall be free to select any operating system, programming language and database tools for accomplishing the given problem successfully.

Marks of this course shall be given in the marks memorandum of next term.

CE-494	SEMINAR –I	L T P	Cr
		0 0 2	1

The seminar is to cover the details regarding Major Project Phase-I/Major Project Phase-II and Internship-II viz. problem definition, literature survey, concepts and methodology employed, analysis, design and development, conclusions and future work.

CE-495	SEMINAR-II	L T P	Cr
		0 0 2	1

Refer to CE-494 for details

CE-461	CONSTRUCTION OPERATIONAL MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

Construction is a fragmented industry. A typical project is made up of independent parties working together under a construction manager. Architects, designers, engineers, contractors, suppliers and manufacturers must coordinate their efforts across different locations, often using disparate technologies developed specifically for their professions.

- 1. INTRODUCTION TO OPERATIONS MANAGEMENT:** Nature, Scope, Importance and Functions; Evolution from manufacturing to operations management; Evolution of the factory system; manufacturing systems; quality; mass customization. Contribution of Henry Ford, Deming, Crosby, Taguchi.
- 2. TYPES OF INDUSTRIES:** Variety of Business; Integration of Manufacturing & Services; Scale of Operations. Methods of Manufacturing; Project / Jobbing, Batch Production, Flow / Continuous Production, Process Production - Characteristics of each method.
- 3. FACILITIES LOCATION & LAYOUT:** Strategic importance - Factors affecting location & layout; Installation of facilities; Single location, multi-location decisions. Principles and Types of Facilities Layout. Importance and Functions of Production Planning & Control. Introduction to PERT / CPM; Network Crashing (Numericals expected for PERT/CPM)
- 4. MAINTENANCE MANAGEMENT:** Importance and types of maintenance; Maintenance Planning; Spare Parts Management; Concept of TPM.
- 5. INSPECTION:** Cent percent Inspection, Sample Inspection, Operation Characteristics Curves, Statistical Quality Control; Construction & Interpretation of Control Charts ; (X-R,n,p,c,np) Introduction to Six Sigma, (Numericals expected for Control Charts).
- 6. PRODUCTIVITY:** Work Study; Objectives, Scope and Uses; Methods Study; Flow process chart, Flow diagram & Process mapping ; Work Measurement; Elements; Performance Rating; Allowances; Standard Time; Synthetic Time Standards; Work Sampling (Numericals expected for Standard Time).
- 7. LEAN PRODUCTION SYSTEMS:** Lean Production Systems, TOYOTA system, JIT, KANBAN, and Theory of Constraints.

TEXT BOOK

Chary., "Production & Operations Management", Tata McGraw Hill Publishing Company Limited, 2009

REFERENCE BOOKS

1. Krajewski, Operations Management
3. Mahadevan, Operations Management

B.Tech. Civil Engineering (Regular)

4. Chase, Production & Operations Management
5. Adam & Ebert ,Production & Operations Management
6. Jhamb LC, .Manufacturing & Operations Management
- 5 James Womack, The Machine that Changed the World

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2. en.wikipedia.org/wiki/Lean_manufacturing
3. www.scribd.com/doc/31688352/Production-Operation-Mgt
4. fisher.osu.edu/departments/management-sciences/courses

CE-462	DESIGN OF WATER RESOURCE SYSTEMS	L T P	Cr
		5 0 0	3

OBJECTIVE

It is practically a science of planning and designing of the Hydrology system for the agricultural land to protect the crops from bad effects of drought or low rainfall. It includes the construction of weirs or dams, barrages or canal system for the regular supply of water to the cultivable lands

1. **SCOPE:** Water resources management.
2. **METHOD OF IRRIGATION:** Global trends in water utilization, crop water requirements and irrigation planning, modern irrigation methods, water logging hazards mitigation
3. **DRAINAGE & DESIGN:** Hydropower systems management. Economical analysis of water resource project. Flood control studies.
4. **WATER PRINCIPLE OF HYDRO POWER GENERATION:** Hydropower project planning, Site Selection, hydropower development, Reservoir storage, Assessment of power potential, Hydrologic Analysis.
5. **FLOW DURATION AND POWER DURATION CURVES:** Intakes, hydraulic turbines, centrifugal and axial flow pumps, Conduits and water conveyance.
6. **PERFORMANCE CHARACTERISTICS OF TURBINES:** Specific and unit quantities, electrical load on hydro turbines, powerhouse dimension and planning.
7. **WATER HAMMER AND SURGE ANALYSIS:** Surge tanks, small hydropower development, tidal plants current scenarios in hydropower development socio economic conditions and national economy.

TEXT BOOK

1. Garg, S.K., “Water and Water Resources Engineering”, Khanna Publishers, New Delhi.
2. Punmia BC , Water supply Engineering
3. Garg KK , O/I Water Supply

REFERENCE BOOK

1. Purcell Patrick., “Design of Water Resources Systems”, Institution of Civil Engineers Publishing 2003.

2. Larry, W. Mays., Mays, Larry., “Water Resource Systems Management Tools”, McGraw-Hill Professional, 2004
3. B. Marsh, M. Dowgert, R. Hutmacher & C. Phene., “Water Resources Management”,
4. Singh, Vijay., “Water Resources”, Publications, LLC

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2. www.icid.org/book_detl.html
3. ahec.org.in/.../web%20ua%20water%20for%20welfare/proposed%20%20new%20courses%20syllabi.doc
4. www.ppiaf.org/documents/41-India_River_Basin.pdf

CE-463	REPAIR AND MAINTENANCE OF BUILDINGS	L T P	Cr
		5 0 0	3

OBJECTIVE

The Object of Repair and maintenance of Building is to repair, alteration, and remodeling of buildings, offices, houses, and other City facilities, involve numerous trades and skills, such as rough and finished carpentry, plumbing, roofing, painting, and concrete/masonry.

1. **NEED FOR MAINTENANCE:** Importance and significance of repair and maintenance of buildings, objectives of maintenance
2. **AGENCIES CAUSING DETERIORATION:** (Sources, causes, effects) Definition of deterioration /Decay factors causing deterioration effects of various agencies deterioration on various buildings materials i.e. bricks, timber, concrete, paints, metals, plastics.
3. **MAINTENANCE OF MANAGEMENT (PRINCIPLES, INSPECTION, PRACTICES):** Importance of maintenance management, Organizational structure for maintenance, building inspection and reports, Maintenance budgets and estimate, specifications for maintenance jobs
4. **INVESTIGATION AND DIAGNOSIS OF DEFECTS:** Systematic approach/procedure of investigation, objectives of investigation of building defects, main causes of building defects, defects caused by dampness
5. **DEFECTS AND THEIR ROOT CAUSES:** Define defects in building describe importance and classification of defects, main causes of building defects, defects caused by dampness
6. **MATERIALS FOR REPAIR:** maintenance and protection Basic characteristics of repair material, compatibility aspects of repair material, list various types of repair material, selection procedure of repair material for specific job.
7. **REMEDIAL MEASURES FOR BUILDING DEFECTS:** Preventive maintenance consideration, precaution during repair and maintenance, surface preparation for repair, crack repair methods, repair of surface defects of concrete, repair of corrosion in RCC elements materials placement techniques with sketches, Repair of DPC against rising

dampness, Repair of walls, Repair of joints, repair and maintenance of public health services.

TEXT BOOK

Karen, Dale Dustman., "Maintenance and repair", Publisher: Chandler House Press

REFERENCE BOOKS

1. Gahlot & Sharma., "Building Repair and Maintenance Management", CBS, 2010.
2. Downs, Todd., "Maintenance and repair", Publisher: Rodale Press, 2005.
3. Jack M. Landers., "Home Repair and Maintenance", Publisher: Goodheart-Willcox, 2000.

WEB REFERENCES

1. techeduhry.nic.in/syllabus/CIVIL%20ENGG/6.pdf
2. www.punjabteched.com/curriculum/syllabus-2007/dt.../civil6.doc
3. www.edfacilities.org/rl/roof_maintenance.cfm
4. www.concrete.org/general/RAP-5.pdf

CH-101	APPLIED CHEMISTRY	LTP	Cr
		5 0 0	3

OBJECTIVE

To introduce to the students the latest topics of interests of the new generation science with the accomplishment of various technological advancements of biochemistry and texture of advanced photochemistry.

1. **PHASE RULE:** Terminology of phases; components and degree of freedom; derivation of Gibbs phase rule equation; one component system (water system); application of reduced / condensed phase rule; two component system; eutectic (Pb-Ag) system; congruent (Zn-Mg) system; incongruent system (Na-K) system; merits and demerits of phase rule.
2. **THERMODYNAMICS:** Entropy; entropy change for an ideal gas; free energy and its physical significance; variation of free energy with temperature and pressure; work function and its significance; relation between Gibb's free energy and work function; second law of thermodynamics; Gibbs Helmholtz equation; Its application and significance; chemical potential; Gibbs Duhem equation; Clausius Clapeyron equation and its application.
3. **WATER AND ITS TREATMENT:** Specification of water for different uses; hardness of water; equivalent of calcium carbonate; units of hardness; disadvantages of hard water and determination of hardness; alkalinity of water and its determination; related numericals; scale and sludge formation in boilers and its prevention; caustic embrittlement; water softening; Zeolite process; Ion exchange process and mixed bed demineralization; disinfection of water; desalination; reverse osmosis; electro dialysis.
4. **CORROSION AND ITS PREVENTION:** Introduction; classification; dry and wet corrosion; electrochemistry theory of corrosion; galvanic, pitting and waterline corrosion; differential aeration corrosion; stress corrosion; factors affecting

corrosion; preventive measures; material selection; proper designing; barrier protection; sacrificial protection; cathodic; anodic protection.

5. **LUBRICATION AND LUBRICANTS:** Friction; mechanism of lubrication; classification of lubricants; additives of lubricants; synthetic lubricants; properties of lubricants; consistency; drop point; fire and flash point; cloud point; pour point; viscosity; viscosity index; Iodine no.; aniline no.; saponification no.; steam emulsion no.; neutralization no.; decomposition stability and their significance.
6. **PHOTOCHEMISTRY:** Photochemical and dark reactions; laws of photochemistry; quantum efficiency; classification of photochemical reactions on the basis of their quantum efficiencies; non-radiative processes (ISC and IC); fluorescence; phosphorescence (Jablonski diagram); chemiluminescence; photosensitization; technology based on photochemical processes.
7. **BIOMOLECULES:** Structure; function; diversity and distribution; general composition of living matter. carbohydrates; monosaccharides and their inter-relationship; structure of sugars; glucose; fructose; maltose; lactose, sucrose; stereoisomerism and optical isomerism of sugars; ring structure and tautomeric form and mutarotation; lipids: definitions; classification of lipids; fatty acids; glycerol; building block of lipid; proteins and amino acid; classification and formulae; proteinous and non-proteinous; essential and non-essential amino-acids; primary, secondary, tertiary, quaternary structure of proteins; N and C terminal determination.

TEXT BOOK

Srivastava, H.C., "Engineering Chemistry", Pragati Prakashan Publishing House.

REFERENCE BOOKS

1. Chawla, Shashi, "Engineering Chemistry", First Edition, Dhanpat Rai and Co., 2003
2. Ambasta, B.K, "Engineering Chemistry", Laxmi Publications, 2007
3. Singh, Devender and Vats Satish K., "Comprehensive Engineering Chemistry", I. K. International Publication, 2007
4. Chatwal Gurdeep "Organic Chemistry on Natural Products", Vol. 1, Himalaya Publishing House, Reprint 2002.
5. Chatwal Gurdeep, "Photochemistry", Himalaya Publishing House, 2003.
6. Jain, P.C., and Jain, Monica, "Engineering Chemistry", Dhanpat Rai & Co.
7. Morrison, R.T., and Boyd, R.N., "Organic Chemistry", 6th Edition, Pearson Education, 1994

CH-151	APPLIED CHEMISTRY LAB	LTP	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Determination of Ca⁺⁺ and Mg⁺⁺ hardness of water using EDTA solution.
2. Determination of alkalinity of water sample.

3. Find the melting and eutectic point for a two component system by using method of cooling curve.
4. Determination of viscosity of lubricant by Red Wood viscometer (No. 1 & No. 2).
5. Prepare Phenol-formaldehyde and Urea formaldehyde resin.
6. Find out Saponification number of oil.
7. Determination of concentration of KMnO₄ solution spectro-photometrically.
8. Determination of strength of HCl solution by titrating it against NaOH solution conductometrically.
9. Determination of drop point of given lubricant using drop point apparatus.
10. Estimate the sugar (Glucose) using Fehling solution method.
11. Determine flash point and fire point of oil by Pensky - Marten's flash point apparatus.
12. Determine amount of sodium and potassium in a given water sample by flame photometer.

REFERENCE BOOKS

1. Dara, S. S. "A Text Book on Experimental and Calculation – Engineering Chemistry", S. Chand & Company.
2. Chawla, Shashi, "Essential of Experimental Engineering Chemistry", 2nd Edition, Dhanpat Rai Publishing Company, 2006
3. Virmani, O. P., and Narula, A. K., "Theory & Practice Applied Chemistry", New Age Publications.

CS-101	COMPUTER PROGRAMMING	L	T	Cr
		5	10	4

OBJECTIVE

To provide sound conceptual understanding of the fundamental concepts of computing hardware, software, networking and services; build programming logic and developing skills in problem solving using C/C++; Introduce the concept of object orientation and on how to handle data in different forms; Emphasize the concepts and constructs rather than on language features.

1. **AN OVERVIEW OF COMPUTER SYSTEM:** Anatomy of a digital computer; memory units; main and auxiliary storage devices; input devices; output devices; classification of computers; computer hardware; computer software; data representation – bits and bytes and operations of data; radix number system – decimal, binary, octal, hexadecimal numbers and their inter-conversions; representation of information inside the computers.
2. **OPERATING SYSTEM BASICS:** The user interface; running programs; managing files; introduction to PC operating systems: Unix/Linux, DOS, MacOS and Windows, file system; file formats.
3. **INTERNET BASICS:** Introduction to computer networks; what is internet and WWW; basic WWW concepts; surfing the web; web multimedia; internet applications and features.

4. **PROGRAMMING LANGUAGES:** Machine level language; assembly level language; high level language; system software: assembler, compiler, interpreters, linker and loader, and their inter-relationship, debuggers, IDE; programming fundamentals – problem definition, algorithms, flow charts and their symbols.
5. **C PROGRAMMING LANGUAGE CONSTRUCTS:** An overview of C; expressions – data types, identifiers names, variables, type qualifiers, storage class specifiers, operators, type conversion in expression, type casting; console I/O: I/O functions; the C standard library; problem solving process algorithm: pseudo code and flowchart; statements – true and false in C, selection statements, iteration statements, jump statements, expression statements and block statements; arrays – single dimensions arrays, generating a pointer to an array, passing 1D array to functions; string: 2D arrays, multidimensional array, indexing pointers, array initialization, variable-length array
6. **DATA HANDLING:** Pointers – Pointer variables, pointer operators, pointer expressions, pointers and arrays, multiple indirection, initializing pointers, C's dynamic allocation functions, restrict-qualified pointers, problems with pointers; functions: the general form of a function, scope of a function, function arguments, argc and argv – arguments to main(), the return statement, purpose of main(), recursion, function prototypes, the "implicit int" rule; structures, unions, enumerations, and typedef – structures, arrays of structures, passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, enumerations, using sizeof to ensure portability, typedef; important differences between C and C++.
7. **ADVANCED DATA HANDLING:** Basic file I/O – C vs. C++ File I/O, standard C Vs. Unix file I/O streams and files, file system basics, fread() and fwrite(), fseek() and random-access, fprintf() and fscanf(); the preprocessor and comments – the preprocessor, conditional compilation directives, using defined, the # and ## preprocessor operators, predefined macro names, comments.

TEXT BOOK

Schildt, Herbert "The Complete Reference C", 4th Edition, Tata McGraw Hill, 2004.

REFERENCE BOOKS

1. Balagurusamy, E., "Computing Fundamentals and C Programming", Tata McGraw Hill, 5th Edition, 2010.
2. Dennis, P. Curtin, Foley Kim, Sen Kunal and Morin Cathleen, "Information Technology", Tata McGraw Hill, 17 Edition, 2005.
3. Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language, Prentice Hall of India, 1988.
4. Nabajyoti, Barkakati, "Object Oriented Programming in C++", Prentice Hall of India, 3rd Edition, 1995.
5. Jack, B. Rochester, "Using Computers and Information", Prentice Hall of India, 1996.

- Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill
- Press, Barry and Press, Marcia, "Teach Yourself all About Computers", IDG Books India, 2000.
- Schildt, Herbert, "C++: The Complete Reference", Tata McGraw Hill, 4th Edition, 2003
- Liberty, Jesse, "Programming C#", O'Reilly, 4th Edition, 2005.

WEB REFERENCES

- http://www.physics.drexel.edu/courses/Comp_Physics/General/C_basics/c_tutorial.html
- <http://www.eskimo.com/~scs/cclass/notes/top.html>
- <http://www.lysator.liu.se/c/bwk-tutor.html>

CS-151	COMPUTER PROGRAMMING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS/EXERCISES

- Basic/Simple logic building
- Handling mathematical data
- Use of control structures
- Use of Function
- Handling mathematical problems
- Array and Pointer
- Searching and Sorting
- String Manipulation
- Use of Structure and Union
- File handling

REFERENCE BOOKS

- Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language", Prentice Hall of India, 1988.
- Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill
- Barkakati, Nabajyoti, "Object Oriented Programming in C++", Prentice Hall of India, 2001.
- Schildt, Herbert, "C++: The Complete Reference", Tata McGraw Hill, 4th Edition, 2003

EC-201	ELECTRONICS ENGINEERING	L T P	Cr
		5 1 0	4

OBJECTIVE

The purpose of this course is to give basic electronics concept; their operational significance and its basic application.

PRE-REQUISITES

Knowledge of electricity, solid state physics

- HISTORICAL BACKGROUND:** Vacuum tubes; working of vacuum tube and their characteristics; vacuum diode; triode; tetrode and pentode
- PN JUNCTION:** Depletion layer; Barrier potential; Forward and reverse bias; Breakdown voltage; PIV; switching characteristics of p-n junction diode; knee voltage; load line; and operating Point Ideal p-n junction diode; junction capacitance; zener diode.
- RECTIFIERS AND FILTERS:** Half wave; centre tap full wave and bridge rectifier; percentage of

regulation; PIV; ripple factor; C; RC; LC and PI filter; voltage doubler; clipping and clamping circuit; voltage regulation.

- BIPOLAR JUNCTION TRANSISTOR:** Introduction; basic theory of operation of PNP and NPN transistor-I characteristics; CB; CE and CC configuration; different biasing techniques.
- FET:** Introduction; Theory of operation; JFET Parameters; and JFET Amplifiers. MOSFET: Introduction; theory of operation; MOSFET parameters; application; graphical analysis of BJT and FET circuits; linear models of BJT and FET; pulse and large signal models of BJT and FET
- BIASING TECHNIQUES OF FET:** Introductory idea of multistage and feedback amplifiers; base bias; emitter feedback bias; collector voltage divider bias; Load line and operating point.
- INTEGRATED CIRCUIT:** Analysis of principle of integration. Introduction to Digital Integrated circuits; **THYRISTORS:** Introduction to thyristor family; SCR theory of operation; SCR characteristics and triggering; **TRIAC:** Theory of operation; Characteristics and control by SCR and TRIAC Introduction to op-amp; **UJT:** Introduction; Basic theory of operation characteristics and structure; Complementary and programmable UJT relaxation oscillator.

TEXT BOOK

Millman and Halkias, "Electronic Devices and Circuits", 2nd Edition, Tata McGraw Hill, 2000

REFERENCE BOOKS

- Millman and Halkias, "Integrated Electronic", Tata McGraw Hill, 3rd Edition, 2001.
- Boylestad and Nashelsky, "Electronic Devices and Circuits", 4th Edition, Pearson Education, 1999.
- Malvino, "Electronic Principles", 5th Edition, Tata McGraw Hill, 2004.
- Bell David A., "Electronic Devices and Circuits", 3rd Edition, Prentice Hall of India, 2007
- Bhargave N. N., "Basic Electronics and Linear Circuits", Tata McGraw Hill, 2007
- Salivahan, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2003.

EC-251	ELECTRONICS ENGINEERING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Study V-I characteristics of diode; and its use as a capacitance.
- Study of the characteristics of transistor in Common Base configuration.
- Study of the characteristics of transistor in Common Emitter configuration.
- Study of V-I characteristics of a photo-voltaic cell.
- Study of characteristics of MOSFET/JFET in CS configuration.
- Plot characteristics of thyristor.
- Plot characteristics of UJT.
- Plot characteristics of diac and Triac.
- Introduction to Orcad PSPICE Software.
- Simulation of semiconductor device circuits using Orcad PSPICE.

REFERENCE BOOKS

1. Boylestad and Nashelsky, "Electronic Devices and Circuits", 4th Edition, Pearson Education, 1999.
2. Bell David A., "Electronic Devices and Circuits", 3rd Edition, Prentice Hall of India, 2007
3. Bhargave N. N., "Basic Electronics and Linear Circuits", Tata McGraw Hill, 2007
4. Salivahan, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2003.

EL-101	ELECTRICAL ENGINEERING	L T P	Cr
		5 1 0	4

OBJECTIVE

To provide basic knowledge and understanding of fundamental concepts of Electrical Technology, explaining various basic laws governing the circuit configurations and evaluation and its applications to electrical circuits.

1. **DC NETWORKS:** EMF, potential difference; current, resistance; Ohm's law; effect of temperature on resistance; source conversion; KCL, KVL; mesh analysis, nodal analysis; network theorems – superposition, Thevenin's, Norton, reciprocity, maximum power transfer theorem; star-delta conversion.
2. **SINGLE PHASE AC CIRCUIT:** Generation of AC voltages, frequency, cycle, period, instantaneous, Peak, RMS and average value, peak factor, form factor, phase and phase difference, polar, rectangular, exponential and trigonometric representation of phasors; R, L and C components, behavior of these components in A.C. circuits, series and parallel A.C. circuits and their phasor diagrams, concept of impedance and admittance, power and power factor, Complex power; resonance-Series and parallel resonance, Q factor; bandwidth.
3. **THREE PHASE CIRCUITS:** Phase and line voltages and currents, balanced star and delta circuits; phasor diagram, power equation, measurement of three phase power by two wattmeter method; comparison of single phase, three phase and DC system and their relative advantages.
4. **MAGNETIC CIRCUITS:** Magnetic effect of electric current; concept of MMF; flux, flux density, reluctance, permeability; B-H curve; hysteresis loop, hysteresis and eddy current loss; comparison of electrical and magnetic circuits.
5. **TRANSFORMER:** Construction, principle, working of ideal and practical transformer; equivalent circuit, phasor diagram; OC and SC tests, regulation and efficiency; autotransformer.
6. **ROTATING ELECTRICAL MACHINES:** DC MACHINES – construction, principle of operation and classification of dc machines, EMF equation and characteristics of dc generator, starting and speed control of dc motor.
INDUCTION MACHINES: Construction and principle of operation of three phase induction motor, concept of slip and its importance.

7. **MEASURING INSTRUMENTS:** Voltmeter; ammeter; wattmeter; energy meter.

TEXT BOOK

Gupta, J.B. "Electrical Technology", Katson Publication

REFERENCE BOOKS

1. Theraja, B.L. "Electrical Technology Vol I & II", S. Chand Publications, 2005
2. Kothari and Nagarath, "Basic Electrical Engg.", 2nd Edition, Tata McGraw Hill
3. Theodore, Wildi "Electrical Machines, Drives and Power Systems", 2nd Edition, Prentice Hall, 1991.
4. Edward, Hughes (revised by Ian McKenzie Smith), "Electrical Technology", 7th Edition, English Language Book Society, Publication with Longman, 1995.
5. Del Torro Vincent, "Electrical Engineering Fundamentals", 2nd Edition, Prentice Hall of India, 1994.
6. Cathey, J.J. and Naser, S.A. "Basic Electrical Engg.", 2nd Edition, Schaum Series, McGraw Hill Publ.

EL-151	ELECTRICAL ENGINEERING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. To verify KCL and KVL.
2. To verify Thevenin's and Norton's Theorems.
3. To verify maximum power transfer theorem in D.C Circuit and A.C Circuit.
4. To verify Reciprocity and Superposition theorems.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-Factor for various Values of R, L, C.
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-Factor for various values of R, L, C.
7. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
8. To perform open circuit and short circuit tests on a single-phase transformer determine the losses and efficiency.
9. To perform direct load test of a DC shunt generator and plot load voltage Vs load current curve.
10. To study various types of meters.
11. Measurement of power by 3 voltmeter / 3 ammeter method.
12. Measurement of power in a 3 phase system by two watt meter method.
13. Connection and testing of a single-phase energy meter (unit power factor load only).

REFERENCE BOOKS

1. Theraja, B.L. "Electrical Technology Vol I & II", S. Chand Publications, 2005
2. Kothari and Nagarath, "Basic Electrical Engg.", 2nd Edition, Tata McGraw Hill
3. Del Torro Vincent, "Electrical Engineering Fundamentals", 2nd Edition, Prentice Hall of India, 1994.
4. Cathey, J.J. and Naser, S.A. "Basic Electrical Engg.", 2nd Edition, Schaum Series, McGraw Hill Publ.

EN-101	COMMUNICATION SKILLS	L T P	Cr
		5 0 0	3

OBJECTIVE

By doing this course the students will be acquiring reasonable level of oral and in writing proficiency in English language ultimately they will be able to communicate with their counter parts in business/industry in the country and abroad effectively.

- Vocabulary; Use of Words; Synonyms; Homophones; Homonyms; Forms and Functions of Words
- Sentence Structure; Verb patterns; Simple; Complex and Compound Sentences
- Remedial English Grammar; Common Errors and Rules of Concord
- Phonetics; Basic Concepts; Vowels; Consonants; Syllables; Manner of Articulation and Place of Articulation; Speech Sounds; Transcription of Words ; Word Stress and Intonation
- Comprehension; Interpretation of Seen/Unseen Passages
- (A) Oral Communication: Practicing short dialogues; Group Discussions; and Debates
(B) Technical Writing:
 - Business Letters (Format of Business Letters and Business Letter Writing)
 - Email Writing
 - Reports and types of reports and Press reports
- Book Review (for internal assessment)
Language lab: Emphasis will be laid on accent, pronunciation, intonation, reading/ listening comprehension

TEXT BOOK

Bansal, R.K. and Harrison, J.B., "Spoken English for India", Orient Longman, 2009

REFERENCE BOOKS

- Tickoo M. L. and Subramanian, A. E., "Intermediate Grammar, Usage and Composition", Orient Longman, 1976
- Thomson and Martinet, "A Practical English Grammar", Oxford University Press, 1986
- Hornby, A. S., "Guide to Patterns and Usage in English", Oxford University Press
- Balasubramanian T, "A Textbook of English Phonetics for Indian Students", MacMillan
- D.O'Connor J, "Better English Pronunciation" Cambridge University Press
- McCarthy, "English Vocabulary in Use Foundation Books", Cambridge University Press
- Hashem Abul, "Common Errors in English", Ramesh Publishing House
- Roach P., "English Phonetics & Phonology", Cambridge University Press
- Ramesh M. S. and C.C. Pattanshetti, "Business Communication", R. Chand and Company
- Wood F. T., "Remedial English Grammar for Foreign Students", The Macmillan Press Ltd., 1975
- Hari Mohan Prasad and Uma Rani Sinha, "Objective English", Tata McGraw Hill Education, 2005

EN-151	LANGUAGE LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS/EXERCISES

- Word accent based on stress: Cluster of words will be repeated by the students on the basis of recorded voice.
 - 1st syllable stress
 - 2nd syllable stress
 - 3rd syllable stress
- Sentence intonation: Simple day to day sentences will be repeated by the students
- Public speeches and debates: Recorded debates and public speeches will be heard by the students to enhance their knowledge on the pitch and tone.
- Conversation: Regular conversations will be heard and later practiced in the lab.
- Listening comprehension: Students will hear the text and answer the questions that follow.
- Reading comprehension: Text at par with international standard will be read by the students. Questions will than be answered.
- Speaking: Text conversation, debates & lectures will be heard by the students. The students will be used their aptitude and language to give their on them
- Error correction: Grammatically incorrect sentences will be given to the students to correct.
- Listening and speaking exercises will be practiced for the improvement of the language.
- Added exercise on reading comprehension.

MA-101	APPLIED MATHEMATICS-I	L T P	Cr
		5 1 0	4

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

- MATRICES & ITS APPLICATIONS:** Rank of a matrix; elementary transformations; elementary matrices; inverse using elementary transformations; normal form of a matrix; linear dependence and independence of vectors; consistency of linear system of equations; linear and orthogonal transformations; Eigen values and Eigen vectors; properties of Eigen values; Cayley - Hamilton theorem and its applications.
- INFINITE SERIES:** Convergence and divergence; comparison; D' Alembert's ratio; Integral; Raobes; De Morgan's & Bertrand's; logarithmic and Cauchy root tests; alternating series; absolute and conditional convergence.
- APPLICATIONS OF DIFFERENTIATION:** Taylor's and Maclaurin's series; asymptotes; curvature.
- PARTIAL DIFFERENTIATION:** Functions of two or more variables; partial derivatives; total differential and differentiability; derivatives of composite and implicit functions; Jacobian's; higher order partial derivatives.

5. **APPLICATION OF PARTIAL DIFFERENTIATION:** Homogeneous functions; Euler's theorem; Taylor's series for functions of two variables (without proof); maxima-minima of function of two variables; Lagrange's method of undetermined multipliers; differentiation under integral sign.
6. **FOURIER SERIES:** Euler's formula; conditions for a Fourier expansion; change of interval; Fourier expansion of odd and even function; Fourier expansion of square wave; rectangular wave; saw-toothed wave; half and full rectified wave functions; half range sine and cosine series.
7. **ORDINARY DIFFERENTIAL EQUATIONS & ITS APPLICATIONS:** Exact differential equations; equations reducible to exact differential equations; applications of differential equations of first order and first degree to simple electric circuits; Newton's law of cooling; heat flow and orthogonal trajectories.

TEXT BOOK

Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

REFERENCE BOOKS

1. Jeffery, "Engineering Mathematics", Academic Press/Elsevier.
2. Sastry, S. S., "Engineering Mathematics Part-I", 2nd Edition, Prentice Hall of India
3. Jain, R. K. and Iyengar, S. R. K., "Advanced Engineering Mathematics" 3rd Edition, Narosa Publishing House
4. Greenberg, D., Michael., "Advanced Engg. Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd.

MA-102	APPLIED MATHEMATICS-II	L T P	Cr
		5 1 0	4

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

4. **DIFFERENTIAL EQUATIONS OF HIGHER ORDER AND ITS APPLICATION:** Linear differential equations of second and higher order; complete solution; complementary function and particular integral; method of variation of parameters to find differential particular integral; Cauchy's and Legendre's linear equations; simultaneous linear equations with constant coefficients; applications of linear differential equations to simple pendulum; oscillatory electric circuits.
5. **LAPLACE TRANSFORMS AND ITS APPLICATIONS:** Laplace transforms of elementary functions; properties of Laplace transforms; existence conditions; transforms of derivatives; transforms of integrals; multiplication by t; division by t.
6. **EVALUATION OF INTEGRALS BY LAPLACE TRANSFORMS:** Laplace transform of unit step function; unit impulse function and periodic

- function; Inverse transforms; convolution theorem; application to linear differential equations and simultaneous linear differential equations with constant coefficients.
7. **FOURIER TRANSFORMS:** Fourier integral transforms; shifting theorem (both on time and frequency axes); Fourier transforms of derivatives; Fourier transforms of integrals; convolution theorem; Fourier transform of Dirac-delta function.
 8. **CURVE TRACING:** Applications of single integration to find volume of solids and surface area of solids of revolution; double integral; change of order of integration; double integral in polar coordinates.
 9. **APPLICATIONS OF MULTIPLE INTEGRALS:** Applications of double integral to find area enclosed by plane curves and volume of solids of revolution; triple integral; volume of solids; change of variables; beta and gamma functions and relationship between them.
 10. **VECTOR CALCULUS:** Differentiation of vectors; scalar and vector point functions; gradient of a scalar field and directional derivative; divergence and curl of a vector field and their physical interpretations; integration of vectors; line integral; surface integral; volume integral; Green's, Stoke's and Gauss' theorems (without proof) and their simple applications.

TEXT BOOK

Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

REFERENCE BOOKS

1. Ross, S. L., "Differential Equation", Wiley India Publishers
2. Piaggio, H. T. H., "Differential Equations", 1st Edition, CBS Publishers and Distributors,
3. Jain, R. K. and Iyengar, S. R. K. "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House
4. Greenberg, D., Michael "Advanced Engg. Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd.

MA-202	APPLIED NUMERICAL METHODS	L T P	Cr
		5 1 0	4

OBJECTIVE

To provide a foundation for numerical computing for scientific and engineering applications

PRE-REQUISITE

Knowledge of Basic Mathematics involving differentiation, integration, differential equations, linear equations, etc.

1. **ERRORS IN NUMERICAL CALCULATIONS:** Introduction; numbers and their accuracy; absolute; relative and percentage errors and their analysis; truncation errors; general formula; error calculation for inverse problem.
2. **SOLUTION OF NON-LINEAR EQUATIONS:** Bisection method; Regula-Falsi method; Secant method; Newton-Raphson method; fixed point

- method; initial approximation and convergence criteria.
- SOLUTION OF LINEAR SYSTEMS:** Gauss elimination method; Gauss-Jordan method; UV factorization, Jacobi's method; Gauss-Seidal method.
 - INTERPOLATION & CURVE FITTING:** Introduction to interpolation; Newton's forward and backward formula; Sterling formula; Lagrangian polynomials; divided differences; least squares method.
 - NUMERICAL DIFFERENTIATION AND INTEGRATION:** Derivatives from differences tables; numerical differentiation formulas, Newton-Cotes integration formulae; trapezoidal rule; Simpson's rule; Boole's rule; Weddle's rule; Romberg's rule.
 - SOLUTION OF DIFFERENTIAL EQUATIONS:** Taylor's series method; Euler and modified Euler's method; Runge-Kutta method; Milne's prediction corrector method, Adams-Bashforth method.
 - SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS:** Finite difference approximation; solution of Laplace equation (standard 5 point formula) one-dimensional heat equation (Schmidt method, Cranck-Nicolson method; Dufort & Frankel method and wave equation.

TEXT BOOK

Grewal B. S., "Numerical Methods in Engineering and Sciences", Khanna Publisher

REFERENCE BOOKS

- Curtis F, Gerald and Patrick, "Applied Numerical Analysis", 7th Edition, Addison Wesley
- Balagurusamy E., "Numerical Methods", Tata McGraw Hill
- Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India
- Jain M. K., Iyenger S. R. K. and Jain R. K. "Numerical Methods for Scientific and Engg. Computations", Wiley Eastern
- Rao S. S., "The Finite Element Method in Engg.", 2nd Edition, Pregamon Press/McGraw Hill, 1989

MA-252	APPLIED NUMERICAL METHODS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To find the roots of non-linear equation using Bisection method.
- To find the roots of non-linear equation using Secant method.
- To find the roots of non-linear equation using Newton's method.
- To solve the system of linear equations using Gauss-Elimination method.
- To solve the system of linear equation using Gauss-Seidal iteration method.
- To find the values of function at a particular point using Newton's forward formula.
- To find the values of function at a particular point using Newton's backward formula.
- To find the values of function at a particular point using Lagrange's interpolation formula.
- To integrate numerically using Trapezoidal rule.

- To integrate numerically using Simpson's rule.
- To find the solution of o.d.e (ordinary differential equation) by Euler's method.
- To find the solution of o.d.e by Runge-Kutta method.
- To find the numerical solution of Laplace equation.
- To find the numerical solution of heat equation.
- To find the numerical solution of wave equation.

REFERENCE BOOKS

- Curtis F, Gerald and Patrick, "Applied Numerical Analysis", 7th Edition, Addison Wesley
- Balagurusamy E., "Numerical Methods", Tata McGraw Hill
- Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India
- Jain M. K., Iyenger S. R. K. and Jain R. K. "Numerical Methods for Scientific and Engg. Computations", Wiley Eastern

ME-101	ENGINEERING MECHANICS	L T P	Cr
		5 1 0	4

OBJECTIVE

Engineering Mechanics is one of the core subjects that introduces the student to analysis of forces and motion and prepares the student for studying strength of materials and theory of machines.

- FORCE SYSTEMS:** Basic concepts of space, time, mass, force, particle and rigid body; scalars and vectors; conventions for equations and diagrams; external and internal effects of a force; principle of transmissibility; force classification; rectangular components of two and three dimensional force systems; resultant of two and three dimensional and concurrent force systems; moment about a point and about an axis; Varignon's theorem; resultant of non-concurrent force systems; couple; equivalent couples; force couple systems.
- EQUILIBRIUM:** Equilibrium in two and three dimensions; system isolation and the free-body-diagram; modeling the action of forces; equilibrium conditions; applications including plane trusses; frames and machines.
- PROPERTIES OF SURFACES/CROSS SECTIONS:** Centre of mass; determining the centre of gravity; centre of mass versus centre of gravity; centroids of lines, areas and volumes including composite sections; moments of inertia; MI of plane figures; MI with respect to axis in its plane and with respect to an axis perpendicular to the plane of figure; parallel axis theorem; moment of inertia of a rigid body – of a lamina and of three dimensional body; MI of composite figures.
- SIMPLE STRESSES AND STRAINS:** Resistance to deformation; Hook's law and stress-strain diagram; types of stresses; stresses and strains in bars of varying sections; stresses in composite bars; lateral strain and Poisson's ratio; volumetric strain, modulus of rigidity and bulk modulus; relation between elastic constants.
- TORSION:** Circular shafts, torsion formula power transmission
- SHEAR FORCE AND BENDING MOMENTS:** Definitions: SF and BM diagrams for cantilevers,

simply supported beams with or without overhang and calculation of max. BM and SF and point of contra-flexure under i) concentrated loads, ii) uniformly distributed loads over whole span or part of it iii) combination of concentrated and uniformly distributed loads, iv) uniformly varying loads and application of moments; relationship between rate of loading, shear force and bending moments.

7. **KINEMATICS / KINETICS OF PARTICLES:** Velocity and acceleration under rectilinear and circular motion; Newton's Second Law; D'Alembert principle; Inertial system; Newton's Second Law applied to bodies under rectilinear and circular motion; solutions of problems using D'Alembert Principle and free-body diagrams.

TEXT BOOK

Meriam, J. L. "Engineering Mechanics", John Wiley & Sons.

REFERENCE BOOKS

- Beer, F.P. and Johnston, E.R. "Mechanics of Materials", Tata McGraw Hill
- Shames, I.H. "Engineering Mechanics", 4th Edition, Pearson Education, 2003
- Pytel, A and Kiusalaas, J. Thomsom, "Mechanics of Materials", Brooks & Cole, 2003

WEB REFERENCES

www.eCourses.ou.edu

ME-151	ENGINEERING MECHANICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To study various forces and moments.
- Prove polygon law of coplanar forces, experiments with pulley systems.
- Find support reactions for simply supported beam
- Find Forces in Truss elements
- Measuring forces in members of jib crane.
- Finding C.G. and MOI of various parts like connecting rod. Flywheel using various methods
- To find mechanical advantage and mechanical efficiency of compound screw jack.
- To study various simple machines including gear trains e.g. Wedge; clock; sewing machine, etc.
- To conduct tensile test and determining ultimate tensile strength percentage elongation of steel specimen
- To conduct compression test and determine compressive strength of specimen
- To calculate VR, MA and efficiency of single, doubles and triple start worm and worm wheel
- To study slider crank mechanism of 2 stroke and 4 stroke IC engine models
- To study and analyze gear trains

ME-152	WORKSHOP PRACTICE	L T P	Cr
		0 0 4	2

OBJECTIVE

To provide an overview of the basic production techniques and allied / supporting techniques used to

produce finished products from raw materials. In addition to theory, students will be given practical training on various basic production techniques. After going through this course, the students will be in a position to understand the working of a mechanical workshop.

- INTRODUCTION:** Basic manufacturing processes and safety in workshop.
- ENGINEERING MATERIALS:** Classification of materials—their general mechanical properties and their selection
- CASTING PROCESSES:** Sand casting process; pattern making; types of moulding sands, cores, mould making, melting and pouring of metal; Casting defects.
- MACHINING PROCESSES:** Production of components involving turning; facing; taper turning; milling; shaping; planning and drilling operations.
- METAL FORMING PROCESSES:** Sheet metal forming operations; shearing, bending, punching and blanking, forging processes as upsetting, drawing down, bending etc.
- JOINING PROCESSES:** Metal arc welding; gas welding; resistance welding; soldering and mechanical fastening processes.
- FITTING AND MAINTENANCE:** Study of fitting tools, marking tools and measuring instruments like micrometer, vernier calipers and height gauge; introduction to some basic maintenance techniques/processes.

TEXT BOOK

Raghuwanshi, B.S., "A course in Workshop Technology, Vol. I & II", Dhanpatrai & Co.

REFERENCE BOOK

Hazra & Chaudhary, "Workshop Technology Vol. I & II", Asian Book Co.

NOTES:

- In all sections of workshop, students will study about the tools used, different operations performed and main parts of the machine
- Term final evaluation will be done on the basis of doing a practical job and viva-voce. There will be no theory paper on this subject.

JOBS TO BE DONE

- Machine Shop**
 - To prepare a job on a lathe involving facing, turning, taper turning, step turning, radius making and parting off.
 - To prepare horizontal surface/ vertical surface/ curved surface/ slot or v-grooves on a shaper / planer.
 - To prepare a job involving side and face milling on a milling machine.
 - To prepare a job involving drilling and tapping of holes.
- Sheet Metal Work**
 - To draw layout, do marking and prepare a rectangular tray of sheet metal.
 - To draw layout, do marking and prepare a funnel of sheet metal.
- Foundry**
 - To prepare a single piece pattern mould, put metal in the mould and fettle the casting.

2. To prepare a split piece pattern mould.
- D. **Welding**
1. To prepare joints (Lap and butt) by metal arc welding
 2. To prepare welded joint by resistance welding
- E. **Fitting and Maintenance Jobs**
1. Fitting jobs involving, chipping, filing, marking and measuring with precision instruments.
 2. Maintenance and repair of common domestic appliances such as desert cooler, LPG stove, room heater, water tap, flush system, electric iron, scooter etc.

ME-153	ENGINEERING GRAPHICS	L T P	Cr
		0 0 6	3

OBJECTIVE

Engineering graphics is the primary medium for development and communicating design concepts. Through this course the students are trained in engineering Graphics concepts through manual drafting. The ISI code of practice is followed. With this course students can improve the visual concepts in all engineering streams.

1. **INTRODUCTION:** Need drawing instruments; geometrical drawing, conventional representation—indicating welds, Joints, surface texture, structural work etc.; various types of projections; first and third angle systems of orthographic projections.
2. **SIMPLE PROJECTS:** Projection of points in different quadrants; projections of, lines parallel to or inclined to one or both reference planes, true length of a line and its inclination with reference planes; traces of a line; concept of auxiliary plane.
3. **PROJECTIONS OF PLANES:** Parallel to one reference plane; inclined to one plane but perpendicular to the other, inclined to both reference planes.
4. **PROJECTIONS OF SOLIDS AND SOLIDS OF REVOLUTION:** In simple positions with axis perpendicular to a plane; with axis parallel to both planes; with axis parallel to one plane and inclined to the other.
5. **SECTIONS OF SOLIDS:** Prisms; pyramids; cylinders and cones; section plane is parallel, perpendicular and inclined to both reference planes; true shape of sections.
6. **DEVELOPMENT OF LATERAL SURFACES OF REGULAR SOLIDS:** Rectangular block; cylinder; cone; pyramid.
7. **ISOMETRIC VIEWS OF PLANES:** circle, square, rectangle; Isometric views of solids- prisms, pyramids and cylinders; principle of perspective projection, perspective of planes and solids.

TEXT BOOK

Bhatt, N.D., and Panchal, V.M., "Engineering Drawing Plane and Solid Geometry", Forty-Fourth Edition, Charotar Publishing House, 2002.

REFERENCE BOOKS

1. Gill, P. S., "Engineering Graphics and Drafting", Millennium Edition, S. K. Kataria and Sons

2. Mathur, S.B., "A Text Book of Engineering Drawing", Second Revised and Enlarged Edition, Vikas Publishing House, 2000.
3. SP 46-1988, Bureau of Indian Standards (BIS), New Delhi

WEB REFERENCES

1. www.technologystudent.com
2. www.animatedworksheets.co.uk
3. www.ider.herts.ac.uk/school/courseware

LIST OF SHEETS TO BE MADE:

Sl. No.	Details of the sheet	No. of sheets
1.	Basic Geometrical Constructions including the curves, ellipse, parabola, Hyperbola, and cycloidal curves.	1
2.	Projection of Lines including traces.	2
3.	Projection of Planes.	1
4.	Projection of Solids.	2
5.	Section of solids.	2
6.	Developments of surfaces	1
7.	Isometric and Perspective views.	2

Notes:

The students will Practice/Draw at least one sheet from each Unit. The Examiner will set one question from each unit and the student will attempt four questions in all.

PH-101	PHYSICS	L T P	Cr
		5 1 0	4

OBJECTIVE

To educate the students with the present day physical sciences through concepts like optics, acoustics, EM theory, etc.

1. **INTERFERENCE:** Interference by division of wave front; Fresnel's biprism and its application to find wavelength; interference by division of amplitude; Newton's rings and its applications; determination of wavelength and refractive index of liquids; Michelson interferometer and its applications; determination of wavelength; resolution of spectral lines (difference in wavelength); determination of refractive index of thin sheet.
2. **DIFFRACTION:** Difference between Interference and diffraction; difference between Fraunhofer and Fresnel diffraction; Fraunhofer diffraction through single slit; variation of intensity (analytical); plane transmission diffraction grating; absent spectra; maximum order spectra; dispersive and resolving power of grating.
3. **POLARIZATION:** Polarised and unpolarized light; double refraction; Nicol prism; quarter and half wave plates; optical activity; Dextro and Leavo rotatory; specific rotation; biquartz and Laurent's half-shade polarimeters.
4. **LASER AND FIBRE OPTICS:** Spontaneous and stimulated emissions; laser action (pumping and population inversion); characteristics of laser beam-concepts of coherence; solid state (Ruby) laser; gas (He-Ne) laser; applications; basic principles; fiber

- construction; propagation of light in fibers; numerical aperture; single mode and multi mode fibers; applications of optical fibers.
- SPECIAL THEORY OF RELATIVITY:** Inertial frames of reference; Galilean transformations; non-inertial frames of reference; Michelson-Morley experiment; postulates of special theory of relativity; Lorentz's transformations; length contraction; time dilation; variation of mass with velocity; mass energy equivalence.
 - ELECTRO MAGNETIC THEORY and ELECTROSTATICS :** Review of basic concepts of electrodynamics; Maxwell's modification of Ampere's law, equation of continuity; Maxwell's equations and its simple plane wave solution in free space; Poynting's theorem; dielectric polarization; electric displacement; susceptibility and permittivity and various relations between these; Gauss law in dielectrics; electrostatic energy stored in dielectrics; behaviour of dielectrics in A.C. field: simple concepts; dielectric losses.
 - ULTRASONICS:** Production of ultrasonics by magnetostriction and piezoelectric oscillator methods; detection of ultrasonics by Kundt's tube and acoustic grating method.

TEXT BOOK

Avadhunulu and Kshirsagar, "A Text Book of Engineering Physics", S. Chand & Co.

REFERENCE BOOKS

- Sears, F.W., "Electricity and Magnetism", Narosa
- Arthur Beiser, "Perspectives of Modern Physics", Tata McGraw Hill
- Vasudeva, A.S., "Modern Engineering Physics", S. Chand & Co.
- Resnick and Halliday, "Physics Vol. I-II", Wiley Eastern
- Brij Lal and Subramanyam, "A Text Book of Optics" S. Chand & Co.
- Brij Lal and Subramanyam, "A Text Book of Sound" S. Chand & Co.
- Wehr, Richards and Adair, "Physics of the Atom", Narosa

PH-102	APPLIED PHYSICS	L T P	Cr
		5 1 0	4

OBJECTIVE

To educate the students with the present day physical sciences through concepts like nanotechnology, quantum physics, thermal physics, super conductivity, etc.

- CRYSTAL STRUCTURE:** Space lattice; unit cell and translation vector; Miller indices; simple crystal structure(sc; bcc; fcc; hcp); principle of X- ray diffraction; Bragg's law; experimental X-ray diffraction methods: Laue method and Powder method; point defects in solids; concentration of Frenkel defects and Schottky defects.

- QUANTUM PHYSICS:** Failure of classical concepts; black body radiation; Planck's radiation law; wave packets; group velocity and phase velocity; Schrödinger wave equations: time dependant and time independent equations; significance of wave function; wave function for a particle in a box.
- FREE ELECTRON THEORY:** Elements of classical free electron theory and its limitations; Drude's theory of conduction; quantum theory of free electrons; Fermi level; Density of states (3D); average kinetic energy $\left(= \frac{3}{5} E_F \right)$ of free electrons (3D); Fermi-Dirac distribution function; thermionic emission; Richardson's equation.
- BAND THEORY and NANO TECHNOLOGY:** Origin of energy bands; classification of solids into metals; semiconductors and insulators; Kronig Penney model (Qualitative); E-K diagrams; Brillouin zones; concept of effective mass and holes; hall effect and its application, nanotechnology (basic concept only) and its application.
- THERMAL PHYSICS:** Gas law; iso-thermal and isentropic process; Rankin cycle; Carnet cycle; principal of equipartition of energy; specific heat of monoatomic gases; Maxwell's velocity distribution; mean velocity; RMS velocity; most probable speed; Joule Thomson's expansion; liquification of He I and He II Stefan Boltzmann's law; Newton's law of cooling.
- MAGNETIC PROPERTIES OF SOLIDS:** Atomic magnetic moments; orbital diamagnetism; classical Langevin's theory of dia-magnetism and para-magnetism; ferro-magnetic domains; antiferromagnetism; ferrimagnetism (simple ideas).
- SUPERCONDUCTIVITY:** Introduction (experimental survey); Meissner effect; Type I and Type II superconductor; London equation.

TEXT BOOK

Avadhunulu and Kshirsagar, "A Text Book of Engineering Physics", S. Chand & Co.

REFERENCE BOOKS

- Kittel, Charles "Introduction to Solid State Physics", John Wiley Powell and Crasemann, "Quantum Mechanics", Oxford and IBH
- Aggarwal, R.S., "Thermal Physics and Statistical Physics", MTG Books.
- Saxena, B.S., and Gupta, R.C., "Fundamentals of Solid State Physics", Pragati Prakashan.
- Pillai, "Solid State Physics", New Age
- Ghatak and Loknathan, "Quantum Mechanics", McMillan
- Beiser, Arthur, "Modern Physics", Tata McGraw Hill.

PH-151	PHYSICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

The experiments in 1st term will be based mainly upon optics, electrostatics, wave and oscillations which are the parts of the theory syllabus of 1st term.

1. To find the wavelength of sodium light by Newton's rings experiment.
2. To find the wavelength of sodium light by Fresnel's biprism experiment.
3. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
4. To find the refractive index and Cauchy's constants of a prism by using spectrometer.
5. To find the wavelength of sodium light by Michelson interferometer.
6. To find the resolving power of a telescope.
7. To find the pitch of a screw using He-Ne laser.
8. To find the specific rotation of sugar solution by using a polarimeter.
9. To compare the capacitances of two capacitors by De'Sauty bridge and hence to find the dielectric constant of a medium.
10. To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor.
11. To study the photoconducting cell and hence to verify the inverse square law.
12. To find the temperature co-efficient of resistance by using platinum resistance thermometer and Callender and Griffith bridge.
13. To find the frequency of A.C. mains by using sonometer.
14. To find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.

REFERENCE BOOKS

1. Worshnop, B. L. and Flint, H. T. "Advanced Practical Physics", KPH
2. Gupta, S. L. & Kumar, V. "Practical Physics", Pragati Prakashan
3. Chauhan & Singh, "Advanced Practical Physics Vol. I & II", Pragati Prakashan.

PH-152	APPLIED PHYSICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

11. To find the low resistance by Carey – Foster's bridge.
12. To find the resistance of a galvanometer by Thomson's constant deflection method using a post office box.
13. To find the value of high resistances by Substitution method.
14. To find the value of high resistances by Leakage method.
15. To study the characteristics of a solar cell and to find the fill factor.
16. To find the value of e/m for electrons by Helical method.
17. To find the ionization potential of Argon/Mercury using a thyratron tube .
18. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
19. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
20. To find the value of Planck's constant by using a photo electric cell.
21. To find the value of co-efficient of self-inductance by using a Raleigh bridge.
22. To find the value of Hall co-efficient of semi-conductor.
23. To study the V-I characteristics of a p-n diode.
24. To find the band gap of intrinsic semi-conductor using four probe method.
25. To calculate the hysteresis loss by tracing a B-H curve.

REFERENCE BOOKS

1. Worshnop, B.L. and Flint, H.T. "Advanced Practical Physics", KPH
2. Gupta, S.L. and Kumar, V. "Practical Physics", Pragati Prakashan.
3. Chauhan and Singh, "Advanced Practical Physics Vol. I & II", Pragati Prakashan.

ADDITIONAL/BRIDGE COURSES

OBJECTIVE

A student found deficient in any area of knowledge/skill needed for programmes of study e.g. Communication Skill, Mathematics, etc. may be required to do suitable additional course(s) on audit basis which will not be shown on his Grade Card. However if a bridge course(s) is (are) required for those students admitted to second year the same will be shown on the Grade Card as an audit course.

Note: These Courses are made for a specific purpose and are available only for the intended purpose.

EN-291	ESSENTIALS OF COMMUNICATION OBJECTIVE (BRIDGE COURSE)	L T P	Cr
		5 0 0	3

OBJECTIVE

The objective of bridge course is to bring some of the students who are not up to the mark and are not able to pursue the technical education like their counter parts. This course has been devised to bring the students to that level from where they can do justice to the technical education they are going to pursue.

1. Advertisements; notices; formal and integral invitations.
2. Report writing; or factual description based on verbal input provided.
3. Letter writing: business letter; enquires; registering complaints; asking and giving information; placing orders and sending replies; letter to editor.
4. Parts of speech: noun; pronoun; verb; adverb; adjective; proposition; conjunction; exclamation and general English grammar.
5. Verb patterns and sentences structure and tense.
6. Foreign words; one word substitutions and word formation.
7. Group discussion and debate on various current affairs.

TEXT BOOK

Wren & Martin, "A High School Grammar & Composition"

REFERENCE BOOKS

1. Wood F. T., "Remedial English Grammar for Foreign Students", The Macmillan Press Ltd., 1975
2. Tikku M. C., "An Intermediate Grammar Book"
3. "English for Engineers and Technologists: A Skill Approach", Vol. 2, Orient Longman
4. Ramesh M. S. and Pattanshetti C. C., "Business Communication", R.Chand and Company, Delhi
5. "Group Discussion", Sudha Publications/Ramesh Publishing House, New Delhi.

MA-191	MATHEMATICS (MAKEUP COURSE)	L T P	Cr
		5 0 0	3

OBJECTIVE

Mathematics is a very essential part of all engineering courses. The students entering in the first year who are some how weak in concepts of Mathematics need up gradation in their level of Mathematics. This course is designed keeping in view such students.

1. **BASIS OF CURVES:** Important equations for different types of curves in plane including Cartesian, Parametric forms; Concept of polar coordinates and important curves in polar coordinates.
2. **SEQUENCE AND SERIES:** Sequences, A.P, G.P., H.P; Special sequences $\sum_{n=1}^n n, \sum_{n=1}^n n^2, \sum_{n=1}^n n^3$; Expansions of important functions.
3. **DIFFERENTIAL CALCULUS:** Definition of derivatives and concepts of partial derivatives, Differentiation of parametric curves up to second order; Successive differentiation including Leibnitz rule; analytical and geometrical significance of differentiation.
4. **INTEGRAL CALCULUS:** Formulae of indefinite integrals; Properties of definite integrals; Integration by parts and continued integration by parts.
5. **THREE DIMENSIONAL GEOMETRY:** Dimensional coordinates and important equation of planes and surfaces (including sphere, cone, cylinder and ellipsoid); cylindrical and spherical coordinates in three dimensions.
6. **VECTORS:** Representation of vectors in two and three dimensions; operations on vectors including dot and cross product of three vectors and four vectors.
7. **PROBABILITY THEORY:** Permutation; Combination; Binomial theorem.

TEXT BOOK

NCERT, "Mathematics for XI and XII", NCERT, New Delhi

REFERENCE BOOKS

1. Sharma R. D., "Text Book of Mathematics for Class XI", 10th Edition, Dhanpat Rai & Sons
2. Sharma R. D., "Text Book of Mathematics for Class XII", 10th Edition, Dhanpat Rai & Sons
3. Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005

MA-291	MATHEMATICS (BRIDGE COURSE)	L T P	Cr
		5 0 0	3

OBJECTIVE

The students, who join the University after diploma course, are deficient in mathematics. This course is designed to upgrade and update their knowledge in mathematics so that they are at par with second year students.

1. **PARTIAL DIFFERENTIATION:** Functions of two or more variables; Partial derivatives; Total differential and differentiability; Derivatives of composite and implicit functions; Jacobians; Higher order partial derivatives; Homogeneous functions; Euler's theorem.
2. **MULTIPLE INTEGRALS:** Double integrals; Change of order of integrations; Double integrals in polar co-ordinates; Applications of double integral to find area enclosed by plane curves and volume of solids of revolution; triple integrals; Volume of solids; Change of variables.
3. **SPECIAL INTEGRALS:** Differentiation under integral sign; Beta and gamma functions and relationship between them.
4. **LAPLACE TRANSFORMS:** Laplace transforms and its elementary properties; Inverse transforms; Convolution theorem.
5. **FOURIER SERIES AND FOURIER TRANSFORMS:** Euler's formulae; Change of intervals; Fourier series of odd and even functions; Half range sine and cosines series; Fourier integrals; Fourier transforms; Elementary properties.
6. **DIFFERENTIAL EQUATIONS:** Formations of ordinary differential equations; Solutions of ordinary linear differential equations including solutions by Laplace transform.
7. **PARTIAL DIFFERENTIAL EQUATIONS:** Formations of partial differential equations; Solutions of linear and non-linear partial differential equations.

TEXT BOOK

Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005

REFERENCE BOOKS

1. Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006
2. Jain R. K. and Iyengar S. R. K., "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House
3. Greenberg Michael D., "Advanced Engineering Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd., New Delhi

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PROFESSIONAL DEVELOPMENT COURSES

OBJECTIVE

To meet the corporate requirements bridge the gap between technological skills and soft skills, by improving communication, behavioural, analytical skills, etc.

METHODOLOGY

To enable students become competent professionals and good citizens with moral and ethical values, a set of 14 courses of one credit each will be provided covering

- (i) Value Added Courses,
- (ii) Professional Development Courses, and
- (iii) Co-curricular Activities.

PD-151	BASICS OF COMPUTER FUNDAMENTALS	L T P	Cr
		0 0 2	1

OBJECTIVE

To understand fundamentals of computer applications, networking and building projects.

1. **MS-WORD:** Introduction to MS-Word: Menus, toolbars, ruler, scroll bars, creating, saving, importing, exporting and inserting files, formation, indents/out dents, lists, tabs, styles, working with frames, columns, pictures, chart/graphs, forms, tools, equations and macros.
2. **MS-EXCEL:** Worksheet overview: rows, columns, cell, menus, creating worksheets; opening and saving worksheet; formatting, printing, charts, window, establishing worksheet links, macros, database, tables, using files with other programs.
3. **MS-POWERPOINT:** Overview of MS-PowerPoint, creating slides and presentations, rehearsing presentation, insert, tools, format, slide-show, Window options.
4. **MS-PROJECT:** Starting a Project, Starting Microsoft Project 2000, planning a project, defining the project scope, outlining and task relationships, outlining the project, developing the schedule, changing task relationships and constraints, adding and assigning resources, developing the project calendar, assigning project resources, determining project costs, adjusting project resources and timelines, analyzing the project, using different views and reports, displaying project data, organizing project information, sorting and filtering project data, creating custom filters.
5. **NETWORKING:** Basics of networking, study of topology: LAN, WAN, MAN, Connecting devices: passive hub, repeater, active hub, bridges, two layer switches, routers, three layer switches, gateway, network attack and defense: most common attacks.
6. **TROUBLESHOOTING:** Ping command, TRACERT or TRACEOUT, IP configuration, NETSTAT, NET, recovery commands DISKPART etc., setting up local security policies, installation of servers.
7. **FUNDAMENTALS OF CYBER LAW:** Overview of computer and web technology, access control: operating system access controls, group and roles, access control lists, Unix operating system security, Windows NT, capabilities, added features in Windows 2000, granularity, sandboxing and

proof-carrying code, hardware protection, other technical attacks.

REFERENCE BOOKS

1. Habraken, "MS-Office 2000 8 in 1", Prentice Hall
2. Taxali R. K., "PC Software for Windows Made Simple", Tata McGraw
3. Sandler, "Teach Yourself MS Office", BPB Publications
4. Bangia R., "Learning MS Office 2000", Khanna Book Co
5. Wang W. and Parker R. C., "MS Office 2000 Windows for Dummies", IDG Books India (P) Ltd
6. Peter Dyson, "Undertaking PC Tools", Sybex / Tech Asian Edition Tech Publications.
7. Bansal S. K., "Cyber Crime"
8. Ahmand Tabrez, "Cyber law , E-commerce & M-Commerce"
9. Carl Chatfield and Timothy Johnson, "Microsoft Office Project 2007 Step by Step"

PD-191	CO-CURRICULAR ACTIVITIES	L T P	Cr
		0 0 2	1

OBJECTIVE

To help the students in their all round growth and acquire attributes like team spirit, organizational ability, leadership qualities, etc.

OPERATION

The students are to take part in Co-curricular activities outside contact hours through clubs/ societies spread over all the three terms of the year. They are required to register for this course in each term and their performance will be evaluated in last term of the year.

PD-192	PERSONALITY SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To equip the students with the understanding of human behavior, develop time management skills, and enhance personality.

1. **TRANSACTIONAL ANALYSIS:** Winners and losers; ego states; OK states; positive and negative strokes; life scripts; exercises.
2. **CREATIVE THINKING:** What is creativity; 6 thinking hats; mental blocks; exercises.

- SELF DISCOVERY:** Importance of knowing yourself; SWOT analysis; benefits; strengths and weaknesses; exercises.
- DEVELOPING POSITIVE ATTITUDE:** Meaning; changing attitudes; power of positive thinking; overcoming negative attitude; exercises.
- TIME MANAGEMENT:** Features, time management matrix; tips for time management; effective scheduling; time wasters; time savers; exercises and time bound tasks.
- STRESS MANAGEMENT:** What is stress; causes; positive and negative stress; effects; signs; tips to overcome stress; stress busters; exercises
- DECISION MAKING:** Definition; models and types; skills and techniques; courses of action; steps involved in decision making; individual decision making and group decision making; exercises
- ETIQUETTE & MANNERS:** Social etiquette; dining etiquette; party and wedding etiquette; sensitivity towards diverse cultures; respecting religions and traditions.
- BUSINESS ETIQUETTE:** Dealing with people at work place (peers, subordinates and superiors); international business; etiquette at meetings and conferences.
- COMMUNICATION MEDIA ETIQUETTE:** Telephone etiquette; email etiquette; media etiquette.

REFERENCE BOOKS

- Muriel, James and Jongeward, Dorothy, "Born to Win", Signet Publishers, 1978
- Harris, Thomas Anthony, "I'm OK, You're OK", Galahad Books, 2004
- Dr. Alex, K., "Soft Skills", 2009, S. Chand, 2009
- Adams Scott, "Positive Attitude", Andrews Mcbeel Publishing, 2004
- Newton Tim, "Managing Stress – Emotion and Power at Work", Sage Publications Ltd., 1995
- Koch Richard, "The 80/20 Principle :The Secret to Success by Achieving with Less", Broadway Business, 1999
- Covey Stephen R., "The 7 Habits of Highly Effective People", Simon & Schuster UK, 2004

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-193	ENTREPRENEURIAL & PROFESSIONAL SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To empower the students with entrepreneurial skills, behaviour, grooming and effective interaction at the work place.

- GOAL SETTING:** Types of goals; setting smart goals; personal goal setting; business goal setting; goal setting techniques.
- ENTREPRENEURIAL SKILLS:** Meaning; entrepreneurial competencies; advantages; risks involved, avenues and opportunities; support from Govt.; basic and significant personality traits; venture project planning and entrepreneurship cycles; planning the project; entrepreneurship in daily life; case studies in entrepreneurship; exercises.
- CORPORATE DRESSING:** The corporate fit; corporate culture; dress codes; dressing for interviews; clothing do's and don'ts.
- CORPORATE GROOMING:** Making a good impression at work; grooming check list; accessories, do's and don'ts for men and women; hygiene and skin care; hands and feet; make up and hair accessories.

REFERENCE BOOKS

- Miner, B. John, "The 4 Routes to Entrepreneurial Success", Berrett-Koehler, 1996
- Ellis, Keith, "The Magic Lamp", Three Rivers Press, 1998
- Blair, Gary Ryan, "The Ten Commandments of Goal Setting", GoalsGuy Learning Skills Inc., 2005
- Gupta, Seema, "Correct Manners and Etiquette", Pustak Mahal, 1992
- Soundararaj, Francis, "Speaking and Writing for Effective Business Communication", MacMillan, 1995

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-251	MATLAB	L T P	Cr
		0 0 2	1

OBJECTIVE

MATLAB is a powerful language for technical computing. It is widely used in universities and colleges for courses in mathematics, science and especially in engineering. In industry the software is used in research, development and design. This course is intended for students who are using MATLAB for the first time and have little or no experience in computer programming.

- BASIC STRUCTURE and FEATURES OF MATLAB:** Command window; figure window; editor window and help window; arithmetic operations with scalars, order of precedence; using MATLAB as a calculator; display formats; elementary math built-in functions; scalar variables, assignment operator; predefined variables; useful commands for managing variables; applications in problem solving.
- CREATING ARRAYS** – one dimensional, two-dimensional; array addressing; built-in functions for handling arrays; mathematical operations with matrices; strings and strings as variables; generation of random numbers; examples of MATLAB applications.
- SCRIPT FILES:** Creating and saving a script file, current directory; output commands.
- TWO – DIMENSIONAL PLOTS:** Plot command; line specifiers plot of a given data; plot of a function; plotting multiple graphs in the same plot.
- FUNCTIONS AND FUNCTION FILES:** Creating a function file; input and output arguments; function body; comment lines; saving a function files; using a function file; programming in MATLAB.

TEXT BOOK

Gilat Amos, "MATLAB: An Introduction with Applications", John Wiley & Sons, Inc (Wiley Student Edition), 2008

REFERENCE BOOK

Herniter, E. Marc, "Programming in MATLAB", Brooks/Cole, Thomson Learning

PD-291	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

Refer to PD-191 for details.

PD-292	EFFECTIVE COMMUNICATION	L T P	Cr
		0 0 2	1

OBJECTIVE

To acquaint the students with the basics of effective spoken and written English and enhance their reading, listening, and communication skills.

- COMMUNICATION:** Importance; barriers and types of communication; methods to develop effective communication skills.
- GRAMMAR:** Parts of speech; subject/verb agreement; tenses; error correction; business idioms; Indianism in English; frequently mispronounced words; exercises.
- SPOKEN ENGLISH:** Vowel and consonant sounds; syllables and syllabic stress; conversational skills; extempore; JAM.
- READING & LISTENING SKILLS:** Reading with comprehension; story reading; passage reading; newspaper reading; listening and active listening; barriers to listening; effective listening and types of listening; exercises.
- WRITING SKILLS:** Importance of writing skills; how to develop writing skills; writing exercises i.e., essay writing, reviews, reports, etc.
- NON VERBAL COMMUNICATION:** History; kinesics; postures; gestures; functions; importance and challenges of non verbal communication.
- BUSINESS COMMUNICATION:** Business letters and messages; business reports; presentation skills; do's & don'ts; personal journal.

REFERENCE BOOKS

- Wren and Martin, "High School Grammar", Paperback, 2000
- Condill Jo, & Bough, Bennie, "101 Ways to Improve Your Communication Skills Instantly", 4th Edition, Paperback, 2005
- Rai S. M., Rai Urmila, "Communication Skills", Students Edition, Himalaya, 2007.
- Connor J. D. O, "Better English Pronunciation" Cambridge. 2nd Edition, Paperback, Cambridge University Press, 2008
- Raina Arjun, "Speak Easy Voice And Accent Training Manual", Paperback (Special India Edition, Full Circle
- Guffey Mary Ellen, "Business Communication" 3rd Edition, South – Western College Publishing, 2000

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-293	INTRA & INTER-PERSONAL SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To acquaint the students with the understanding of self development through good inter-personal skills for effective social communication in order to succeed in maintaining relationships in professional and social environments. This module will also help at learning group discussions and interview skills to enable employability and professional fit.

- SELF AWARENESS:** Development of our self image; social comparison; significant others; self esteem; self confidence.
- ASSERTIVENESS & CONFIDENCE:** Assertiveness; being confident; strategies to make assertive NO easier; dealing with emotions; difference between being aggressive and being assertive.
- TEAM BUILDING & TEAM WORK:** The team concept; elements of team work; stages of team formation; effective team; essential building blocks of effective teams; team player's style; team tasks; exercises.
- LEADERSHIP SKILLS:** Leadership skills and styles; motivating people; understanding abilities; delegating tasks; managing people; overcoming hurdles; exercises.
- INTERVIEW SKILLS:** Why an interview; the first step to a successful interview; resumes that make an impact; the interview process; the interview preparation checklist; interviewing skills; putting your best foot forward; common interview mistakes; one on one HR interviews (two for each student).
- GROUP DISCUSSION SKILLS:** Meaning of a GD; types; role of a moderator; do's and don'ts; mock GDs on general, knowledge based and abstract topics.
- THE ART OF CONVERSATION:** Skills to strike a conversation; sustaining conversation; communicating across cultures; conflict management.

REFERENCE BOOKS

- Haddon, F. Peter, "Mastering Personal and Interpersonal Skills", Viva Books Pvt. Ltd., 2003
- Schuller, Robert H., "Tough Times Never Last But Tough People Do", Orient Paperbooks, 1988
- Bolton, Robert, "People Skills", Touchstone Books, 1986
- Jansaz, De Suzanne, " Interpersonal Skills in Organizations", 3rd Edition, McGraw Hill Education (Asia), 2009
- Fontana, David, "Social Skills at Work", Universities Press, 2000
- Burns, James Mac Gregor, "Leadership", Harper Perennial, 1982
- Harris, Godfrey, "Art of Conversation", Jaico Publishing House, 2002
- Ganguly, Anand, "Group Discussions and Interviews", Ramesh Publishing House, 2008

Notes: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-352	CIVIL ENGINEERING DRAWINGS	L T P	Cr
		0 0 2	1

EXPERIMENTS

CONSTRUCTION (at site)

1. Setting out of a building
2. Taking block levels of the plot area.
3. Visual examination of the soil exposed in trial pits at site.
4. Brickwall construction – English bond, Flemish bond, Ruled Pointing, Flush Pointing, Plastering.
5. Formwork for Beams, Slabs, Columns.
6. Reinforcements for Beams, Slabs, Columns.
7. Fixing of ceramic tiles/stones for skirting/dado.

MATERIALS

8. Kota/marble/granite stones for flooring.

DRAWINGS

- 9-10. Preparation of building drawing mentioning its Salient features including the following details:
 - a. Ground Floor Plan
 - b. Two Sectional Elevations.
 - c. Front and Side Elevations.
 - d. Plan and Sectional Elevation of stair-case

REFERENCE BOOK

"Building Construction and Materials" by Gurcharan Singh, Standard Book House, Eleventh Edition, 2010.

PD-391	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

Refer to PD-191 for details.

PD-392	PROBLEM SOLVING SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To train and enhance the students' problem solving skills, reasoning ability, quantitative ability, and reading comprehension skills.

1. **LOGICAL REASONING:** Logical deductions (Syllogism & Venn Diagrams); logical connectives.
2. **ANALYTICAL REASONING:** Seating arrangements; combinations; selections; comparisons; blood relations; directions, etc.
3. **NON-VERBAL REASONING (ALPHA-NUMERIC & VISUAL PUZZLES):** To solve problems on numbers, alphabet, symbols and visuals; problem types are series, analogies, odd man out, coding decoding, and symbols & notations.
4. **BUSINESS MATHS:** Number system; ratios; averages; time & work; time & distance; percentages; profit & loss; simple & compound interest.
5. **HIGHER MATHS:** Algebra; Mensuration.
6. **DATA INTERPRETATION & SUFFICIENCY:** Tables, Bar chart, line graph, pie charts; to enable student assess whether the given data is sufficient

to solve a question; for both reasoning based and quant based problems.

7. **READING COMPREHENSION:** To enable a student comprehend short and long passages from the perspective of solving questions based on the passage.

REFERENCE BOOKS

1. Aggarwal R. S., "Verbal & Non-Verbal Reasoning", 2008, S. Chand, 1994
2. Aggarwal R. S., "Quantitative Aptitude for Competitive Examinations", S. Chand, 2008
3. Gulati, SL, "Quantitative Ability", Bookhive India, 2006
4. "GRE Barron's", 13th Edition, Barron's Educational Series, 2009
5. Devi Shakuntla, "Book of Numbers", 1984
6. Summers George J., "The Great Book of Puzzles & Teasers", Jaico Publishing House, 1989

PD-393	ADVANCED PROFESSIONAL DEVELOPMENT	L T P	Cr
		0 0 2	1

OBJECTIVE

To equip the students with the basics of law, accounting, corporate policies, and ethics; the general awareness useful in leading a well informed life.

1. **LAW FOR THE LAYMAN:** Indian Judiciary System; Intellectual Property Rights (IPR); labour laws; employee rights; human rights; criminal laws, civil rights.
2. **BASICS OF ACCOUNTING:** Credit-Debit transactions; balance sheet; ledgers; receipts & vouchers; P & L statement; exercises.
3. **MONEY MANAGEMENT:** Types of taxes; how to manage taxes; investment options; an overview of stocks & shares; savings options; understanding important terms (depreciation, VAT, education cess).
4. **CORPORATE RULES & POLICIES:** The need; advantages; illustrations of certain rules & policies followed by selected corporate; code of conduct.
5. **RIGHTS & DUTIES:** An overview of the Indian constitution; fundamental rights & duties; directive principles of state policy; societal values; ideologies of some famous personalities.
6. **TECHNOLOGY, POLITICS & RELIGIONS IN INDIA:** various religions and their teachings; political developments in India; history of science & technology.
7. **HUMAN VALUES:** Ethics at work place; human values; morals & ethics; professional ethics; case studies.

REFERENCE BOOKS

1. Anthony M.J., "Law for the Layman", Hind Pocket Books, 2003
2. Mathur Reeta, "Recent Trends in Indian Economy", 3 Vol set, Sublime Publication, 2003
3. Eisen J. Peter, "Accounting - The Easy Way", Barron's Educational Series, 2003
4. Kiyosaki Robert, and Lechter Sharon, "Rich Dad, Poor Dad", Warner Books, 2001
5. Lakhota R. N., "Income Tax Guide for the Taxpayer", Vision Books, 2009

B.Tech. Civil Engineering (Regular)

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-452	CONSTRUCTION TECHNIQUES AND EQUIPMENT	L T P	CR
		0 0 2	1

EXERCISES INCLUDING SITE VISITS

1. Fabrication of Concrete Blocks
2. Fabrication of Hume Pipes (R.C.C)
3. Design & Drawing of Water Tank
4. Interior Finishes in buildings
5. Cavity Wall

6. Specifications of Earth Moving Equipment
7. Specification of Hoisting Equipment

REFERENCES BOOK

Gupta B. L., "Construction Management and Machinery", Amit Gupta Jain Book Depot, New Delhi-110001.

PD-491	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

Refer to PD-191 for details.

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OPEN ELECTIVE COURSES

OBJECTIVE

The idea of open elective is to expand the application horizon of the knowledge acquired beyond the boundaries of one's own discipline

METHODOLOGY

The student may enroll for one course from the list provided in the Scheme of Studies & Syllabus. The course shall strictly be from any other discipline. Selection of course from the same discipline of study is not allowed.

AE-411	TRANSPORT MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

The course has been designed such that the student can own a fleet of buses; trucks etc and manage the same; He also gets familiar with provisions of motor vehicle act and vehicle insurance.

- 1. INTRODUCTION:** Necessity for making acts and rules on motor vehicles; Procedure for enactment and implementation of these acts by central and state Govts; Formats of the acts; rules and titles; Definitions – articulated vehicle; axle weight; certificate of registration; driver; conductor; licence; contract carriage; stage carriage; dealer; educational institution bus; goods; goods carriage; gross vehicle weight; heavy goods vehicle; invalid carriage; learners licence; HMV; LMV; motor cabs etc.
- 2. DRIVING LICENCE:** Necessity; age limit to obtain D.L. learners D.L permanent D.L grant; restrictions; renewal; endorsement; disqualification; suspension; fees; documents; educational qualifications required for driving trucks; buses; oil tankers; missile carriers; driving on hills; Driving schools:requirements; Effectiveness of different DLs; Maintenance of state registers of D;L. conductors licence – necessity; grant; age limit; disqualifications; revocation; disqualification; uniforms.
- 3. VEHICLE REGISTRATION:** Necessity; area of registration; time given for registration; format and documents to be attached and fees; period of registration; renewal; suspension; Temporary and permanent registration; vehicle fitness; refusal; NOC; registration for embassy vehicles; production of vehicle at the time of registration; Migration of vehicle from one state to other; Hire purchase; lease or hypothecation; transfer of registration on sale; removal of hypothecation clause; Transfer of ownership; Change of residence or place of business; death of owner; sale or purchase; Alteration in motor vehicle; age limit of vehicles; attachment of trailers; Maintenance of state registers of motor vehicles;
- 4. PERMITS:** Necessity; route allotments; state Govts; powers; provisions for application of permits; Procedure of R;T;A to grant permits; limits of issuance of permits and rules; documents to be attached; preferences while issuing permits; Types of permits – Private service; all India goods carriage; temporary; national; composite etc; Renewal; duration; cancellation; suspension of

permits and transfer of permits; Rules for replacement of vehicles; colour schemes; general conditions attached; Validation of permits for use in outside region; Issue of permits to state transport undertakings : restrictions

- 5. CONSTRUCTION; EQUIPMENT; MAINTENANCE AND TRAFFIC REGULATION:** General provisions; Central Govt; rules and provisions regarding construction; maintenance of vehicle; emissions and safety provisions; Control of traffic: limits of speed; weight; length and height; power to restrict and erect traffic signs; design of traffic signs and its colour scheme; Signals; driving test; Driving regulations; signaling devices; Definitions– Pass; ticket; removal of vehicle obstructing traffic; Safety measures for drivers and pillion riders; Precautions at unguarded railway crossings; Schemes for investigation of accidents and wayside amenities; Traffic navigation; global positioning system.
- 6. LOGISTICS:** Definition of fleet; types of fleet-luxury cars; buses; trucks; cash vans; fire-fighting vehicles etc; Management; supervisory; training and staffing; Driver; conductor and Mechanics hiring; duties; Vehicle operations-productivity and control; Fleet maintenance programs; tyre maintenance; productivity and control; Budget activity; Fleet management and data processing; Procurement and disposal; labour relations; energy management; Loss prevention management; control and predicting costs; Fitness of vehicles; Stores; definition; management; storing methods; inventory control; Duties and responsibilities of store manager; purchase manager; Storing methods; Bin card; requisition card; Inventory control procedures; Vendor development; Stores-layout; spare parts flow chart; Store documentation; store organization.
- 7. MOTOR INSURANCE:** Types; scope; limitations; liability of insurance Cos; insurance documents-claim form; estimate and bills; Necessity for insurance against third party risk; Requirements and limits of liability of insurance polices; Procedure to be followed for settlement of a claim after an accident; Surveyor and loss assessor; Surveyors report; Certificate of insurance transfer; Compensation to third party deaths; Motor accident claims tribunal (MACT); Transit insurance

TEXT BOOK

The Motor Vehicle Act, 1988; Govt. of India Publication.

REFERENCE BOOKS

1. Patankar P. G., "Road Passenger Transport in India"; CIRT Pune, March 2007.

2. Srivastav S. K., "Economics of Transport", S Chand & Co., 1981.

4. Dale Yoder, "Personnel Management & Industrial Relations", Tata McGraw Hill

BA-271	HUMAN RESOURCE MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

The course aims to provide the insights into effective management of human resources to enable the students to meet the HR challenges in the present scenario.

- 1. INTRODUCTION:** Meaning, scope, objective, functions, policies & roles and importance of Human Resource Management; Interaction with other functional areas; HRM & HRD - a comparative analysis, organizing the Human Resource Management department in the organization; Human Resource Management practices in India.
- 2. HUMAN RESOURCE PLANNING:** Definition, objectives; process and importance job analysis; Description, specification and job evaluation.
- 3. DEVELOPING EFFECTIVE HUMAN RESOURCE:** Recruitment; selection; placement and introduction process; human resource development: concept, employee training & development, career planning & development
- 4. PERFORMANCE MANAGEMENT:** concept and process, performance appraisal, Potential appraisal Job Compensation: Wage & salary administration, incentive plans & fringe benefits; Promotions, demotions, transfers, separation, absenteeism and turnover; Quality of work life (QWL): Meaning, origin, development and various approaches and; to QWL, techniques for improving QWL; Quality circles: concept, structure, role of management QC in India
- 5. JOB SATISFACTION AND MORALE:** Health, safety & employee welfare; counseling for effective; enforcing equal employment opportunity legislation; fair employment; fair practice laws,
- 6. HUMAN RESOURCE DEVELOPMENT:** Human Resource: definition, objectives & approaches to human relations; Employee grievances and discipline; participation & empowerment; Introducing to collective bargaining; HR Audit.
- 7. HIGH PERFORMANCE WORK SYSTEM:** Fundamental principles-Principle of shared info; principle of knowledge development; principle of performance reward linkage; principle of Egalitarianism; Testing alignment of the HR system-HR deliverables

TEXT BOOK

Rao V. S. P., "Human Resource Management", Excel Publications

REFERENCE BOOKS

1. C. B. Memoria "Personal Management", Himalaya Publications, New Delhi
2. Edwin B. Flippo, "Personal Management" Tata McGraw Hill
3. Aswathappa K., "Human Resource Management", Tata McGraw Hill

BA-272	ENTREPRENEURSHIP DEVELOPMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the challenges of starting new ventures and enable them to investigate, understand and internalize the process of setting up a business.

- 1. CONCEPT OF ENTREPRENEURSHIP:** meaning and characteristics of entrepreneurship, entrepreneurial culture, socio-economic origin of entrepreneurship, factors affecting entrepreneurship, conceptual model of entrepreneurship, traits of a good entrepreneur, entrepreneur, intra-preneur and manager
- 2. ENTREPRENEURIAL MOTIVATION:** motivating, compelling and facilitating factors, entrepreneurial ambition, achievement motivation theory and Kakinada experiment
- 3. ESTABLISHMENT OF ENTREPRENEURIAL SYSTEMS:** search, processing and selection of idea, Input requirements
- 4. SMALL SCALE INDUSTRY:** meaning, importance, characteristics, advantages and problems of SSIs. Steps for starting a small industry, guidelines for project report, registration as SSI.
- 5. ASSISTANCE TO SSI:** need for incentives & subsidies, need for institutional support, role of government and other institutions.
- 6. FUNCTIONAL PLANS:** Marketing plan- marketing research for the new venture, steps in preparing marketing plan, contingency planning; Organizational plan- Forms of ownership, designing organizational structure, job design, manpower planning; Financial plan- cash budget, working capital, proforma income statement, Proforma cash flow, proforma balance sheet, break even analysis.
- 7. SOURCES OF FINANCE:** Debt or Equity financing, commercial banks, venture capital; financial institutions supporting entrepreneurs; legal issues- intellectual property rights, patents, trade marks, copy rights, trade secrets, licensing, franchising.

TEXT BOOK

Gupta C. B. and Srinivasan N. P., "Entrepreneurial Development", Sultan Chand & Sons

REFERENCE BOOKS

1. Vasant Desai, "Management of a Small Scale Industry", Himalaya Publishing House

CE-471	ADVANCED TRAFFIC ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

To introduce the students about various modern traffic engineering and management problems and their solutions.

- 1. INTRODUCTION AND TRAFFIC CHARACTERISTICS:** Objectives and scope of traffic engg. Organisational set up of traffic engg department in India; Importance of traffic characteristics; Road user characteristics; Vehicular characteristics; Max dimensions and weights of vehicles allowed in India. Effects of traffic characteristics on various design elements of the road.
- 2. TRAFFIC SURVEYS:** Methods of conducting the study and presentation of the data for traffic volume study; speed study and origin and destination study. Speed and delay study. Parking surveys; On street parking; off street parking. Accident surveys. Causes of road accidents and preventive measures; Use of photographic techniques in traffic surveys.
- 3. HIGHWAY CAPACITY:** Importance. Space and time headway. Fundamental diagram of traffic flow. Relationship between speed; volume and density. Level of service. PCU. Design service volume. Capacity of non-urban roads. IRC recommendations. Brief review of capacity of urban roads.
- 4. TRAFFIC CONTROL:** Types of traffic control devices. Traffic signs; general principles of traffic signing; types of traffic signs. Road markings; types; general principles of pavement markings. Design of rotary. Grade separated intersections. Miscellaneous traffic control aids and street furniture.
- 5. Signal Design:** Types of signals. Linked or coordinated signal systems. Design of signal timings by trial cycle method; approximate method; Webster's method and IRC method
- 6. Traffic Regulation And Management:** Need and scope of traffic regulations. Regulation of speed; vehicles and drivers. General traffic regulations. Motor vehicle act. Scope of traffic management. Traffic management measures: restrictions on turning movements; one way streets; tidal flow operations; exclusive bus lanes; traffic restraint; road pricing.
- 7. TRAFFIC AND ENVIRONMENT COMPUTER APPLICATION; TRAFFIC SIMULATION:** Detrimental effects of traffic. Vehicular air pollution. Situation in India. Vehicular emission norms in India and abroad. Alternate fuels. Factors affecting fuel consumption. Arboricultur. Computer application in traffic engg.; transport planning and public transport. Traffic simulation; advantages. Steps in simulation. Scanning techniques. Introduction to Intelligent vehicle highway system. Various types of IVHS.

TEXT BOOK

Khanna S. K. and Justo C. E. G., "Highway Engineering", Nem Chand Bros., Roorkee

REFERENCE BOOKS

1. Kadiyali L. R., "Traffic Engg. and Transport Planning", Khanna Publishers
2. Matson T. M., Smith W. S. and Hurd F. W., "Traffic Engineering", McGraw Hill, New York.
3. Drew D. R., "Traffic Flow Theory", McGraw Hill, New York.

WEB REFERENCES

1. syllabus.icbse.com/jntu/19-TRANSPORTATION%20ENGINEERING.pdf2.
2. www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc
3. www.uniqueinstitutes.org/kuk/civilengg/38civilf.pdf
4. worldinfo.org/wp-content/uploads/.../Ecology.Enquirer.August.2009.pdf

CE-472	ELEMENTS OF TOWN PLANNING AND ARCHITECTURE	L T P	Cr
		5 0 0	3

OBJECTIVE

To impart knowledge on various aspects of town planning and architecture, historical structures, planning development of habitats.

- 1. INTRODUCTION TO ARCHITECTURE:** Origin & definition; factors influencing architecture – climate; topography; materials; socio – cultural conditions; economic and technological factors etc. components of architecture – functional; aesthetic and structural.
- 2. BASIC ELEMENTS OF ARCHITECTURE:** Principles of architectural composition - concept of beauty; unity; balance; proportion scale; rhythm; harmony; contrast; symmetry; character; integration etc. aesthetic responses to colour; texture; light & shade; formal and informal organizations of solids and void
- 3. INTRODUCTION OF TOWN PLANNING:** General Planning concepts in town planning; ancient town planning Greek; Roman; Medieval & Renaissance towns; history of town planning in India; modern town planning – industrial revaluation and its impact ; garden city concept new town and satellite towns.
- 4. TOWN PLANNING LEGISLATIONS:** Urbanisation trends in India ; classification of town; Evolution of planning legislation in India; organizations and administration of planning agencies at National state; regional level and metropolitan level ; building bye laws; provision of building regulation; function of local authorizes.
- 5. DEVELOPMENT PLANS:** Need; objective; scope and content of master plan; regional plan; structural plan; zonal development plan etc; Planning of land uses – residential; industrial; commercial; principles of planning for traffic & transportation; utility and services ; zoning regulation; sub division regulation; FARs; densities etc.
- 6. ELEMENTS OF A TOWN / CITY PLAN:** Planning attributes- physical infrastructure; social infrastructure; commerce; housing etc ; surveys for town planning ; importance of climate; topography; drainage; water supply in selection of site for development; planning standards – UDPI guidelines.
- 7. COMPONENTS OF TOWN PLANNING:** Housing; housing problems in India; National housing policy; housing agencies; housing finance institutions; Dhum housing; transportation planning process; national transportation policy; surveys of

transportation planning; urban conservation; National Building Code of India 1983 guidelines; norms for planting of shrubs, trees, etc.

TEXT BOOK

Hiraskar G. K., "Fundamentals of Town Planning", Dhanpat Rai & Co, 2001

REFERENCE BOOKS

1. Rangwala S. C. and Krishnarjun N., "Town Planning", Charotar Publishing House, Anand, 1985.
2. Prammar V. S., "Design Fundamentals in Architecture", Somaiya Publications, New Delhi.

REFERENCE WEB SITE

1. www.jadavpur.edu/academics/.../Architecture/archsyl.htm
2. www.oauiife.edu.ng/faculties/edm/arch/coursedescripition.pdf
3. www.unitytempleutr.org/Unity%20Temple%20Teaches.pdf-issuu.com/brentallpress/docs/adr3_vol3_1

CH-471	ADVANCED APPLIED CHEMISTRY	L T P	Cr
		5 0 0	3

OBJECTIVE

To make students familiar with the concept of chemistry associated with dairy life, with the general method of analysis and other aspects related to engineering field.

1. **FUELS & PETROCHEMICALS TECHNOLOGY:** Classification of fuels; coal biomass; biogas determination of calorific values using bomb calorimeter; bio- fuels and liquid fuels; general consideration of petrochemicals; an overview of petroleum refining; petroleum transpiration; an elementary ideas of petrochemicals; petroleum refining -catalytic cracking & naptha reforming.
2. **CHEMICALS TOXICOLOGY:** Introduction; kind of toxic pollutants; toxic chemicals in air water & soil; toxic elements in waste water; carcinogenesis, impact of toxic chemicals on enzymes; biochemical effects of As ,Cd, Pg, Hg, CO, NO₂, O₃ CN- Toxic metal pollutants; Toxic minerals and dust; Toxic organic compounds .
3. **ENVIRONMENTAL HAZARDS & POLLUTION:** Cause; Effects; control & measures of water pollution; soil pollution; thermal pollution; Nuclear pollution; solid waste management; industrial waste & bio-medical waste management; cause; effects & control measures of urban & industrial waste.
4. **INDUSTRIAL WASTE MANAGEMENT:** Magnitude of industrial waste generation & their characteristics; effluent standards for disposal into water bodies; waste water characterization & process survey; advanced treatment &sludge handing; combined treatment of raw industrial waste with sewage; common effluent treatment for industrial estates; management of industrial waste from small scale industries.
5. Selection procedure for physical; chemical & biochemical methods of industrial waste water treatment.

6. **CORROSION & ITS CONTROL:** Introduction; dry corrosion; wet corrosion; mechanism of wet corrosion galvanic corrosion; concentration; Cell; corrosion fitting corrosion; inergranular corrosion; waterline corrosion; stress corrosion; galvanic series; factors influencing corrosion; control methods.
7. **POLYMER TECHNOLOGY:** Introduction of natural and synthetic polymers; classification of polymers on different basis; Natural rubber; Source; Formula; Elasticity of rubber; chemical relativity; properties; isomerism in rubber; vulcanized rubber and its uses .
8. **ADVANCED ANALYTICAL METHODS:** Thermo analytical methods; Thermo gravimetric analysis (TGA); Differential thermal analysis (DTA); Differential scanning calorimetry (DSC); Instrumentation; Flame photometry; spectrophotometry; conductometry; conductometry chromatographic methods; Adsorption; liquid - liquid partition; ion-exchange; paper & thin-layer chromatography; gas chromatography; HPLC & Electrophorisis.

TEXT BOOK

Jain & Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.

REFERENCE BOOKS

1. Drago, "Physical Methods of Chemistry".
2. Hutzinger, "Hand Book of Environmental Chemistry", Springer Verlag
3. Fristschen L. J. and Gay L. W., "Environmental Instrumentation", Springer Verlag
4. Bhatia H. S., "Environmental Pollution and Control", Galgotia Publications, 2003
5. Khopkar S. M., "Basic Concept of Analytical Chemistry", 2nd edition, New Age Publications, 1998

CS-303	COMPUTER GRAPHICS	L T P	Cr
		5 0 0	3

OBJECTIVE

Students completing this course are expected to be able to:

- Write programs that utilize the OpenGL graphics environment.
- Use polygonal and other modeling methods to describe scenes.
- Understand and be able to apply geometric transformations.
- Create basic animations.
- Understand scan-line, ray-tracing, and radiosity rendering methods

PRE-REQUISITES

Knowledge of computer programming, 2D and 3D geometry

1. **INTRODUCTION:** What is computer graphics, computer graphics applications, computer graphics hardware and software, two dimensional graphics primitives: points and lines, line drawing algorithms: DDA, Bresenham's; circle drawing

algorithms: using polar coordinates, Bresenham's circle drawing, mid point circle drawing algorithm; polygon filling algorithm, boundary filled algorithm, scan-line algorithm, flood fill algorithm.

- TWO DIMENSIONAL VIEWING:** The 2-D viewing pipeline, windows, viewports, window to view port mapping; clipping: point, clipping line (algorithms): 4 bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck).
- POLYGON CLIPPING ALGORITHM:** Sutherland-Hodgeman polygon clipping algorithm, homogeneous coordinates system, two dimensional transformations: transformations, translation, scaling, rotation, reflection, shearing, transformation, composite transformation.
- THREE DIMENSIONAL GRAPHICS:** Three dimensional graphics concept, matrix representation of 3-D transformations, composition of 3-D transformation; viewing in 3D: projections, types of projections; the mathematics of planner geometric projections; coordinate systems.
- HIDDEN SURFACE REMOVAL:** Introduction to hidden surface removal; the Z- buffer algorithm, scan-line algorithm, area sub-division algorithm.
- REPRESENTING CURVES AND SURFACES:** Parametric representation of curves: Bezier curves, B-Spline curves; parametric representation of surfaces; interpolation method.
- ILLUMINATION, SHADING, IMAGE MANIPULATION:** Illumination models, shading models for polygons, shadows, transparency; what is an image, filtering, image processing, geometric transformation of images.

TEXT BOOK

Foley James D., van Dam Andeies, Feiner Stevan K. and Hughes Johb F., "Computer Graphics Principles and Practices", 2nd Edition, Addison Wesley, 2000

REFERENCE BOOKS

- Hearn Donald and Baker M. Pauline, "Computer Graphics", 2nd Edition, Prentice Hall of India, 1999
- Rogers David F., "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw Hill, 2001
- Watt Alan, "Fundamentals of 3-Dimensional Computer Graphics", Addison Wesley, 1999
- John Corrign, "Computer Graphics: Secrets and Solutions", BPB Publications, 1994
- Krishanmurthy N., "Introduction to Computer Graphics", Tata McGraw Hill, 2002

WEB REFERENCES

- http://en.wikipedia.org/wiki/Computer_graphics
- <http://www.cgw.com/ME2/Default.asp>
- <http://www.graphics.cornell.edu/online/tutorial/>
- <http://graphics.stanford.edu/>

CS-402	ARTIFICIAL INTELLIGENCE	L T P	Cr
		5 0 0	3

OBJECTIVE

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

PRE-REQUISITES

Knowledge of neural networks, data structures

- INTRODUCTION TO AI AND SEARCH TECHNIQUES:** Foundation and history of AI; data, information and knowledge; AI problems and techniques – AI programming languages, problem space representation with examples; blind search strategies, breadth first search, depth first search, heuristic search techniques: hill climbing; best first search, A * algorithm AO* algorithm, Means-ends analysis.
- KNOWLEDGE REPRESENTATION ISSUES:** predicate logic; logic programming; constraint propagation; representing knowledge using rules.
- REASONING UNDER UNCERTAINTY:** Reasoning under uncertainty, non monotonic reasoning; review of probability; Bayes' probabilistic interferences and Dempster Shafer theory; heuristic methods; symbolic reasoning under uncertainty; statistical reasoning, fuzzy reasoning.
- PLANNING & GAME PLAYING:** Minimax search procedure; goal stack planning; non linear planning, hierarchical planning, planning in situational calculus; representation for planning; partial order planning algorithm
- LEARNING:** Basic concepts; rote learning, learning by taking advices, learning by problem solving, learning from examples, discovery as learning, learning by analogy; explanation based learning; neural nets; genetic algorithms.
- OTHER KNOWLEDGE STRUCTURES:** semantic nets, partitioned nets, parallel implementation of semantic nets; frames, common sense reasoning and thematic role frames; architecture of knowledge based system; rule based systems; forward and backward chaining; frame based systems.
- APPLICATIONS OF ARTIFICIAL INTELLIGENCE:** Principles of natural language processing; rule based systems architecture; expert systems, knowledge acquisition concepts; AI application to robotics, and current trends in intelligent systems; parallel and distributed AI: psychological modeling, parallelism in reasoning systems, distributed reasoning systems and algorithms

TEXT BOOK

Rich Elaine, Knight Kevin and Nair, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009

REFERENCE BOOKS

- Nilson Nils J., "Artificial Intelligence", New York McGraw-Hill, 1971.
- Russell Stuart and Norvig Peter, "Artificial Intelligence: A Modern Approach", Prentice Hall of India, 1998
- Negnevitsky, "Artificial Intelligence: A Guide to Intelligent System", Pearson Education, 2004.
- Patterson O. W., "Introduction to Artificial Intelligence & Expert Systems", Prentice Hall of India, 1996.
- Winston Patrick Henry, "Artificial Intelligence", 3rd Edition, Addition Wesley, 1992
- Clockson & Mellish, "Programming PROLOG", Narosa Publications, 3rd Edition, 2002.

WEB REFERENCES

1. <http://www.formal.stanford.edu/jmc/whatisai/>
2. <http://library.thinkquest.org/2705/>
3. www.imdb.com.

CS-422	CRYPTOGRAPHY AND DATA COMPRESSION	L T P	Cr
		5 0 0	3

OBJECTIVE

The course will attempt to dispel some of the many myths that surround the idea of cryptography. Cryptography is (and will continue to be) an increasingly important area of IT and it is important that practitioners are aware of the realities of the subject. The course will provide a down-to-earth overview of cryptographic techniques applicable in an IT environment, and outline the constraints and limitations of realistic secure systems. A running theme is the tradeoff between usability and security of a system. Also covered are a number of compression techniques - data compression and data encryption are, in some respects, closely related. A working knowledge of C is assumed and essential.

PRE-REQUISITES

Knowledge of cryptography, analysis & design algorithms and mathematics

1. **INTRODUCTION:** Basics of cryptography; history; usefulness of compression techniques
2. **COMPRESSION:** Packing, Huffman coding, Run length encoding, Lempel-Ziv-Welch, PKZIP, Delta modulation, JPEG; latest compression techniques
3. **ERROR DETECTION AND CORRECTION:** Parity, 1, 2, n-dimensions, Hamming codes, p-out-of-q codes
4. **CRYPTOGRAPHY:** vocabulary; history; steganography - visual textual, cipher hiding, false errors; public key cryptography – authentication; signatures; deniability
5. **MATHEMATICS:** information; confusion; diffusion; modular arithmetic; inverses; Fermats little theorem; Chinese remainder theorem, factoring; prime numbers; discrete logarithms
6. **ALGORITHMS:** DES, AES (Rijndael), IDEA, One time pad, Secret sharing and splitting, RSA, Elliptic curves, Modes, Random numbers
7. **ATTACKING SYSTEMS:** Recognition, Destroying data, Cryptanalysis - Differential cryptanalysis - cracking DES

TEXT BOOK

B. Schneier, “Applied Cryptography: Protocols, Algorithms and Source Code in C”, 2nd edition, Wiley, 1996.

REFERENCE BOOKS

1. Suhas Desai, “Security in Computing”, Pearson Education, 2010
2. “Integration of Data Compression and Cryptography: Another Way to Increase the Information Security”, IEEE Computer Society Volume 2, 2007
3. W. Trappe and L. Washington, “Introduction to Cryptography”, 2nd edition, Pearson Education, 2006

WEB REFERENCES

1. <http://www.data-compression.com/index.shtml>
2. http://www.webopedia.com/TERM/D/data_compression.html
3. http://en.wikipedia.org/wiki/Data_compression
4. <http://www.debugmode.com/imagecmp/>

EC-305	EMBEDDED SYSTEM DESIGN	L T P	Cr
		5 0 0	3

OBJECTIVE

The course intends to cover the design issues involved in embedded systems and system-on-chip technologies. The course also deals with the applications and programming languages and processor architectures used for embedded systems. This course introduces the students to standard Embedded System Development tools and gives a hands-on experience in developing various embedded applications.

1. **INTRODUCTION:** Different types of microcontrollers: Embedded microcontrollers; External memory microcontrollers; Processor Architectures: Harvard vs. Princeton; CISC vs. RISC; microcontrollers memory types; Introduction to Real Time Operating System.
2. **8051 MICROCONTROLLER ARCHITECTURE:** Architecture; memory considerations; Addressing modes; clocking; i/o pins; interrupts; timers; peripherals; serial communication; Instruction set; simple operations.
3. **PIC MICROCONTROLLER ARCHITECTURE:** Introduction to PIC microcontrollers; Architecture and pipelining; program memory considerations; Addressing modes; CPU registers; Instruction set; simple operations.
4. **INTERRUPTS AND I/O PORTS:** Interrupt logic; Timer2 scalar initialization; IntService Interrupt service routine; loop time subroutine; External interrupts and timers; synchronous serial port module; serial peripheral device; O/p port Expansion; I/p port expansion; UART.
5. **SOFTWARE:** Development tools/ environments; Assembly language programming style; Interpreters; High level languages; Intel hex format object files; Debugging.
6. **PROGRAMMING WITH MICRO-CONTROLLERS:** Arithmetic operations; Bit addressing; Loop control; Stack operation; Subroutines; interfacing of 8051 with LCD; LED; keyboard; motors; seven segment and other interfacing; PIC simple operations.
7. **DESIGNING USING MICROCONTROLLERS:** Music box; Mouse wheel turning; PWM motor control; aircraft demonstration; ultra sonic distance measuring; temperature sensor; pressure sensor; magnetic field sensor.

TEXT BOOK

John B. Peatman, “Design with PIC Microcontrollers”, Pearson Education, 4th edition, 2005.

REFERENCE BOOKS

1. Mazidi, “8051 Microcontroller”, 2nd Edition, Prentice Hall, 2005

- Predko, "Programming and Customizing the 8051 Microcontroller", 2nd Edition, McGraw Hill, 2002.
- Catsoulis John, "Designing Embedded Hardware", 2nd Edition, O'Media, 2005.
- Barr Michael, "Programming Embedded Systems in C and C++", Shroff Pub. and Distr., 3rd Edition, 2003.
- Ayala A. J., "The 8051 Microcontroller: Architecture, Programming, and Applications", Pap/Dsk edition, West Publishing Company, 1991
- Udai Shankar; "8051 Microcontrollers", CSVTU Research Journal, Chhattisgarh Swami Vivekanand Technical University, 2010.

EC-401	MOBILE COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

This subject covers the entire concept behind the cellular technology. It covers the different standards like GSM; CDMA and going through these topics will help the students to face telecom sector and software companies.

- MOBILE RADIO SYSTEM:** reference model; frequencies for radio transmission; signals; antennas; signal propagation; multiplexing; modulation
- CHARACTERISTICS OF RADIO WAVES:** Multipath characteristics of radio waves; signal fading; time dispersion; Doppler spread ; coherence time; LCR; fading statistics; diversity techniques
- WIRELESS SYSTEMS:** GSM: architecture; services; frame structure; signal processing
Wireless data services :RAM ;CDPD; GPRS
- WI-FI AND THE IEEE STANDARD 802.11:** 802.11 architecture; MAC layer; PHY layer; Bluetooth and the IEEE standard 802.15
- MOBILE NETWORK LAYER: MOBILE IP:** Goals and requirements; IP packet delivery; agent discovery; registration; tunneling and encapsulation; optimization; reverse tunneling; IP-V6; Mobile ad-hoc networks
- MOBILE TRANSPORT LAYER:** Traditional TCP; classical TCP improvement; TCP over 2.5 G/3G wireless networks; performance enhancing proxies
- CDMA IN MOBILE COMMUNICATION SYSTEMS:** Introduction, spreading sequences, basic transmitter and receiver schemes in the CDMA system, RAKE receiver, joint detection of CDMA signals, basic properties of a CDMA mobile system

TEXT BOOK

Rappaport T. S., "Wireless Communication: Principles and Practice", 2nd Edition, Prentice Hall of India, 2001

REFERENCE BOOK

- Schiller Jochen, "Mobile Communication", 2nd Edition, Pearson Education, 2005.
- William C. Y. Lee, "Mobile Cellular Telecommunications", 2nd Edition, McGraw Hill, 1995.

EE-401	PROGRAMMABLE LOGIC CONTROLLERS & SCADA	L T P	Cr
		5 0 0	3

OBJECTIVE

The programmable logic controller represents a key factor in industrial automation. Its use permits flexible adaptation to varying processes as well as rapid fault finding and error elimination. Today, Industrial environment is steered with the latest technological advancements in computers and communication. Programmable Logic Controllers (PLC) based automation is its outcome. This subject is useful to understand the concept of automation used in industry.

- INTRODUCTION:** Programmable Logic Controller; advantages of PLCs Over Relay System; input output Section – Fixed input output, Modular input output, Discrete input output Modules, Analog input output Modules.
- PROCESSOR UNIT:** Processor; Memory types; Guarding against Electro Static Discharge; Peripherals; Memory Organization.
- PROGRAMMING DEVICES:** Programming Devices; Dedicated Desktop Programmes; Hard Held Programmes; Computer Programmes
- LADDER DIAGRAM & PLC PROGRAMMING:** Ladder Diagram Rules; Writing Diagram; Ladder Diagram; Basic Stop / START Circuit; Digital Logic gates; Sequenced Motor Starting; Relay Type Instruction; Programming a PLC; PLC Peripherals; Network Limitation; Program Scanning
- Program Control Instructions:** Master Control Relay Instructions; Latching Relay instruction; immediate input output instruction; Jump and Label Instruction.
- PROGRAMMING TIMER & COUNTERS:** Pneumatic Timers; Cascading Timers; Allen Bradley PLCs Counters; Combining Timer & Counters.
- SCADA:** Introduction; Concept of Automatic Scada; Architecture of Scada; Hierarchical of Supervisory Control & Data Acquisition System; Technology Available; Data Acquisition Unit; Remote Technical Unit.

TEXT BOOK

Cox Richard A., "Technician's Guide to Programmable Controllers", 4th Edition, Delmar Thomson Learning, 2001

REFERENCE BOOKS

- Hackworth, John. R. and Hackworth, Jr. Frederick D., "Programmable Logic Controllers: Programming Methods and Applications", Pearson Education, 2004.
- Webb, John W., & Reis, Ronal A., "Programmable Logic Controllers: Principles & Applications", Pearson Education / Prentice Hall, 2008.
- Dunning, Gary, "Introduction to Programmable Logic Controllers", Delmar Thomson Learning, 2004.

EE-431	INDUSTRIAL ELECTRONICS	L T P	Cr
		5 0 0	3

OBJECTIVE

Students who enter the job market and become electronic engineers must be prepared to work on industrial electronics in many forms. The job responsibilities for these fields are rapidly changing because electronic devices and circuits have become thoroughly integrated into all aspects of modern industrial control systems during the past ten years. The role of an electronic engineer has changed to the point where he is expected to work on every aspect of industrial system from the simplest electrical components, such as fuses and motor, to the most complex, such as electronic boards, motor drives, and programmable controllers. This course provides sufficient depth to be a useful resource while working on job.

- INDUSTRIAL LOGIC CIRCUITS:** Relay logic; Types of relays; voltage ratings for coils and contacts; typical logic circuits; relay ladder & its application; solid state devices used for relay logic; solid state logic blocks; solid state relays.
- PROGRAMMABLE LOGIC CONTROLLERS (PLC):** Programmable logic controller systems; PLC operation; input module circuitry; processor; processor operations; memory & its layout; program scanning; programming – assembly language; relay language or logic; programming basics; ladder diagram; timing function; sequencing operations; arithmetic functions; move function, conversion.
- TIMERS:** Functions, types – delay timers; interval times; repeat cycle timers; reset timers; timer classification – thermal timers; electromechanical timers; motor driven delay timers; block diagram of the basic elements of an electronic timer.
- ILLUMINATION:** Nature of light; basic laws of illumination; light sources and their characteristics; light production by excitation and ionization; incandescence; fluorescence; different types of lamps; their construction; operation and characteristic; application, latest light sources; design of illumination system.
- POWER SUPPLIES:** Performance parameters, of power supplies, comparison of rectifier circuit; filters, regulated power supplies; switching regulators; switch mode converter.
- POWER FACTOR CONTROL:** Static reactive power compensation; shunt reactive power compensator; application of static SCR controlled shunt compensators for load compensation; power Factor improvement and harmonic Control of Converter fed systems; methods employing natural and forced commutation schemes; implementation of forced commutation.
- MOTOR CONTROL:** Voltage control at constant frequency; PWM control; phase control of dc motor; PLC control of a DC motor.

TEXT BOOK

Dubey G. K., "Power Semiconductor Controlled Drives", Prentice Hall Inc. New York.

REFERENCE BOOKS

- Thomas Kissel E., "Industrial Electronics", 3rd Edition, Prentice Hall of India.
- Date Patrick R. & Stephen Fardo W., "Industrial Electronics: Devices and Systems" 2nd Ed., Marcel Deckker, Inc. New York.

LABORATORY: Performance parameter of various power converters, sequence control of AC-DC power converter, Comparison of AC-DC converters with and without filters, Project on illumination, simulation of power converters using MATLAB, relay network programming, programming PLC.

EL-421	RENEWABLE ENERGY SOURCES & ENERGY CONSERVATION	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing the knowledge to the students about various types of conventional and non-conventional electrical power plants and explain the concepts regarding their layout and their operations at different load conditions.

PRE-REQUISITES

Knowledge of electrical technology and circuits.

- INTRODUCTION:** Energy classification; sources; utilization; economics; power generation terminology; energy conversion matrix; and review of various principal fuels for energy conversion such as solar; biogas; wind ; tidal etc.
- SOLAR ENERGY:** Solar radiation and its measurement; solar energy collectors; storage and applications.
- WIND ENERGY:** Basic principles of wind energy conversion; site selection considerations; wind data and energy estimation; classification of WEC systems; Magnus effect; wind energy collectors; storage and applications of wind energy; safety systems.
- ENERGY FROM BIOMASS:** Introduction; biomass conversion technologies; biogas generation; classification of biogas plants; details of construction of some main digesters; methods for maintaining biogas production; problems related to bio-gas plants etc.
- ENERGY FROM THE OCEANS:** OTEC; open cycle; closed cycle OTEC systems; energy utilization; hybrid cycle etc. operation methods of utilization of tidal energy; prospects in India.
- PRODUCTION OF THERMAL ENERGY:** Introduction; conversion of mechanical energy; conversion of electrical energy; conversion of electromagnetic energy; conversion of chemical energy; conversion of nuclear energy etc. Study of typical energy converters such as high performance motors; special generators driven by biogas engines; wind turbines etc; mini-hydro generators; energy efficient motors; magneto hydro dynamics power generation; thermionic generation.
- ENVIRONMENTAL IMPACT OF POWER PLANT OPERATION:** Introduction; particulate emissions; gaseous pollutants; thermal pollution; solid-waste pollution.

TEXT BOOK

Mukund R., "Non-conventional Energy Sources", Khanna Publishers, 2002

REFERENCE BOOKS

1. Domkundwar and Arora, "Power Plant Engineering", Dhanpat Rai & Sons 2002.
2. Rai R. C., "Power Plant Engineering", Dhanpat Rai Publication, 2005
3. Cul A. W., "Energy converters", McGraw Hill, 2000.
4. Nag, P. K., "Power Plant Engineering", Tata McGraw Hill, 1995
5. Subir, R., "Electrical Power System", Prentice Hall India, 2007

EL-422	HVDC TRANSMISSION	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing a basic knowledge and understanding of the fundamental concepts of high voltage engineering, explaining various methods of HVDC power transmission, converter techniques and HVDC control and protection, and the method of measurement and testing of HVDC.

PRE-REQUISITES

Knowledge of electromagnetic field theory and power systems.

1. **DC POWER TRANSMISSION TECHNOLOGY:** Introduction; comparison of AC and DC transmission; application of DC transmission; description of DC transmission system; planning for HVDC transmission; modern trends in DC transmission.
2. **THYRISTOR VALVE & ANALYSIS OF HVDC CONVERTERS:** Introduction; thyristor device; thyristor value; value tests; recent trends; pulse number; choice of converter configuration; simplified analysis of Graetz circuit; converter bridge characteristics; characteristics of twelve pulse converter; detailed analysis of converters.
3. **CONVERTER AND HVDC SYSTEM CONTROL:** General; principles of DC link control; converter control characteristics; system control hierarchy; firing angle control; current and extinction angle control; starting and stopping of dc link; power control; higher level controllers; telecommunication requirements.
4. **CONVERTER FAULTS AND PROTECTION:** introduction; converter faults; protection against over currents; overvoltages in a converter station; surge arresters; protection against overvoltages introduction of multiterminal DC systems; potential applications of MTDC systems; types of MTDC systems; control and protection of MTDC systems; study of MTDC systems
5. **SMOOTHING REACTOR AND DC LINE:** Introduction; smoothing reactors; DC line; transient over voltages in DC line; protection of DC line; DC breakers; monopolar operation; effects of proximity of AC and DC transmission lines.
6. **REACTIVE POWER CONTROL, HARMONIC AND FILTERS:** Introduction; reactive power

requirement in steady state; sources of reactive power; static var systems; reactive power control during transients; introduction of harmonic and filters; generation of harmonics; design of AC filters; DC filters; carrier frequency and RI noise

7. **MEASUREMENTS & TESTING OF HVDC:** Measurement of high direct voltage; electrostatic voltmeters; generating voltmeter; sphere-gap; measurement of ripple voltages; types tests and routine tests of equipment; dielectric testing of HVDC equipments; power frequency voltage withstand tests; impulse voltage withstand test; measurement by sphere gaps; application of test voltage to the equipments under test.

TEXT BOOK

Arrillaga, J., "High voltage D.C. Transmission", Peter Peregrinus Ltd, 1996

REFERENCE BOOKS

1. Padiyar K. R., "HVDC Power Transmissions Systems", New Age International Pvt. Ltd., 2001
2. Rao S., "EHV-AC, HVDC Transmission & Distribution Engineering", Khanna Publishers, 1999
3. Tagare, D. M., "Reactive Power Management", Tata McGraw Hill, 1996
4. Dubey, G. K., "Power Semi-conductor Controlled Drives", Prentice Hall, 1999.
5. Subrahmaniyam V., "Electric Drives: Concepts and Applications", Tata McGraw Hill, 2005.

EL-423	HIGH VOLTAGE ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing a basic knowledge and understanding of the fundamental concepts of high voltage engineering, explaining various basic laws governing the conduction and breakdown, voltage gradients on conductors, phenomenon of corona and lightning discharges and high voltage testing arrangements.

PRE-REQUISITES

Knowledge of Electromagnetic field theory and power systems.

1. **INTRODUCTION:** Recent trends in high voltage transmission.
2. **CONDUCTION AND BREAKDOWN:** Conduction and breakdown in gases; liquids and solid dielectrics; insulator breakdown; insulation characteristics of long air gaps.
3. **VOLTAGE GRADIENTS ON CONDUCTORS:** Electrostatic fields of sphere gaps; fields of line charges and their properties; charge-potential relations for multi-conductor lines; surface voltage gradients on conductors; distribution of voltage gradient on sub conductors of bundle.
4. **CORONA:** Corona and corona loss; corona loss formula; attenuation of traveling waves due to corona; audible noise-generation and characteristics; corona pulses--their generation and properties; properties of pulse; radio interference.

5. **LIGHTENING:** Lightning phenomenon; lightning stroke mechanism; principle of lightning protection; tower foot resistance; insulator flash over and withstand voltage; lightning arresters and their characteristics.
6. **H. V. TESTING AND LAB EQUIPMENTS:** Standard wave-shapes for testing; wave-shaping circuits; principles and theory; impulse generator; generation of ac high voltage for testing; generation of direct voltage; measurement of high voltage; general layout of H.V.laboratory.
7. **MEASUREMENT OF HIGH ALTERNATING VOLTAGES:** Peak voltage measurement with sphere-gaps; peak voltage measurement using measuring capacitors; peak voltage measurement with capacitor voltage divider; measurement of rms values by electrostatic voltmeters; capacitance voltage transformer; digital recording.

TEXT BOOK

Begamudre, R. D., "E.H.V. AC Transmission", Wiley Eastern Ltd. 1992

REFERENCE BOOKS

1. Wadhwa C. L., "High Voltage Engineering", New Age international Ltd. 1995
2. Arrillaga J., "High voltage D.C. Transmission", Peter Peregrinus Ltd. 1996
3. Kamaraju V. and Naidu, M. S., "High Voltage Engineering", Tata McGraw Hill, 1996
4. Naidu M. S., "High Voltage Engineering", Tata McGraw Hill, 4 Edition, 2001
5. Ray Subir, "An Introduction to High Voltage Engineering, Prentice Hall of India, 2008

EN-471	PROFESSIONAL COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

The objective of devising this course is to prepare the students of this University to be ready to take up their professional job on the completion of this course. Professional communication is essential for the pass outs of this University to help them prove their abilities in the interviews and to utilize their knowledge in active job.

1. **PRACTICAL ENGLISH:** Parts of speech; noun; pronouns; adjective; verb, adverb, propulsion, conjunctional interjection; conjunctional interjection; use of articles.
2. **ADVANCED ENGLISH:** Phrasal verbs; reported speech; conditional clauses; concord; correct the sentences; question tags; idioms.
3. **VOCABULARY:** Word formation; one word substitution; foreign words; words often confused; homophones; antonyms; synonyms.
4. **BUSINESS ENGLISH:** Importance: business phrases; emphatic expression; e-mail writing; resume writing; interview techniques; business letter; covering letter; application job; resignation letter, effective telephone handling.
5. **PHONETICS:** Basic concepts; vowels, consonants; phonemes; syllabus; articulation of speech; transcription of words; word stress; Intonation.

6. **BOOK REVIEW**
7. **MOVIE REVIEW**

TEXT BOOK

Roy A. and Sharma P. L., "English for Students of Engineering", Orient Longman, 2007

The following four lessons are prescribes for textual study:

1. The Year 2050
2. Human Environment
3. The Discovery
4. Grief.

REFERENCE BOOKS

1. Tickoo M. L. and Subramanian A. E., "Intermediate Grammar, Usage ad Composition", Orient Longman.
2. Thomson and Martinet, "A Practical English Grammar", Oxford University Press
3. Hornby, "A.S. Guide to patterns and Usage in English", Oxford University Press
4. Balasubramanian T., "A Textbook of English Phonetics for Indian Students", MacMillan
5. D. O' Connor J, "Better English Pronunciation", Cambridge University Press, London.
6. McCarthy, "English Vocabulary in Use Foundation Books", Cambridge University Press
7. Hashem Abul, "Common Errors in English", Ramesh Publishing House
8. Roach P, "English Phonetics & Phonology", Cambridge University Press
9. Ramesh M. S. and Pattanshetti C. C., "Business Communication", R. Chand and Company
10. Wood F. T., "Remedial English Grammar for Foreign Students", The Macmillan Press Ltd., 1975

EN-472	BUSINESS COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

The course proposes to help students develop competence in business and technical communication. It focuses on writing skills and strategies for specific purposes. The inevitability of introducing this course to Engineering students is embodied in that it has comparatively a high concentration of certain complex writing techniques and procedures.

1. **BUSINESS CORRESPONDENCE:** Characteristics and formats of business letter; quotations, orders, tenders, sales letters, complaints, claim and adjustment letters; credit and collection letters; application; letters for vacant situations with emphasis on resumes and curriculum vitae; e-mail and netiquette- format, style and tone
2. **BUSINESS REPORTS AND PROPOSALS:** Importance; function; pattern and formats of reports, typical business reports; report presentation, and formal reports: proposal formats, writing problem- solving proposals; executive summery proposals and project proposals
3. **MEETINGS:** Writing of memoranda; notes; agenda and minutes of the meeting.
4. **PUBLIC RELATIONS AND ADVERTISING**

DOCUMENTS: Press releases; public service announcements, advertising strategy and its objectives; designing of classified and display advertising copies.

- 5 **PHONETICS:** Vowels; consonants; syllables; transcription; word stress & intonation.
- 6 **ESSAY WRITING ON BUSINESS TOPICS- TRADITIONAL & CONTEMPORARY**
- 7 **BOOK REVIEW/MOVIE REVIEW**

TEXT BOOK

Bansal R. K. and Harrison J. B., "Spoken English for India", Orient Longman

REFERENCE BOOKS

- 1 Mary Ellen Guffey, "Business Communication: Process & Product", 4th Edition, South-Western College Publishing, Cincinnati.
- 2 Sharma R. C. and Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill
- 3 Ramesh M. S. and Pattanshetti C. C., "Effective Business English and Correspondence", R. Chand & Co.
- 4 Shruter C., "Effective Letters in Business by Robert", Tata McGraw Hill
- 5 Wing F. W. and Anncreed D., "English Business Letters", Orient Longman.
- 6 Sarah Freeman, "Written Communication in English", Orient Longman.
- 7 Leo Jones and Riched Alexander, "International Business English", Cambridge University Press
- 8 Sweet Stephen, "General and Business English", Sir Issac Pitman & Sons Ltd., London.
- 9 Charles Fl. Sides, "How to Write and Present Technical Information", Cambridge University Press
- 10 Susan Stevenson/Steve Whitmore, "Strategies for Engineering Communication", John Wiley and Sons/Replika Press. Pvt. Ltd. Delhi.

currencies and payment systems; offline secure processing; private data networks; security protocols; electronic payment systems: digital payment systems

3. **DIGITAL CURRENCIES:** Operational process of Digicash; Ecash Trail; Using Ecash; Smart cards; Electronic Data Interchange: basics, EDI versus Internet and EDI over Internet; Strategies, Techniques and Tools; Shopping techniques and online selling techniques.

PART B

4. **ERP- AN ENTERPRISE PERSPECTIVE:** Production Finance, Personnel disciplines and their relationship, Transiting environment, MIS Integration for disciplines, Information/Workflow, Network Structure, Client Server Integrator System, Virtual Enterprise.
5. **ERP – RESOURCE MANAGEMENT PERSPECTIVE:** Functional and Process of Resource; Management; Introduction to basic modules of ERP System: HRD, Personnel management, training and development; skill inventory, material planning and control, inventory; forecasting; manufacturing; production planning; production scheduling; production control; sales and distribution; finance; resource management in global scenario.
6. **ERP - INFORMATION SYSTEM PERSPECTIVE:** Introduction to OLAP (Online Analysis and Processing), TP, OAS, KBS, MRP, BPR, SCM, REP, CRM, Information Communication Technology.
7. **ERP-KEY MANAGERIAL ISSUES:** Concept Selling; IT infrastructure; implication of ERP systems on business organization; critical success factors in ERP System; ERP Culture implementation issues; resistance to change; ERP selection issues; return on investment; pre and post implementation issues.

TEXT BOOK

Kalakota Ravi and Whinston Andrew, "Frontiers of Electronic Commerce", Addison Wesley, 1996

REFERENCE BOOKS

1. V. K. Garg and N. K. Venkita Krishna, "Enterprise Resource Planning – Concepts and Practice", Prentice Hall of India, 1998,
2. Motiwala, "Enterprise Resource & Planning", 1st edition, Pearson Education
3. John Antonio, Fernandez, "The SAP/3 Handbook", Tata McGraw Hill
4. Denial Amor, "The E-Business Revolution", Addison Wesley
5. Sokol, "From EDI to E-Commerce: A Business Initiative", Tata McGraw Hill
6. Greenstein and Feinman, "E Commerce", Tata McGraw Hill
7. Rajan and Nag, "E Commerce: The Cutting Edge of Business", Tata McGraw Hill
8. Jaffrey F. Rayport , Bernard J. Jaworski, "E-Commerces", Tata McGraw Hill, 2002
9. Greenstein and Feinman, "Electronic Commerce – Security, Risk Management and Control", Tata McGraw Hill, 2002
10. Hendry Chan, Raymond Lee, Tharam Dillon and Ellizabeth Cang, "E-Commerce Fundamentals and Applications", John Wiley.

IT-423	INTRODUCTION TO E-COMMERCE & ERP	L T P	Cr
		5 0 0	3

OBJECTIVE

To provide knowledge about the protocols, methods, security issues in electronic commerce as well as about enterprise resource planning tools, models and techniques

PRE-REQUISITES

Knowledge of internet and web development, data mining, computer networks, software engineering

PART A

1. **INTRODUCTION AND CONCEPTS:** Networks and commercial transactions – Internet and other novelties, networks and electronic transactions today; model for commercial transactions; Internet environment – internet advantage; world wide web and other internet sales venues; online commerce solutions.
2. **ELECTRONIC PAYMENT METHODS:** Updating traditional transactions, secure online transaction models; online commercial environments; digital

- Efraim Turbon, Jee Lee, David King, H. Michael Chang, "E-Commerce" Wiley VCH, 2004

WEB REFERENCES

- www.exforsys.com/tutorials/erp/erp-and-e-commerce.html
- www.bizautomation.com
- itmanagement.earthweb.com/erp
- www.e2-llc.com/e2_ecommerce_erp.aspx
- e-comm.webopedia.com/TERM/e/ERP.html

IT-443	INFORMATION STORAGE & MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

Using a "building block" approach, the ISM curriculum provides a core understanding of storage technologies and progresses into system architectures, introduction to networked storage, and introduction to information availability. The course provides a comprehensive introduction to data storage technology fundamentals. Students will gain knowledge of the core logical and physical components that make up a storage systems infrastructure.

PRE-REQUISITES

Knowledge of Computer Networks at B Tech level

- INTRODUCTION:** Meeting today's data storage needs - data creation; data creation: individuals, business; categories of data; data storage models; common data storage media and solutions - tape storage systems, optical data storage, disk based storage
- DATA CENTER INFRASTRUCTURE:** Example; key requirements of storage systems management activities
- STORAGE SYSTEMS ARCHITECTURE:** Storage system environment; components of a host; connectivity; physical disks; RAID array; disk storage systems; data flow exercise
- NETWORKED STORAGE:** Direct Attached Storage (DAS), Network Attached Storage (NAS), Fiber Channel Storage Area Network (FC SAN), IP Storage Area Network (IP SAN), Content Addressed Storage (CAS)
- BUSINESS CONTINUITY:** Introduction, overview, backup and recovery, local replication, remote replication.
- MONITORING AND MANAGING THE DATA CENTER:** Areas of the data center to monitor; considerations for monitoring the data center; techniques for managing the data center.
- SECURING STORAGE AND STORAGE VIRTUALIZATION:** Securing the storage infrastructure; virtualization technologies.

TEXT BOOK

Osborne Marc Farley, "Building Storage Networks", Tata McGraw Hill

REFERENCE BOOKS

- Spalding Robert, "Storage Networks: The Complete Reference", Tata McGraw Hill
- Gupta Meeta, "Storage Area Network Fundamentals", Pearson Education Limited

- Kowalski Gerald J. and Maybury Mark T., "Information Storage & Retrieval Systems Theory & Implementation", BS Publications
- Thejendra B. S., "Disaster Recovery & Business Continuity", Shroff Publishers & Distributors, EMC – Students Kit

WEB REFERENCES

- http://www.cs.cmu.edu/~fp/courses/03-312/handouts/18-storage.pdf
- http://www.freedomdownloadcenter.com/Information_Management/

MA-471	DISCRETE MATHEMATICS	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of computer field.

- SET THEORY:** Different types of sets; Set operations; Classes of sets; Relation; Types of relation; Functions; Types of functions and composition of functions and relation; Cardinality and inverse relations; Fuzzy sets; Basic operations of fuzzy sets.
- BOOLEAN ALGEBRA & LATTICES:** Definition of Boolean algebra; Basic operations of Boolean algebra; Partially ordered sets; Lattices; Sub Lattices; Different types of Lattices; Operations on Lattices.
- NUMBER THEORY:** Basic properties; Divisibility theory; Congruences; Chinese remainder theorem; Fermat's little theorem; τ & μ functions.
- COMBINATORICS:** Fundamental principal of counting; Pigeonhole principal; Multinomial coefficients; Recurrence relation; Generating functions.
- ALGEBRAIC STRUCTURES:** Binary operations; Group; Subgroup; Normal subgroup and their elementary properties; Order of element and group; Lagrange's theorem; Rings; Sub ring; Ideal; Integral domain; Field only definition and examples.
- GRAPH THEORY:** Introduction to graphs; Type of graphs; Sub graphs and isomorphic graphs; Representation of graphs; Properties of graphs; Euler's formula for planar graph; Eulerian and Hamiltonian graph; Ore's theorem.
- TREES:** Trees and their properties; Spanning trees; Kruskal's algorithm; Prim's algorithm; Binary tree.

TEXT BOOK

Sarkar S. K., "A Textbook of Discrete Mathematics" 5th Edition, S. Chand Publications

REFERENCE BOOK

- Liu C. L., "Element of Discrete Mathematics" McGraw Hill.
- Sengadir, "Discrete Mathematics and Combinatorics", Pearson Education.
- Deo, "Graph Theory", Prentice Hall of India.
- Bough R. Johnson, "Discrete Mathematics", Pearson Education.

MA-472	ADVANCED HIGHER ENGINEERING MATHEMATICS	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

- SERIES SOLUTION OF DIFFERENTIAL EQUATION:** Series solution and its validity; General method; Forms of series solution.
- CALCULUS OF VARIATIONS:** Introduction; Functionals; Euler's equation; solutions of Euler's equation; Geodesies; Isoperimetric problems; Several dependent variables; Functionals involving higher order derivative; Approximate solution of boundary value problems- Rayleigh-Ritz methods; Hamilton's principle; Lagrange's equations.
- TENSOR ANALYSIS:** Introduction; Summation convention; Transformation of co-ordinates; Tensor of order zero; Kronecker Delta; Contravariant and Co-variant tensors; Quotient law; Riemannian space; Conjugate tensor; Christoffel symbols; Transformation of Christoffel symbol; Covariant differentiation of a covariant tensors; Covariant differentiation of a contravariant tensors.
- INTEGRAL EQUATIONS:** Definition and classification of integral equations; Conversion of a linear differential equation to an integral equation and vice versa; Volterra Integral equations, solution of integral equation by resolvent Kernel, Method of successive approximation, Euler integrals, Volterra Integral equation of the first kind, Fredholm equation of second kind.

TEXT BOOK

Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005

REFERENCE BOOKS

- Wylie C. Ray and Barrett Louis.C., "Advanced Engg. Mathematics", McGraw Hill
- Sastry S. S., "Engineering Mathematics", 11th Edition, Prentice Hall of India, 1994
- Jerri Abdul J., "Introduction of Integral Equation with Application", Wiley-Interscience; 2nd Edition, 1999
- Debnath Lokenath, "Integral Transforms and their Applications", 2nd Edition, Chapman & Hall, 2007
- Weatherburn, "Tensor Calculus", Cambridge University Press, 2008
- Kreyszig E., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

MA-473	ADVANCED NUMERICAL TECHNIQUES	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

- EIGEN VALUE PROBLEMS:** Eigen values and eigen vectors; Power methods: Jacobi's methods; Given's methods; House-holder's methods.
- DIFFERENCE EQUATIONS:** Introduction; formation of difference equations; complementary function; particular integral; difference equations reducible to linear form; simultaneous difference equations and its applications.
- PARABOLIC PARTIAL DIFFERENTIAL EQUATION:** Transient heat flow equation; the explicit method; Crank-Nicolson method; parabolic equation in two or three dimension; finite elements for heat flow.
- HYPERBOLIC PARTIAL DIFFERENTIAL EQUATION:** The wave equation; solving the wave equation by finite differences; comparison to the d'Alembert solution; method of characteristics; the wave equation in 2-D; finite elements and the wave equation.
- APPROXIMATION OF FUNCTION:** Chebyshev polynomials; economized power series; approximation with rational functions; Fourier series; getting Fourier co efficient numerically and fast Fourier transform.
- APPLICATION IN ENGINEERING FIELD:** Application of Gaussian quadrature in evaluating stiffness and stress matrices for 2D and 3D elements.

TEXT BOOK

Curtis F, Gerald and Patrick, "Applied Numerical Analysis", 7th Edition, Wheatley Solution

REFERENCE BOOKS

- Balagurusamy E., "Numerical Methods", Tata McGraw Hill
- Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India
- Jain M. K., Iyenger S. R. K. and Jain R. K., "Numerical Methods for Scientific and Engg. Computations" by - Wiley Eastire Ltd.
- Rao S. S., "The Finite Element Method in Engg.", Pregamon Press/McGraw Hill, 1989

MA-474	OPERATION RESEARCH	L T P	Cr
		5 0 0	3

OBJECTIVE

The aim of the topic is to provide a common platform for the Engineers, Scientists along with people from management, industry & defence sector. This topic also provides how to get optimal solution in above said branch.

- LINEAR PROGRAMMING:** Linear programming modeling and examples; resolution of degeneracy; duality theory; dual-simplex and primal-dual algorithms; transportation; assignment problems; sensitivity analysis; industrial applications of linear programming like product mix problems; blending problems; optimal allocation of resources, etc.
- INTEGER PROGRAMMING, GOEL PROGRAMMING & MULTICRITERIA DECISION MAKING:** Formulation of various industrial problems

as integer and mixed integer programming problems; branch and bound algorithm; cutting plane methods for pure and mixed integer programming problems; Knap-sack; travelling salesman and shortest route problems. multicriteria decision; multicriteria decision making models; determination of set of feasible alternatives; solution techniques; goal programming approach; goal programming models; ranking and weighting of multiple goals; simplex method in goal programming.

3. **NON-LINEAR PROGRAMMING:** Constraint qualification and Kuhn-Tucker necessary conditions; sufficiency of Kuhn-Tucker necessary conditions and convex programs; Linear Complementarity Problem (LCP); Quadratic programming and use of LCP for solving quadratic programming problems.
4. **SEQUENCING MODEL:** Two machine and n jobs (no passing) problem and three machine and n jobs (no passing) problems; different routing; 2 jobs and m machines; n jobs and m machines; branch and bound algorithms.
5. **QUEING THEORY & INVENTORY CONTROL:** Introduction to waiting line models? steady state behavior of M/M/1 and M/M/C queues-the problem of machine interference and use of finite queuing tables- introduction to M/G/1, and G/M/1 .inventory control problem; Concept of inventory and various costs; EQQ formula newspaper boy problems.
6. **PERT/CPM:** Introduction to network analysis; Definition of a project; job and events; drawing of arrow diagrams; determination of critical paths and calculation o floats; resource allocation and least cost planning; use of network flows for least cost planning; uncertain duration and PERT.
7. **STOCHASTIC PROGRAMMING:** Stochastic programming with one objective function; stochastic linear programming; two stage programming technique; chance constrained programming technique.

TEXT BOOK

Taha H. A., "Operations Research: An Introduction", Macmillan, N.Y.

REFERENCE BOOK

1. Hitter F. S. and Lieberman G. J., "Introduction to Operations Research", Addison Wesley.
2. Hadley G., "Linear Programming", Addison Wesley.
3. Dantzig G., "Linear Programming and Extensions", Princeton, N.J.
4. Fletcher R., "Practical Methods of Constrained Optimization", John Wiley.
5. Bazaraa M. S., Jervis J. J. and Sherali H. D., "Linear Programming & Network Flows", John Wiley.

ME-442	ERGONOMICS	L T P	Cr
		5 0 0	3

OBJECTIVE

The course provides knowledge of ergonomics principles so that the students are able to visualize factors which affect the efficiency of human beings. After the study of the subject, the students will be able to select a proper design of display controls, equipment, work plan and environment

1. **INTRODUCTION:** Definition of ergonomics and ergonomist; social and economic values of ergonomics; general and individual ergonomics.
2. **POSTURE AND MOVEMENT:** Biomechanical; physiological and anthropometric background; postures; sitting and standing; Movement – lifting; carrying; pulling and pushing; Workplace design and assessment.
3. **INFORMATION AND OPERATION:** User; information – visual; hearing and other senses; Control for operation – fixed and others diagues user friendliness; different forms and help; Website design; mobile interaction; virtual reality.
4. **ENVIRONMENTAL FACTORS:** Noise reduction; hearing conservation; Vibration prevention; illumination – light intensity; brightness differences; colour of light; Climate – heat and cold; Chemical substances – measures; ventilation.
5. **WORK ORGANISATION JOBS & TASKS:** Tasks; jobs; work organization – flexible; autonomous groups; coaching measurement styles.
6. **ERGONOMIC APPROACH:** Project management – initiative phase; problem identification phase; selection of solution phase; implementation phase; evaluation phase.
7. **CASE STUDIES:** A set of case studies will be used to demonstrate how ergonomics had lead to changes in work activity; safety and product design; Case studies will include advanced computer application; work place assessment; accidents; analysis and industrial inspection.

TEXT BOOK

Jan Dul and Bernard Weerdancester, "Ergonomics for Beginners", CRC Press/Taylor and Francis Group

REFERENCE BOOKS

1. Knoz Stephana, Johnson Steven, Halconts "Work Design - Industrial Ergonomics", Hathway, Scottsdagta, AZ
2. Sanders M. S. and McCormic E. J., "Human Factors in Engineering and Design", McGraw Hill New York
3. Verma A. P., "Industrial Engineering", S. K. Kataria and Sons

ME-443	FINITE ELEMENT ANALYSIS	L T P	Cr
		5 0 0	3

OBJECTIVE

The objective of the course is to teach the fundamentals of finite element method of solids; structures and fluids with emphasis on the underlying theory, assumptions, and modeling issues as well as providing hands on experience using finite element software to model, analyze and design systems of relevance to mechanical engineering. This includes the theoretical foundations and appropriate use of finite element methods.

1. **INTRODUCTION - VARIATIONAL FORMULATION:** General field problems in Engineering; Modeling; Discrete and Continuous models; Characteristics; Difficulties involved in

solution; The relevance and place of finite element method; Historical comments; Basic concept of FEM; Boundary and initial value problems; Gradient and divergence theorems; Functional; Variational calculus; Variational formulation of VBPS; The method of weighted residuals; The Ritz method.

2. **FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS:** 1D second order equations; discretisation of domain into elements; Generalised coordinates approach; derivation of elements equations; assembly of element equations; imposition of boundary conditions; solution of equations; Cholesky method; Post processing.
3. **EXTENSION OF THE METHOD TO FOURTH ORDER EQUATIONS AND THEIR SOLUTIONS:** time dependant problems and their solutions; example from heat transfer; fluid flow and solid mechanics.
4. **FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS:** Second order equations involving a scalar; valued function; model equation; Variational formulation – Finite element formulation through generalised coordinates approach; Triangular elements and quadrilateral elements ; convergence criteria for chosen models; Interpolation functions; Elements matrices and vectors; Assembly of element matrices; boundary conditions; solution techniques.
5. **ISOPARAMETRIC ELEMENTS AND FORMULATION:** Natural coordinates in 1, 2 and 3 dimensions; use of area coordinates for triangular elements in; 2 dimensional problems; Isoparametric elements in 1, 2 and 3 dimensions; Lagrangean and serendipity elements; Formulation of element equations in one and two dimensions ; Numerical integration.
6. **APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONS:** Equations of elasticity; plane elasticity problems; axisymmetric problems in elasticity; Bending of elastic plates; Time dependent problems in elasticity; Heat transfer in two dimensions; Incompressible fluid flow and related problems.
7. **INTRODUCTION TO ADVANCED TOPICS (NOT FOR EXAMINATION PURPOSES):** Three dimensional problems; Mixed formulation; use of software packages.

TEXT BOOK

Reddy J. N., "An Introduction to Finite Element Method", McGraw Hill, Intl Student Edition

REFERENCE BOOKS

- 1 Zienkiewitch, "The Finite Element Method; Basic Formulation and Linear Problems", Vol 1, 4th Edition, McGraw Hill
- 2 Desai C. S. and Abel J. F., "Introduction to the Finite Element Method", Affiliated East west Press, 1972
- 3 Rao S. S., "The Finite Element Method in Engineering", Pergaman Press, 1989

ME-461	RENEWABLE SOURCES OF ENERGY	L T P	Cr
		5 0 0	3

OBJECTIVE

This gives the knowledge of estimation; conversion and utilization of non conventional sources of energy. With the depletion of fossil fuel sources, the importance of non-conventional renewable sources of energy has gained tremendous importance. This course introduces the students to these sources and how these can be utilized for power production.

1. **INTRODUCTION:** Trends of energy consumption; sources of energy; conventional and Renewable; fossil fuel; availability and limitations; need to develop new energy sources.
2. **SOLAR ENERGY:** Solar radiation characteristics and estimation; Solar Collectors; Flat Plate and concentrating types; Their comparative study; design and material selection; Efficiency; Selective paints and surfaces; Heating of air and water for building and other Uses; Thermal storages; Solar Ponds; Solar pumps; solar Power; Solar Cookers etc; Direct Conversion of Solar energy to electricity and its various uses; materials; limitations and Costs.
3. **BIO-CONVERSION:** Generation of bio-gas; digesters and their design; selection of material; feed to digester; paralytic gasification; production of hydrogen; Algae production and their uses.
4. **WIND ENERGY:** Types of rotors; horizontal axis and vertical axis systems; system design and site selection.
5. **GEO-THERMAL ENERGY:** Sites; potentiality and limitation; study of different conversion systems.
6. **TIDAL ENERGY:** Sites; potentiality and possibility of harnessing from site; limitations; Ocean Thermal Energy: Principle of utilization and its limitations; description of various systems.
7. **OTHER NON-CONVENTIONAL ENERGY SOURCES:** Fluidized bed combustions; heat from waste and other sources.

TEXT BOOK

Tiwari G. N. and Ghosal M. K., "Renewable Energy Resources", Narosa Publishing House

REFERENCE BOOKS

1. Rai G. D., "Solar Energy Utilization", Khanna Publishers, 1995
2. Duffie J. A. and Beckman, "Solar Heating and Cooling"
3. Wakil M. M, EL, "Power Plant Technology", McGraw Hill
4. Sharma P. C., "Power Plant Engineering", S. K. Kataria and Sons

PH-471	NON DESTRUCTIVE TESTING TECHNIQUES	L T P	Cr
		5 0 0	3

OBJECTIVE

To give a general overview of novel non destructive testing methods, the principles behind them, their uses, the advantages and limitations, both in application and defect detection capability.

1. **NON-DESTRUCTIVE TESTING:** Non-destructive testing (NDT): role, components and advantages; common NDT techniques.
2. **ULTRASONIC TESTING:** ultrasonic flaw detection: principle, working and applications, advantages and limitations.
3. **RADIOGRAPHY:** X-ray radiography, Gamma ray radiography and Neutron radiography; principle, working and applications, advantages and limitations.
4. **EDDY CURRENT TESTING:** Principle, working and applications of eddy current testing; probes and sensors; testing procedures, applications, advantages and imitations.
5. **MAGNETIC TESTING:** Magnetic testing: particle, flux leakage testing; magnetization methods; detectables. applications and imitations,
6. **DYE PENETRANT TESTING:** Principle, working and applications of dye penetrant testing, advantages and limitations.
7. **VISUAL AND OPTICAL TESTING:** Principle, workhg and applications of holography, optical interference techniques, advantages and limitations.

TEXT BOOK

Baldev Raj, Jayakumar T., and Thavasimuthu M., "Practical Non-Destructive Testing", Narosa Publishing, 1997

REFERENCE BOOKS

1. Suryanarayana C., "Testing of Metallic Materials", Prentice Hall of India, 1979
2. American Society for Metals, "Metals Hand Book (Mechanical Testing)", Volume VIII, American Society for Metals, 1988
3. Rolfe T. and Barson J., "Fracture and Fatigue Control and Structure - Application of Fracture Mechanics", Prentice Hall, 1977
4. Halmshaw R, "Non-Destructive Testing", Edward Arnold, 1989
5. Hull, "Non-Destructive Testing", ELBS Edition, 1991.
6. Das A. K., "Metallurgy of Failure Analysis", JMH, 1992.

PH-472	NANO TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

The goal is to teach students some basic nanoscience/hanotechnology. Students are expected to learn both some basic science and technology. Students from all branches are encouraged to take (his course. In addition, students are expected to assist each other in teaming and discussing the content and die context, and to maintain respect for the scientific approach.

1. **NANOMATERIALS:** Introduction to nano-materials; nano-scale in one dimension: thin films, layers and surfaces, nanoscale in two dimensions: carbon nano-tubes; inorganic nano-tubes, nano-wires, biopolymers; nano-scale in three dimensions: nano-particles, fullerenes

- (Carbon 60), dendrimers, quantum dots
2. **NANOMETROLOGY:** Introduction to nanometrology; length measurement; force measurement; measurement of single molecules; applications of metrology.
3. **ELECTRONICS, OPTOELECTRONICS AND INFORMATION AND COMMUNICATION TECHNOLOGY:** Introduction to electronics; optoelectronics and information and communication technology; nanoscience in electronics, opto-electronics and information and communication technology; current applications: computer chips, information storage, opto-electronics; applications anticipated in the future: sensors.
4. **NANO-BIOTECHNOLOGY AND NANOMEDICINE:** introduction to nano-biotechnology and nano-medicine, nano-science in nano-biotechnology and nano-medicine, current and future applications array technologies, drug delivery, drug discovery, medical imaging, nano-technologies and cancer treatment, implants and Prosthetics.
5. **NANOFABRICATION:** Lithographic techniques for nano-printing; nano-manipulation techniques, self assembly.
6. **SYNTHESIS AND CHARACTERIZATION:** Metallic, semiconducting, magnetic and carbon based nano structures, nanocomposites and biological nanomaterials.
7. **APPLICATIONS OF NANOMATERIALS:** Sunscreens and cosmetics, composites, clays. coatings and surfaces, tougher and harder cutting toots, paints; remediation, fuel ceils; displays, batteries, fuel additives, catalysts; carbon nanotube composites; lubricants, magnetic materials; medical implants; machinable ceramics, water purification, military battle suits.

TEXT BOOK

Poole Charles P. and Owens Frank J., "Introduction to Nanotechnology", Wiley Interscience, 2003

REFERENCE BOOKS

1. Rainer Waser, "Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices", Wiley VCH, 2003
2. Wang Z. L., "Characterization of Nanophase Materials", Wiley-VCH, 2001
3. Edelstein A. S. and Cammamm R. C., "Nanomaterials: Synthesis, Properties and Applications", IOP (UK), 1996
4. Heinzl T., "Mesoscopic Electronics in Solid State Nanostructures", Wiley-VCH, 2003

PH-473	LASER TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

To give a general overview of fundamentals of Laser, Laser production techniques and applications.

1. **CONDITIONS:** Conditions for producing laser, concept of coherence - spatial and temporal, population inversions

2. **GROWTH FACTOR:** Einstein coefficients, gain and gain saturation, saturation intensity, development and growth of a laser beam, exponential growth factor, threshold requirement for a laser.
3. **NORMAL INVERSION:** Inversions and two level systems, steady state inversions,
4. **POPULATION INVERSION:** Three and four level systems, transient population inversions, factors effecting population inversion, laser Amplifiers.
5. **EXCITATION AND PUMPING:** Excitation or pumping threshold requirements, pumping pathway and specific excitation parameters associated with optical and particle pumping.
6. **TYPES OF LASERS:** Helium-Neon Laser, CO₂ Laser, Ruby Laser, Semiconductor diode laser.
7. **LASER SPECTROSCOPY:** Introduction and applications

TEXT BOOK

Silfvast William T., "Laser Fundamentals", Cambridge University Press

REFERENCE BOOKS

1. Beynon John, "Introductory University Optics", Prentice Hall of India.
2. Ghatak A. K., "Optics", Tata McGraw Hill.

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Lingaya's Group of Institutions:

- **Lingaya's University (Faridabad)**
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 - **Lingaya's Public School**
- **Lingaya's Lalita Devi Institute of Management & Sciences, New Delhi (I.P. University)**
- **Sri Viveka Institute of Technology, Vijayawada**



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